MODERN WIRELESS

January

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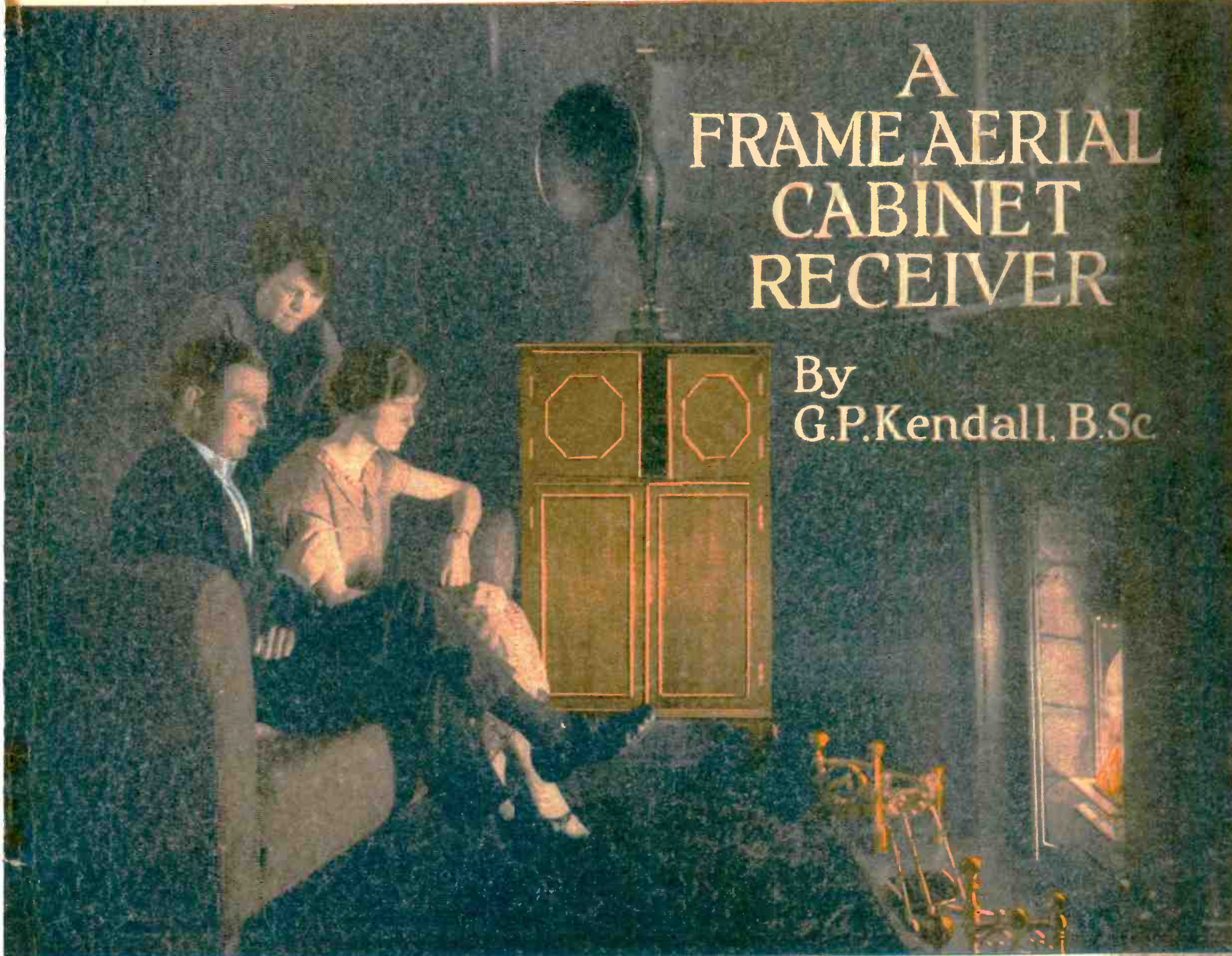


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MODERN WIRELESS

Vol. V. No. 4.

Contents

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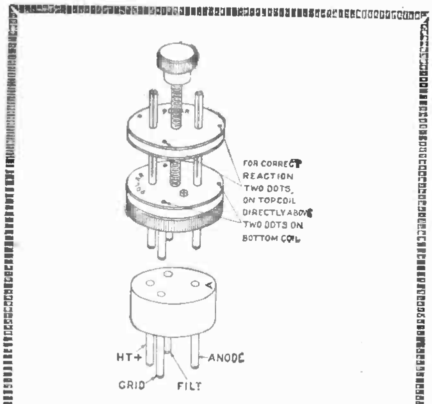
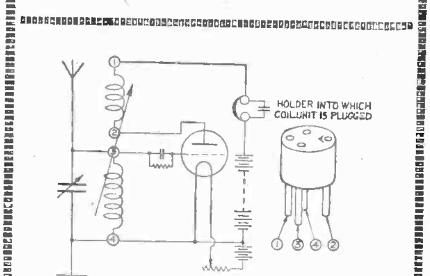
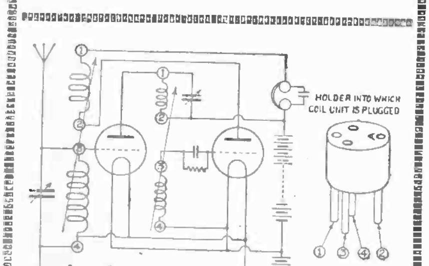
Save space, expense and trouble by fitting this new Interchangeable Coil-Unit

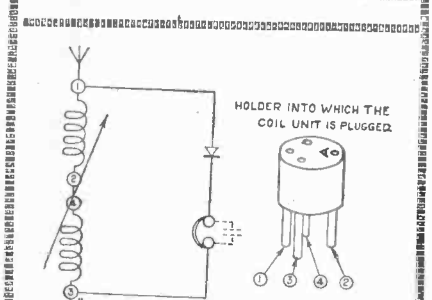




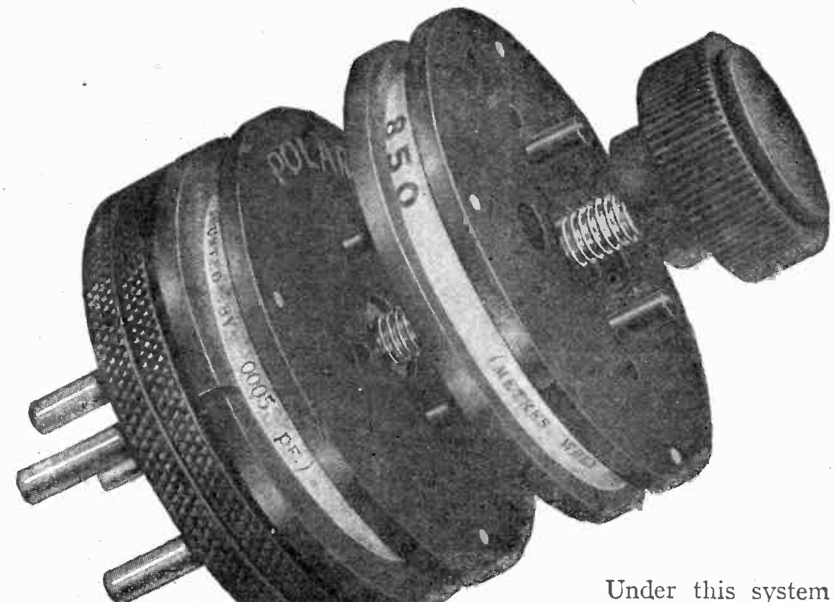
SIMPLE I VALVE CIRCUIT WITH REACTION USING "POLAR" COIL UNIT



"POLAR" COIL UNIT USED AS H.F. TRANSFORMER



"POLAR" COIL UNIT USED AS VARIOMETER IN CRYSTAL SET.



Under this system you can obtain most efficient aerial reaction with micrometric adjustment of coupling, facility for quick reversion of coils, and complete interchangeability.

The unit consists of a four-pin base (fitting any valve holder) with a spring-held centre spindle for adjustment of coupling. The "filament" pins connect to the lower coil, and "gridanode" connect to the upper. "Sense" of coils is indicated by white engraved dots.

In this Unit there are a number of possible uses—as Aerial Reaction Coils, as H.F. Transformer with variable Coupling, as Variometer, as variable H.F. Choke, etc.; and as each interchangeable coil costs only *half a crown* (the series of 11 covers wave-lengths between 170 and 4,720 metres), the system yields a considerable economy. The Coil Unit complete is sold at 7/6; the Mount alone is 2/6 and Coils (any wave-length) 2/6 each.

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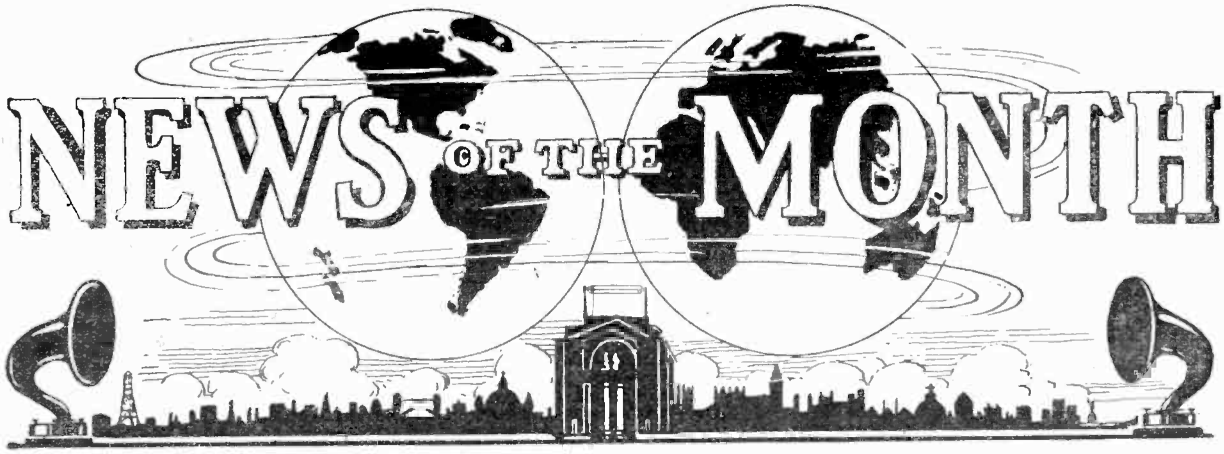
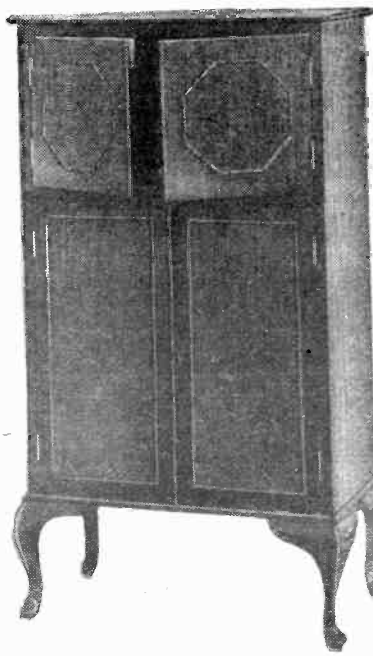


THE season of good resolutions is upon us. We are all promising faithfully to go to bed early, except on very special occasions (about two nights in five, say), never to oscillate, not to growl about the loud-speaker next door, and, in fact, generally to be well behaved—as long as our courage lasts. We wish you all, and ourselves, good luck.

Many of our readers must have desired to build a family set which was a really artistic piece of furniture, and which was, as far as possible, self-contained. Our principal set this month is one by Mr. Kendall, employing a built-in frame aerial, and having provision for all batteries inside the cabinet. The set is primarily intended for the local station, but aerial and earth terminals are provided so that the more distant stations can be obtained if required.



Our feature set this month has a particularly pleasing appearance.

Real Purity with Volume

Mr. Clark describes a three-valve receiver employing a type of trigger circuit which is capable of giving considerable volume with excellent purity of reproduction. This receiver will probably appeal to many who have been looking for really good loud-speaker working.

A novel form of receiver is that described by the Laboratory staff, on which it is possible to receive both the local and high-power station simultaneously. By a simple switching arrangement it is possible to utilise one of the valves as a note magnifier when only one station is being received.

The quest for selectivity has resulted in the production of two simple yet selective receivers. One of these, which was designed by Mr. John Scott-Taggart, employs two tuned filters, followed by a detector valve and note magnifier. By using this arrangement, oscillation troubles are minimised, and a very stable form of selective circuit results.

Simplification of Tuning

The use of two tuned circuits introduces an additional complication in that two tuning controls are usually necessary. In order to simplify the operation of such a circuit, Mr. Reyner describes an ingenious method, by which a variable condenser is made to serve the dual purpose of coupling two circuits together and tuning them, an interesting principle which will probably bear following up.

Another form of selectivity is that obtainable by the use of wavetraps to cut out the interference from the local station. By this means it is often possible to obtain adequate selectivity with a receiver of ordinary construction only. The article on the subject of "Wavetraps and Their Uses," therefore, will be of interest to those readers who are already in possession of receiving sets.

Foreign Programmes

In response to several requests we are again publishing our list of Continental and American transmissions, which will facilitate the identification of the ever-increasing galaxy of foreign stations. We are also giving constructional details of the transformers used in "The Special Five," recently described by Mr. Harris.

We desire to thank our readers for the replies which were sent in the questionnaire. There are many points on which the criticism received has been of assistance and we appreciate the trouble taken by those who responded to our request.

Future Features

We hope in our next issue to give some authentic details of the new Dublin broadcasting station, and also the results of some interesting research which is now taking place on the relative merits of various types of well-known circuits, both as regards selectivity and efficiency. For the present—a Happy New Year to our readers—may it exceed their expectations.

A FRAME AERIAL CABINET SET

By G. P. KENDALL, B.Sc.

An interesting receiver for local work which employs an enclosed frame aerial for short ranges

THERE must be few experimenters of more than a few months' standing who have not realised that it is a most desirable thing to possess a standard local broadcast receiver which shall be always ready for use, simple enough to be operated by members of the family, and not in any way connected with one's experimental apparatus. Something in the nature of a "gramophone set" is needed, with a simple on and off switch, which can always stand ready to be switched on, and will never be interfered with in the course of experimental work.

The Need for a Special Local Set

Attempts to combine such a set with one of the various long-distance receivers which we most of us possess, or aim at possessing, are usually unsuccessful, chiefly because a certain amount of switching gear is necessary to cut out unnecessary valves, and otherwise to modify the set to make it suitable for purely local work. Moreover, one is constantly making alterations and improvements to experimental long-distance sets, and such alterations are liable to interrupt the service of local broadcast, with consequent domestic friction.

Individual Requirements

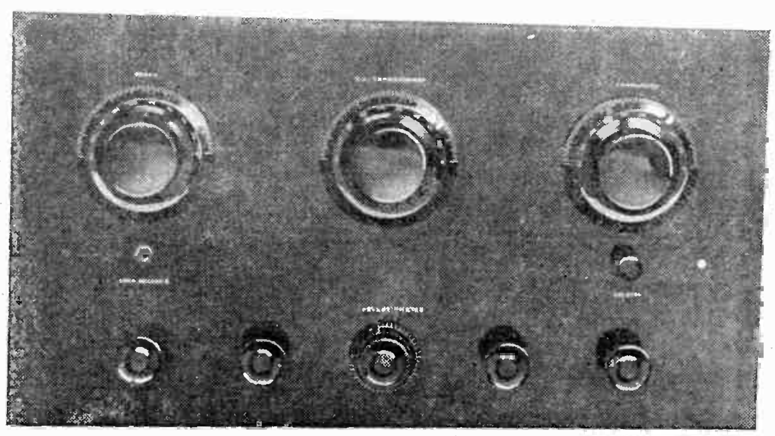
The design and construction of a "gramophone set" is something of an individual problem, since local conditions, distance from the local station, the desirability or otherwise of making use of any form of external aerial, whether outdoor or indoor, or alternatively the use of a frame, will govern the circuit required to a large extent. I have recently built a receiver for my own use to conform to conditions which may apply to a considerable number of readers, and probably the instrument illustrated upon these pages will be found suitable by quite a number of constructors who have come to a similar conclusion with regard to the desirability of a separate set for the local station. At the same time, it is to be understood that since the design is intended for the advanced constructor, it will be quite permissible for him to modify it in certain ways, which will be discussed later, to suit himself.

High Frequency Amplification

My own requirements were that the set should be capable of giving loud-speaker results of a high degree of quality, without any external aerial or earth, an enclosed frame aerial being essential. Since this was to be done at a distance of approximately eight miles from 2LO, it was felt that a minimum of two high-frequency valves must be incorporated, and this number was finally chosen, with a crystal detector and two stages of low-frequency amplification.

The Circuit

The circuit finally chosen was one which can be depended upon to give adequate loud-speaking with the frame aerial which is built into the cabinet up to distances of approximately five miles from a main broadcasting station, this distance being chosen to represent the probable area within which the constructor of such a set would object to the provision of an outside aerial, or an indoor aerial as an alternative. At greater distances from the broadcasting station,



The layout of the front of the panel is pleasing in its symmetry and simplicity.

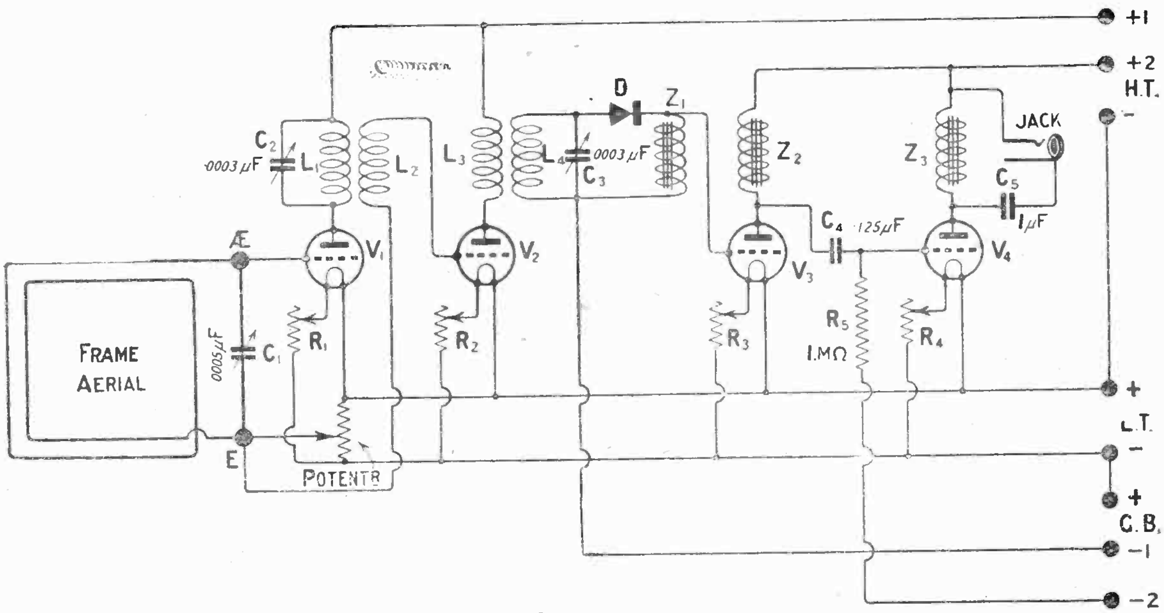


Fig. 1.—The receiver employs two H.F. stages, crystal rectification and two choke-coupled L.F. stages.

it was felt that the provision of a small outdoor aerial or some sort of an indoor aerial would not be objected to, since one would then be in the suburban area, in which facilities for the erection of outside aerials are relatively good, and accordingly arrangements have been made for the use of an ordinary aerial and earth with this receiver, the frame aerial then being regarded merely as a tuning inductance.

As a matter of fact, at my own distance of eight miles, the set with its own frame aerial is capable of giving a satisfactory degree of loud-speaking, but this involves that the most suitable valves shall be used at each stage, a good setting obtained on the crystal, and a careful manipulation of the controls of the set itself, and I should not regard it as possessing an adequate factor of safety at this distance for general work. Accordingly, at this distance, I would advise that a small outdoor or indoor aerial be provided, independent of the frame aerial, only a few yards of wire being needed. As a rule, moreover, no earth connection would be needed at such a distance, although its use may be of some slight advantage. Since two high-frequency valves are incorporated, an efficient aerial is quite unnecessary, and it is possible to bring the lead-in to the set in a manner which would normally be regarded as very inefficient, but which is permissible in this case and enables one to use a suitably

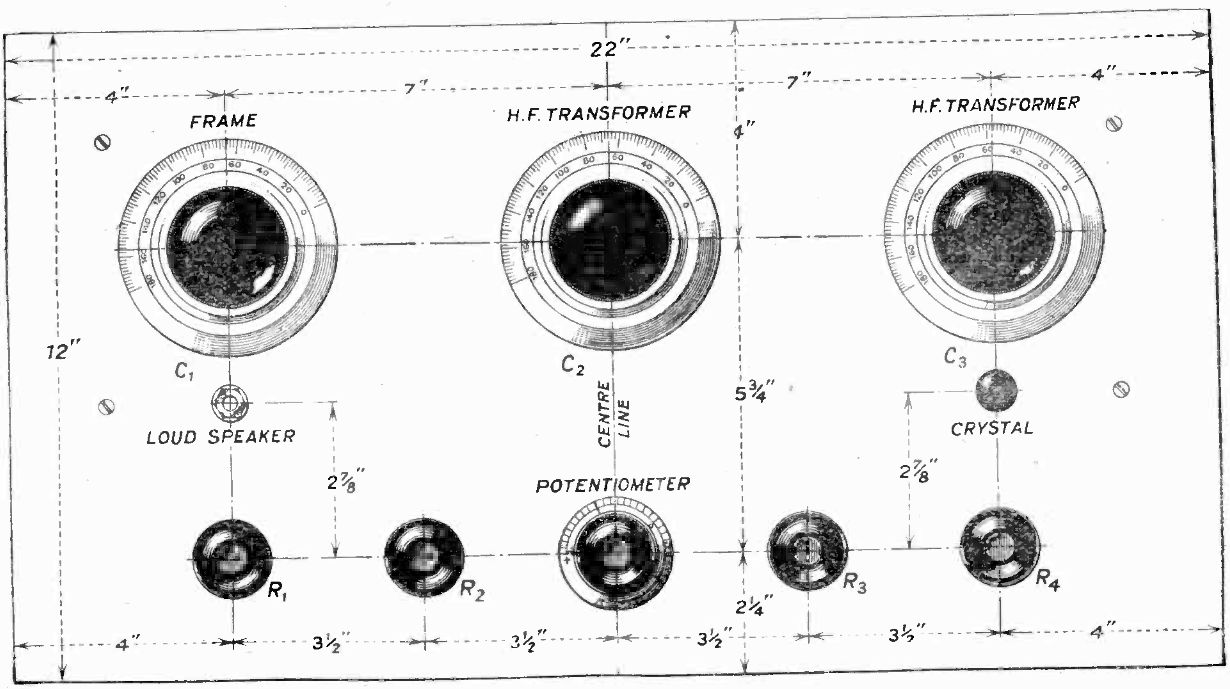
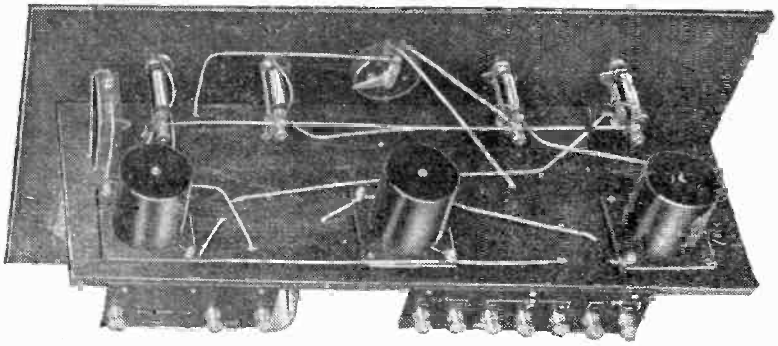


Fig. 2.—The drilling of the panel can be obtained from this diagram or alternatively from Blue Print No. 144a, (price 1/6 post free).



The three chokes are mounted underneath the sub-base of the instrument.

concealed lead, thereby avoiding the usual unsightly arrangement.

Cabinet Requirements

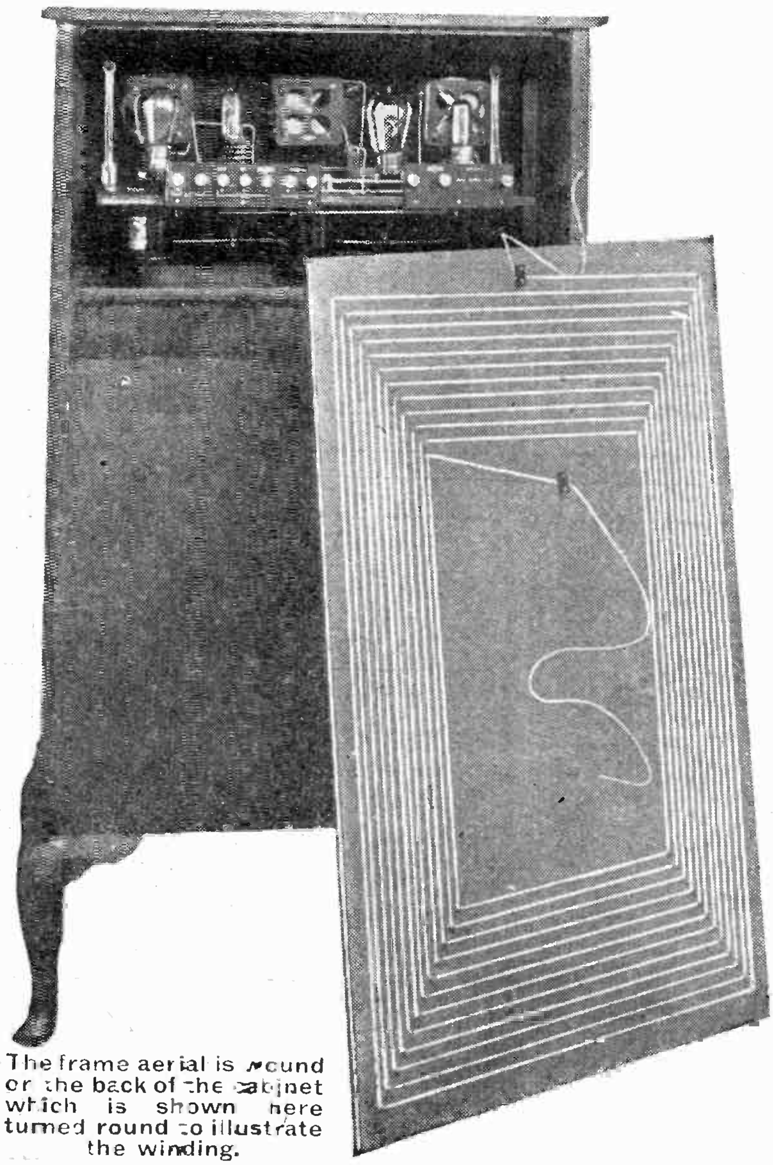
Another obvious requirement of the type of set under consideration is that it shall be provided with an entirely independent set of batteries, and this being so they may as well be enclosed in the cabinet. Since the last valve in a set of this sort will commonly be a power valve drawing a considerable anode current, it will, in many cases, be desirable to use a high-tension accumulator for the anode supply, and accordingly ample room should be arranged in the battery compartment. The cabinet actually chosen for my own set is a standard line of one of the cabinet makers, some very slight modifications having been made, and it will be observed that there is quite a large cupboard below the set compartment which provides ample room for all types of batteries, especially if the user cares to insert a shelf about half-way up.

Valve Limitations.

In deciding upon the circuit for a set of this sort, it was felt that most possible constructors of the instrument would regard the use of more than four valves for the local station as being excessive and therefore a crystal detector was incorporated, which, of course, has in itself a considerable attraction, in that it permits a high degree of purity to be obtained with considerable ease. It will be observed that the two high-frequency valves are coupled to each other and to the crystal detector by ordinary plug-in transformers, the first of these being tuned across its primary in the ordinary way, while the second one is tuned upon the secondary side, the necessary alteration being made to the wiring of its socket. (This point should be particularly noted by the constructor, who should follow the wiring arrangements shown on the wiring diagram in the case of the second transformer, rather than any diagram of connections which he may receive from the makers with his transformer.

The L.F. Amplifier

Following upon the crystal detector will be seen a low-frequency choke, whose lower end is connected back to the other end of the secondary winding of the H.F. transformer, this point being also indicated as one of the grid bias negative terminals. To the upper end of the choke is connected the grid of the first of the low-frequency amplifying valves, this arrangement being adopted in order that the steady current drawn by the crystal and passed through the choke might have the desired damping effect upon the circuit, as an aid to stability. Coupling the first to the second low-frequency valve is another iron-core choke, with the usual grid con-



The frame aerial is wound on the back of the cabinet which is shown here turned round to illustrate the winding.

denser and leak; while an output filter is provided in the anode circuit of the last valve, consisting of a third low-frequency choke and a 1 μF condenser, The loud-speaker is connected in circuit by the insertion of a telephone plug in the jack shown, this jack being of the filament control type, so that the act of inserting the loud-speaker plug switches on all the filaments. This is not shown in the circuit diagram, for the sake of simplicity, but the actual connections will be seen on the wiring diagram.

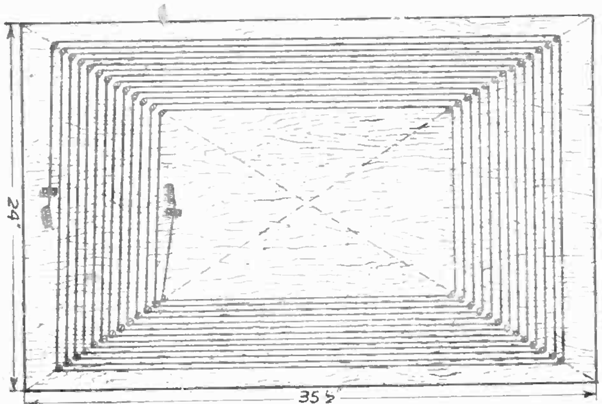


Fig. 3.—The frame is assembled by fixing small brass screws in the positions shown, after which the wire is wound round the screws.

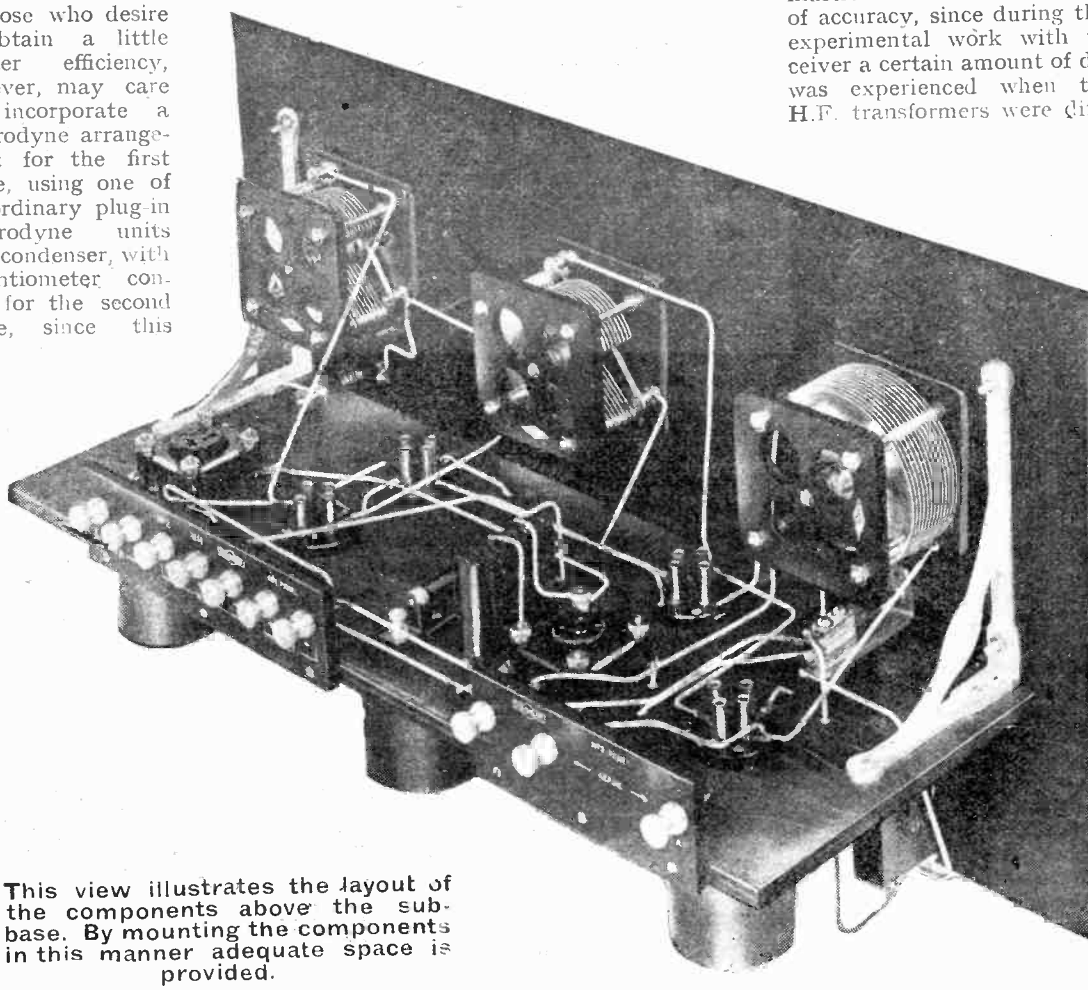
Reaction Control

A potentiometer control of the degree of natural reaction is provided, experiments with a neutrodyne method of control not having proved very successful, apparently on account of the erratic amount of damping introduced by the crystal circuit. Provided the low-capacity general purpose type valves are used in the first two sockets, this method has proved entirely satisfactory, and is to be recommended for a set which is intended for domestic use.

Those who desire to obtain a little greater efficiency, however, may care to incorporate a neutrodyne arrangement for the first valve, using one of the ordinary plug-in neutrodyne units and condenser, with potentiometer control for the second valve, since this arrangement overcomes the difficulty of the erratic crystal damping and proves quite effective in use. It was decided not to incorporate it in the general design, however, on account of the slight extra complication thereby produced.

Constructional Details

The actual construction of the set involves a good deal of work, but the arrangement of a sub-panel or shelf adopted will be found to render it into quite an easy matter. It will be observed that all the high-frequency circuits are wired up on the top of this shelf, all the valve sockets, etc., being placed upon it, while the three low-frequency chokes are placed underneath it, together with the stopping condenser of the output filter. In laying out the parts upon the shelf the constructor will be well advised to follow the arrangement illustrated with a reasonable degree of accuracy, since during the early experimental work with this receiver a certain amount of difficulty was experienced when the two H.F. transformers were differently



This view illustrates the layout of the components above the sub-base. By mounting the components in this manner adequate space is provided.

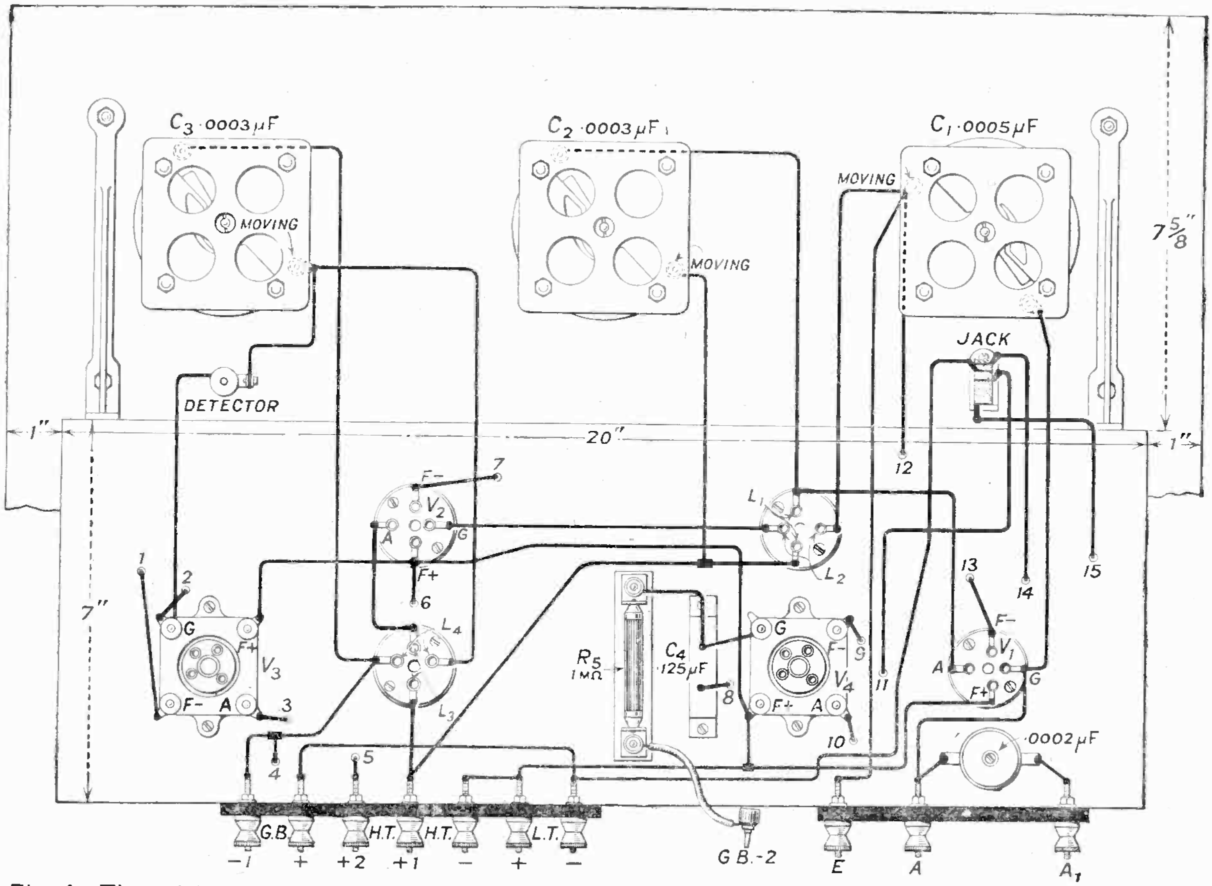


Fig. 4—The wiring of the components on top of the sub-base can be seen from this diagram. Blue print No. 144b can be obtained on application (price 1/6 post free).

placed, and it is possible the constructor would have trouble if he made a modification here. This, it should be noted, is a serious point, since when such a set is being used upon a frame aerial its natural tendency to oscillate is very much exaggerated.

A Wiring Point

The actual building of the set does not, I think, call for any explanation, as the various diagrams accompanying this article, together with the photographs, show clearly how it is put together. It should, perhaps, be mentioned, however, that certain parts of the wiring should be done before the baseboard is finally attached to the panel. These connections are those of the sockets for the second high-frequency valve and the first high-frequency transformer, and one of the connections to the permanent crystal detector. An examination of the photographs will show that the soldering of these wires would be distinctly awkward if it was attemped after the baseboard was fixed to the panel.

Components

In the construction of the original set the following components and materials were used :—

Special Grosvenor cabinet (Camco).

One Radion panel, 22 ins. by 12 ins. by $\frac{3}{16}$ in.

One wooden baseboard, 7 ins. by 20 ins., with brackets for fixing to panel.

Two square law variable condensers of .0003 μF (Peto-Scott, de luxe type).

One ditto, of .0005 μF.

Four filament rheostats (C.A.V.).

One potentiometer (McMichael, Ltd.).

One "single filament" jack (Elwell).

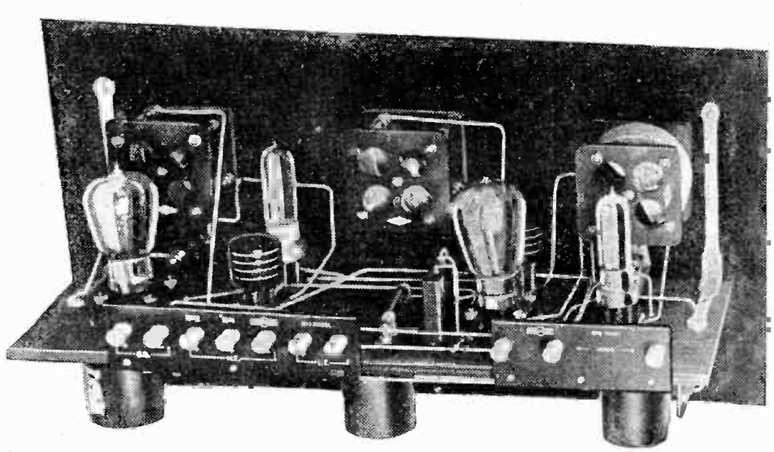
One permanent detector (Radio Instruments, Ltd.).

Four board-mounting anti-capacity valve sockets (Peto-Scott, Ltd.).

Two non-microphonic valve sockets (Benjamin Electric Co.).

Three low-frequency chokes (Super Success, Beard & Fitch, Ltd.).

One T.C.C. condenser of .125 μF.



The relative position of the sub-base can clearly be seen in this photograph.

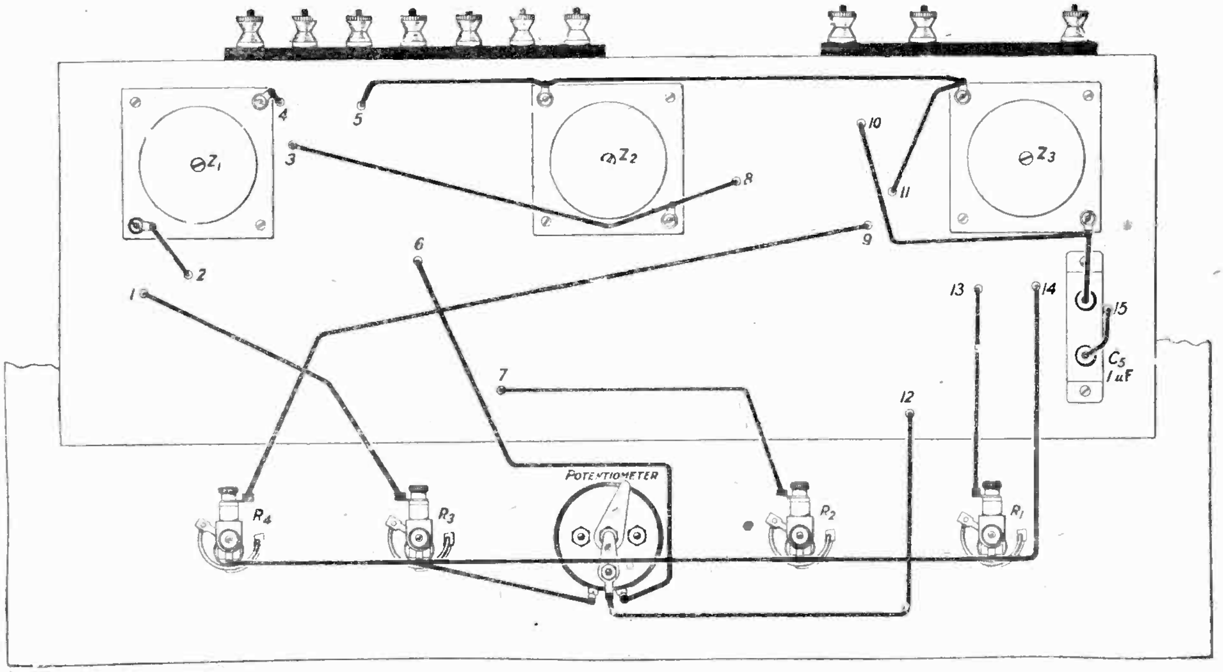


Fig. 5.—This view shows the wiring of the components below the sub-base.

One T.C.C. 1 μF condenser.

One fixed condenser of .0002 μF (Watmel).

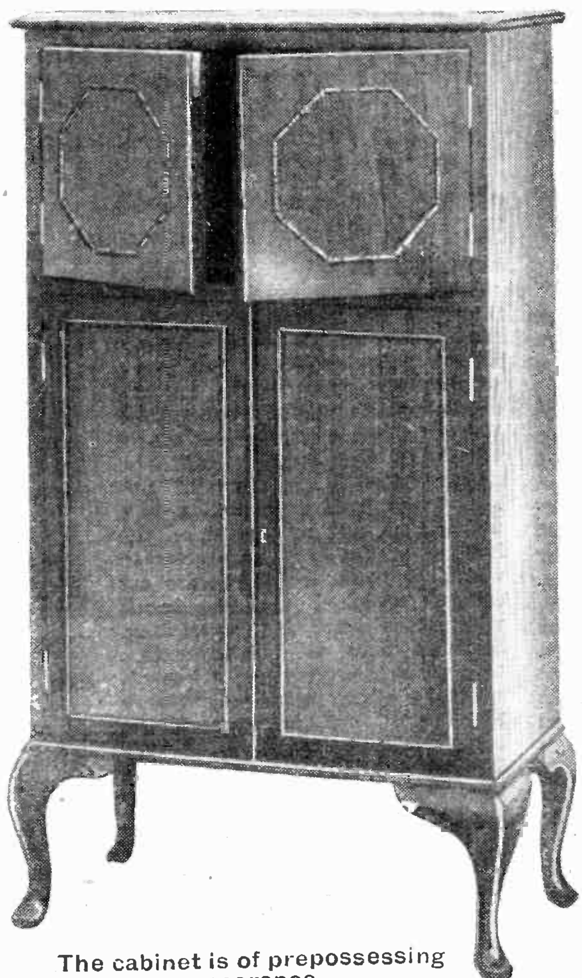
Two terminal strips, one No. 1 panel and one No. 2 panel (Burne-Jones, Ltd.).

Radio Press Panel Transfers.

Two plug-in H.F. transformers. (Any standard make, McMichael, Bowyer-Lowe, Burne-Jones, Peto-Scott, etc.)

Terminals

The arrangement of terminals in the set perhaps calls for explanation, and it will be observed that two terminal panels have been attached to the rear edge of the baseboard, one of these being use for connections to the frame and outside aerial, if used, the other being for the batteries. The frame aerial is wired to the terminal marked earth, and the aerial terminal nearest thereto. Inside the set, between the two aerial terminals, is connected the .0002 μF fixed condenser, which is intended to be brought into action when an external aerial of fair size is used. Under these circumstances, the frame aerial is left wired to its two terminals, an earth is connected to the appropriate terminal and the outside aerial is wired to the second aerial terminal. In this way the small fixed condenser is brought into use, in the same way as the constant aerial tuning condenser is employed in the well-known system. The actual capacity for this small fixed condenser should suit the aerial, and since as a rule only small aerials will be used, I have incorporated one of .0002 μF in the original set. When a full-sized outside aerial is to be used, however, the usual capacity of .0001 μF should be adopted.



The cabinet is of prepossessing appearance.

The other terminal strip accommodates the battery terminals, and it will be seen that there are two high-tension positives, one of these being for the H.F. valves and the other, of course, for the L.F. The two terminals at the extreme end of the strip are for grid bias, and it will be observed that I have not used these as marked by the maker of the strip, for the reason that it simplified the wiring to reverse the positive and negative as shown. This, however, is a matter of taste and it involved re-marking the strip which was, of course, already engraved.

(*continued on page* 464.)

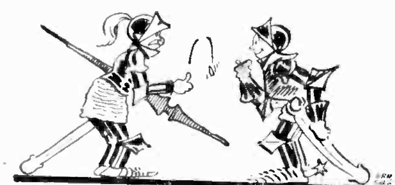
I WAS hard at work the other afternoon in my laboratory . . . . I hope that you have duly noted these words. In my early days as a wireless enthusiast I used to refer to the glory hole in which I did my odd jobs as a workshop. But I never make that mistake now. All real wireless men refer to the place in which their constructional and experimental work is accomplished as the laboratory nowadays. A workshop is a crude amateurish kind of room containing a bench, an assortment of tools, and possibly a lathe. A laboratory is the same room with the same bench, the same tools and the same possible lathe, but with one important addition. This is the milliammeter. So long as you possess a milliammeter, which may or may not be in working condition, you are perfectly entitled to call your erstwhile workshop a laboratory, and to be thoroughly in the swim.

The Goop Elastic Aerial

I give this little explanation because many readers have been puzzled not a little over the topography of Mr. Hercy Parris's abode of late. They observe that he now refers always to his laboratory. The explanation is perfectly simple. He has not added a room to his house; he has added a milliammeter to a room. Other readers have been seriously worried over the question of Mr. Parris's aerial. In the last issue of the magazine, he told the world, on page 297, that his aerial was 45 ft. long and 35ft. high, whilst on page 303 it had risen by 5 ft. and lost 5 ft. in length. The explanation is as simple as before. Mr. Parris has recently installed the Goop Elastic Aerial, whose height and length may be varied from day to day or even from hour to hour, or evener still from moment to moment. Full details of this wonderful aerial cannot yet be published, since it is the subject of some dozens of pending patents, provided that the Professor and I can raise the wind sufficiently to pay the required fees.

Back to Our Muttons

I fear that I have digressed a little, but you will agree that I had every reason for doing so. Even if you do not agree, the fact still remains, and no words or thoughts of yours will alter it. Let us return to our original theme. I was hard at work in my laboratory. It is not often, I must admit, that I am caught working hard, as I was in this case. Almost the last piece of really strenuous toil that I undertook was to paint, in beautiful Gothic characters upon one of the walls of my laboratory (I love that word so I cannot help



"Heddis or tayles?"

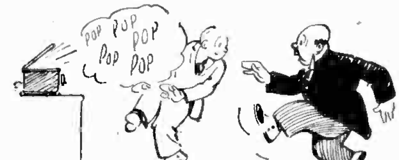
repeating it) my family motto which was first borne upon the shield of Sir Perkyn Ye Lystener in the fourteenth century at the battle of Boffenham. This was a particularly good battle, for my distinguished ancestor, having made the right call when the captain of the other side spun a coin and asked "Heddis or tayles?" put his opponents in to joust first on a wet wicket, and so carried off the honours of the day. The motto to which I refer is "Laborare est errare," which I will not insult your intelligence by translating. Some of these old family mottos take some living up to. I knew a man once whose motto was "Speak the truth," and he died of the effort of living up to it. I may I think, say that if Sir Perkyn Ye Lystener could drop into my laboratory unannounced he would in nine entrances out of ten find that I was living nobly up to the ancient motto of my race.

And Yet Again

It appears that I have digressed once more. You must forgive me, for we who are of the real blue blood cannot help being carried away occasionally by the very natural pride we take in our illustrious ancestry. You will see why at once if, as an example, I recount to you the story of another ancestor, Sir Velvytfoote Ye Lystener. (Certainly not. Return at once to your glory hole.—Ed.) My laboratory? Oh, very well. Just as you wish. All the same, it is a jolly interesting story. You see Sir Velvytfoote was . . . (We *don't* see; we don't *want* to see. Will you kindly get on with it?—Ed.) Owing to the editorial attitude I fear that I must switch off my story about Sir Velvytfoote, though it is highly probable that you will hear about him S.B. from all stations very shortly—"My Great-Great-Great Grand Step-Cousin's Adventure on Wimbledon Heath," or something of that kind.

Hard at Work

Let us, however, come with a bump to modern times, and return to my laboratory. I cannot, I think, do better than write once more the opening sentence of this veracious chronicle. I was hard at work in my laboratory. I imagine by now that you have got it firmly fixed in your mind, provided of course that you are equipped with anything of the kind, that I was toiling hard in the



"Come in!" I called.

splendidly fitted room that is the scene of my wireless labours. Very well. I was just in the middle of an experiment on the effect of connecting the H.T. battery to the L.T. terminals of a receiving set, when there came a knock at the door.

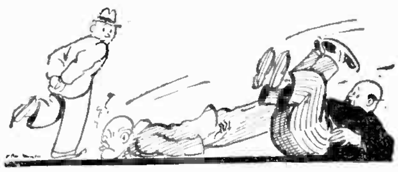
"Come in!" I called. The door opened and there entered my friend Poddleby, who was quite obviously brimming over with enthusiasm.

Enter Poddleby

"Hullo!" I said, "Hullo, *Hullo*! What brings you round to see me?" "I must apologise," said Poddleby, "for bursting like this into your workshop . . . ." I pointed to the milliammeter, borrowed from Gubbsworthy, which occupied a place of honour upon the bench. "*Workshop*?" I said. "What is a workshop? I seem to have heard the word sometime in the long forgotten past, but for the moment I cannot recall its exact meaning. You are now, Poddleby, in my laboratory. The word is derived from the Latin *labor*, work, and *oratory*, speechifying. It means talking a dickens of a lot about the work that you are going to do. As I am never going to do any work, I do not propose to make a speech, and I will therefore listen to what you have to say."

A Suggestion

"What you want," said Poddleby, is exercise. The life you lead is simply horrible. You get up in time for tea, you never take any exercise except for a walk down the High Street, and the result is that your muscles, like your mind, are thoroughly flabby." That is the kind of insult that the blue blood which courses through my veins simply cannot endure. Picking up a spare high-tension battery I hurled it at Poddleby, whom it caught squarely amidships. When he had recovered a little he admitted that flabby was not quite the right word. He said, though, that what I needed was fresh air, and that if I would kindly refrain from throwing batteries about he would tell me why he had come. I found that his visit had nothing to do with wireless. He had come to suggest that I should join him and Professor Goop in an expedition to the flooded area in the neighbourhood of the Pud, where skating was in progress. Skating has always been a hobby of mine, and I readily assented to accompany him. Passing down the High Street we picked up Professor Goop, who, when we found him, was engaged in explaining to a pillar box (which he had mistaken for Bumpleby Brown) the whole theory of the outside edge. When we had linked his arms in ours and borne him along with us the Professor continued to expatiate upon the mathematics of figure skating. We gathered from him that the whole secret lay in keeping the centre of gravity of the body B immediately over the centre of the blade of the skate S. If this were done nothing could possibly go wrong. "Have you ever cut a three?" I asked. The Professor admitted that he had never previously worn a pair of skates, but he assured us that so long as

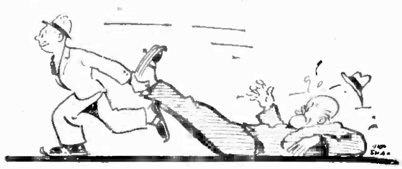


The arrival of the Professor and Poddleby.

one adhered strictly to the formulæ which he had worked out, it was impossible either to make a mistake or to come into involuntary contact with the frozen surface of the flooded meadows.

Loose Ballast

Poddleby fought with me for the honour of putting on the Professor's skates. I said, "That's your job, you silly ass"; and he said, "No, I'm blowed if it is." And then I pushed him over and slid out into the middle of the ice. I was engaged in cutting the diagram of a five valver, and was doing the most perfect circle to indicate V3, when the beauty of my work was spoilt by the arrival of the Professor and Poddleby. The former was advancing at goodness knows how many miles an hour upon his face, followed by the latter moving with equal



I then skated towards the bank.

rapidity upon his back. When I picked up the Professor he explained that his theoretical centre of gravity had been slightly shifted by the presence in his pocket of some loose silver, whose weight he had failed to take into his calculations. I at once relieved him of the incubus, and as he then sat down with some violence, I told him that I suspected that other hidden forces must be at work. A careful search disclosed the presence in his waistcoat pocket of a well-filled note case. When I had disposed of this he fell sideways, and demanded the return of the silver to act as ballast. I refused very firmly to accede to this.

Music

At that moment strange music wafted to us from the far-off edge of the ice. "Wireless!" I cried. "Distortion!" screamed the Professor; "let me go at once and tell the unfortunate operator where he is wrong." As we were a hundred yards or so from the edge, I found, despite his theories, that the task of getting the Professor to the source of the tuneful sounds a rather difficult one. If I skated behind him, endeavouring to hold him up, he promptly fell forwards, whilst if I placed myself in front he tumbled backwards, dragging me with him. After some thought I induced him to lie flat upon his back, whilst I took his feet in my arms. I then skated towards the bank, towing him behind me.

The Expert

"Here is a case," said the Professor, "of a receiving set that is working far too near the point of oscillation. I will now show you how to correct the distortion that is manifesting itself." He moved forward, and seizing a little knob gave it a tweak in an anti-clockwise direction. The music dropped about six octaves down the scale, whilst the time took on what I may describe as a rather fatigued *tempo*. "H'm," said the Professor, "the control appears to be very sensitive. It is quite obvious that there is insufficient high-tension voltage, and I rather doubt whether the grid bias is as much negative as it ought to be." He seized another knob and tweaked that. The music ran up the scale, whilst the *tempo* became such that the various couples engaged in waltzing became mere blurs.

"Extraordinary!" said the Professor. "I have never before met with a receiving set in which adjustment of the tuning controls produced a speeding up or a speeding down of the received oscillations. This must be due to the fact that the temperature is several degrees below zero and that the receiving set is situated close to a large expanse of frozen water. Let me try once again. Now if I . . . ." "'Ere!" said a voice. "'Ere! Kermorfit. Let my blinkin' gramerfone alone can't yer?" Looking up, we saw a nasty looking individual clad in fearsome garments and a particularly unpleasant expression. On mature but rapid consideration, I hastily sought the very middle of the ice, leaving the Professor to expound his theory.

THE LISTENER-IN.

The Choice of the L.F. Transformer Ratio

Some further notes on this subject, which was discussed in last month's issue

SEVERAL readers have written for more information concerning the value of the external impedance in the anode circuit in connection with the article in last month's MODERN WIRELESS by Mr. Reyner on L.F. Transformer Ratios.

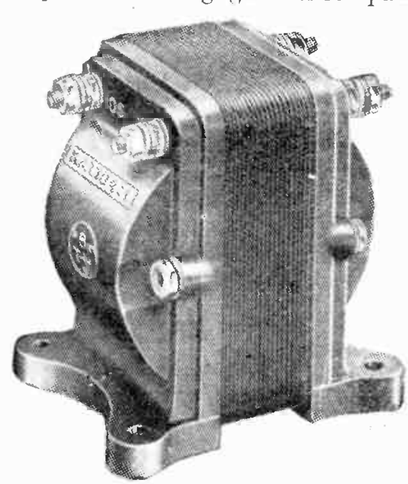
In many cases the makers supply the actual inductance of the primary winding of their particular transformers, and in such a case the calculation is comparatively simple. Since the frequency, however, is varying in accordance with the speech or music being received, it is only possible to obtain an average value, and this is taken at a mean frequency, which is usually about 800 or 1,000 cycles per second. The reactance X is given by L ω where L is the inductance in henries and $\omega = 2\pi \times$ frequency.

Mean Frequency

In practice the mean frequency is taken as 800 cycles per second for speech, and 1,000 or 1,200 cycles per second for music. The values of ω at these frequencies are given approximately below, so that the calculation of the reactance can be made very simply, if the value of the inductance L is known.

Frequency (*cycles per second*).	ω
800	5,030
1,000	6,285
1,200	7,540

The resistance of the average transformer is sufficiently low to be negligible in comparison with



the reactance at this frequency so that this value of X may be substituted in the formula :—

$$\text{Overall amplification} = \frac{X}{\sqrt{R^2 + X^2}}\mu_0 n$$

where μ_0 = theoretical amplification factor of the valve.

n = transformation ratio of transformer.

In the last article the numerator of this expression was incorrectly quoted as X^2 instead of X.

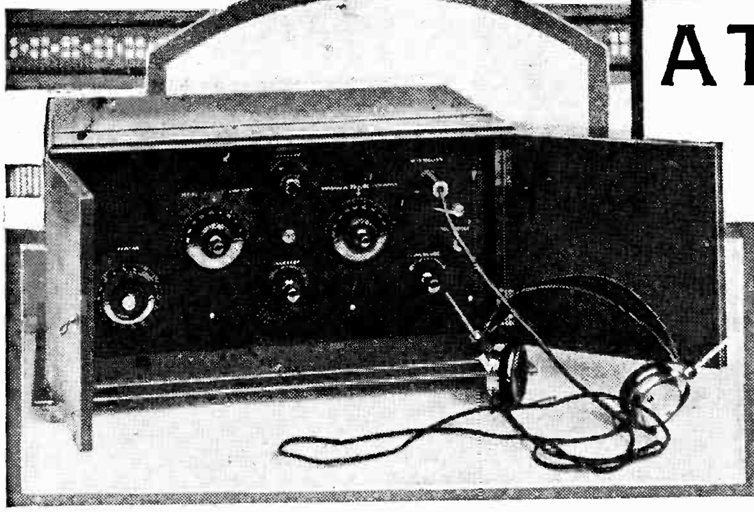
The arbitrary values quoted for the external impedance in the article in question were obtained by taking the actual values of a representative transformer, but with the information given here it will now be possible for readers to make their own calculations. The second example of the three given contains a misprint: the value of the impedance should read 45,000, and not 15,000, as given.

For the benefit of readers we append a list of the average inductances of some of the principal transformers on the market. This list is not by any means complete, but in any particular case readers can obtain the inductance figures direct from the makers.

Inductances of Commercial Transformers

(These values are average figures only—where known the frequency at which they are taken is stated.)

Maker.	*Transformation Ratio.*	*Inductance (henries).*	*Frequency (cycles per second).*
Marconiphone...	2.7 : 1	51	1,000
	4 : 1	28	1,000
	6 : 1	12.5	1,000
	1 : 8	7.2	1,000
Brandes ...	4 : 1	50	800
Gambrell ...	First stage	15	1,000
	Second stage	10	1,000
Lissen	$2\frac{1}{4}$: 1 T1	20	1,200
	$4\frac{1}{2}$: 1 T2	10	1,200
	$4\frac{1}{2}$: 1 T3	7	1,200
R.I.	4 : 1	9	1,200



A TWO-VALVE SELECTIVE RECEIVER

By the Radio Press Research Laboratories

The circuit for this receiver is a loose-coupled filter arrangement suggested by Mr. John Scott-Taggart, F.Inst.P., A.M.I.E.E., and carried out, after due experiment, by the Elstree Laboratory Staff.

SINCE the commencement of broadcasting there has been a great deal of talk about selectivity and selective sets or circuits. The actual meaning of selectivity and its bearing on the problem of broadcasting is probably only thoroughly understood by comparatively few readers. A set which is very critical on adjustment is often spoken of as being a specially selective receiver, whereas it might be quite the reverse. Actually a receiver which is very sharp on, say, the condenser tuning is not necessarily selective. For example, a station may be heard over a quarter of the scale of the condenser on one set and over only a very small fraction of the scale on another, and yet the set receiving the station over a quarter of the condenser scale might easily be more selective than the second set, owing to the condenser being of a much smaller value and covering a much smaller band of frequencies.

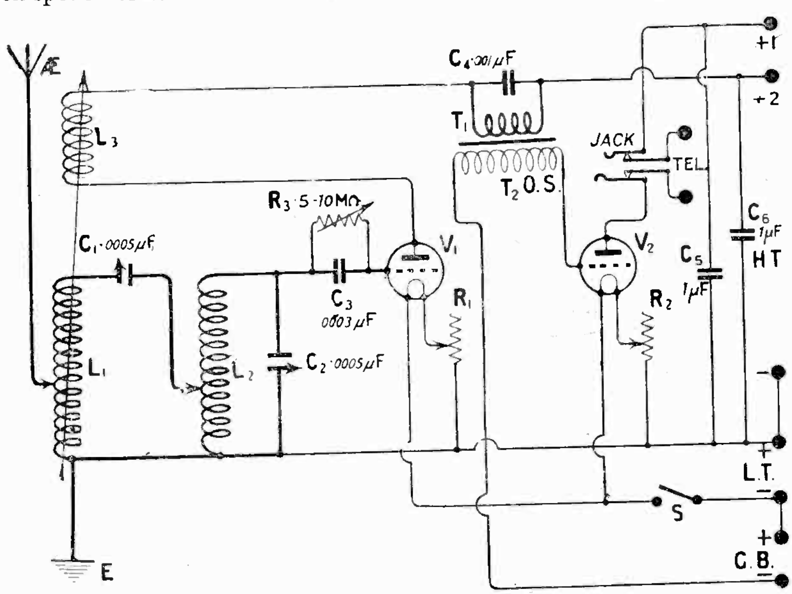


Fig. 1.—The selectivity in this receiver is obtained by the use of two filter circuits, an arrangement which gives sharp tuning without tendency to self-oscillation.

What is Meant by a Selective Circuit

From a broadcasting point of view a set would be considered selective if it could receive the weaker of two broadcasting stations which are separated by a frequency difference of 15 kilocycles, and whose signal strengths are in the ratio of 100 to 1. The selectivity of a circuit can actually be defined by the width of the resonance curve in kilocycles at a point such that the current is reduced to a small fraction of its maximum value. A typical resonance curve is shown in Fig. 2, and in this case the selectivity of the circuit might be defined as 50 kilocycles for a reduction of signal strength to one-tenth of its maximum value.

Can a Circuit be Too Selective?

It is well known that a broadcast station does not employ a single-frequency, but covers a band of frequencies of more than 5 kilocycles on either side the carrier wave. In other words, a broadcast station covers a total band of frequencies of at least 10 kilocycles. The higher musical notes and their harmonics are produced by the outside frequencies of this band. It is thus obvious that in order to receive these high notes, and so to get good quality reproduction, it is necessary that a receiver should respond with reasonable efficiency over the whole of this band of frequencies.

Thus the resonance curve must be sufficiently wide so that signals which are 5,000 cycles out of tune on either side of the carrier wave can be received at an efficiency of not less than 50 per cent. This means that with ordinary circuits the width of the resonance band at a signal strength of the order of one-hundredth of its resonance value will be much more than is required for good selectivity.

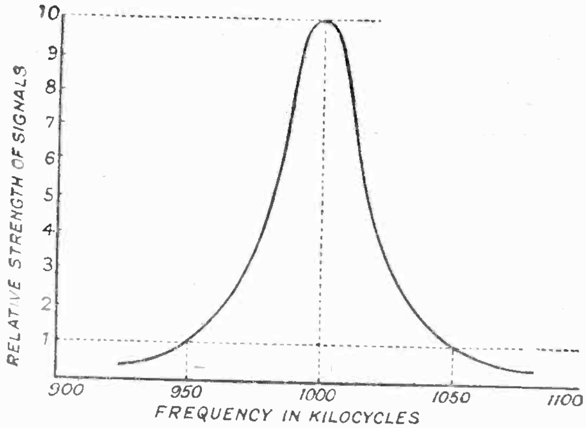
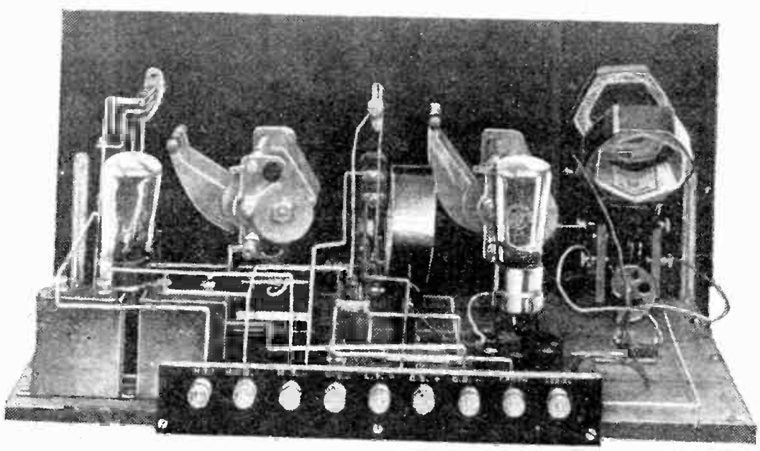


Fig. 2.—A typical resonance curve for a single circuit.

Effect on Quality

In actual practice, of course, circuits can be designed to give a selectivity much greater than this, but with such sets the high notes and their harmonics will be cut out, or very considerably reduced in strength, with the result that serious distortion will take place. The question of selectivity for broadcast receivers is therefore a difficult problem, as we have to design the set so that it will respond to the whole band of frequencies of, say, the local broadcast transmission, and yet be sufficiently selective to receive a distant station the frequency of which is fairly close to that of the local station. In cases where extreme selectivity is essential it would be necessary to sacrifice to some extent the quality of reproduction.



The apparatus is well spaced out. Note the geared condensers employed.

The Ideal Case

The ideal resonance curve for a telephony receiver is one having a flat top so as to cover a band of frequencies of at least 10 kilocycles, and outside this band the signal strength should fall away very rapidly, as shown in Fig. 3.

It can be shown that this ideal type of resonance curve is obtained by using a chain of coupled circuits. The top of the resonance curve is then only slightly affected, but the sides become much steeper, so giving increased selectivity without the sacrifice of quality.

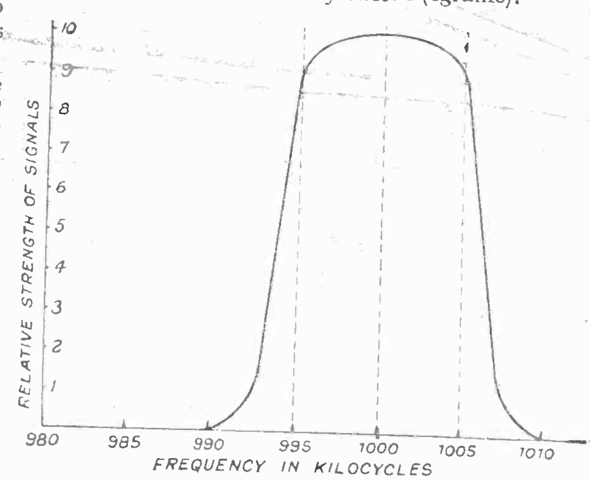


Fig. 3.—The ideal resonance curve would have a flat top for about 10 kilocycles as shown above.

The use of coupled circuits thus gives better quality for a given selectivity than is obtainable with a single circuit only, and the receiver described in this article employs two tuned filters.

The actual circuit is shown in Fig. 1.

The aerial is tapped at a point fairly low down the inductance L_1, and the first oscillatory circuit is formed by L_1, C_1 and a portion of L_2, the point of tapping to the coil L_2 being variable. The secondary circuit is tuned by the condenser C_2.

In the actual receiver plug-in tapped coils have been used, flexible leads enabling connections to be made to the tapped points on the coil.

The circuit L_2 C_2 is connected to a rectifying valve which is followed by a low frequency amplifier, so that a loud-speaker may be employed if desired.

Components

A pair of telephones may be attached to the terminals for tuning purposes, and a jack arranged so that the loud-speaker may be plugged in, when required, this operation automatically cutting the telephones out of circuit.

The components required are given in the list below, the actual makes being also specified for convenience. Other reliable components may, of course, be substituted for those quoted.

One panel, 9 in. by 18 in. by ¼ in. (Peto Scott Co., Ltd.).

One Panel, 10 in. by 1½ in. by ¼ in. (Peto Scott Co., Ltd.).

One coil holder, back of panel mounting (Woodhall Wireless, Ltd.).

Two .0005 μF variable condensers, Vernier pattern (Service Radio).

Two filament resistances, suitable for valves in use (Service Radio).

Two vibratory valve holders (R. I., Ltd.).

Two 1 μF fixed condensers (Telephone Condenser Co.).

One .0003 μF fixed condenser (Therla).

One .001 μF fixed condenser (Therla).

One baseboard mounting coil plug (Burne-Jones and Co., Ltd.).

One intervalve transformer, 1st stage (C.A.V., Ltd.).

Eleven 4 B.A. W.O. type terminals.

One variable grid leak (Bretwood, Ltd.).

One switch plug and jack (General Radio Co., Ltd.).

Two brackets (Formo).

One key switch (Igranic).

Ten 2 ft. lengths square tinned wire (Sparks Radio Supplies).

One suitable cabinet, 9 in. by 18 in., with room behind for baseboard of the size quoted below.

One baseboard, 17 in. by 9 in.

One set Radio Press Panel Transfers.

The panel should be first carefully marked out from the diagram of Fig. 4, or the blue print laid on the panel and the positions of the holes marked through with a sharp-pointed instrument.

When this has been done the drilling may be commenced by running through all the holes with a small drill, say about 1/8 in. diameter, afterwards enlarging them to their required size. The holes in which the coil-holder, the two variable condensers, the filament resistances and the jack are mounted will need to be enlarged to 3/8 in. The grid leak will need a 1/4 in. hole and the terminals a 3/32 in., or a No. 20 Morse drill.

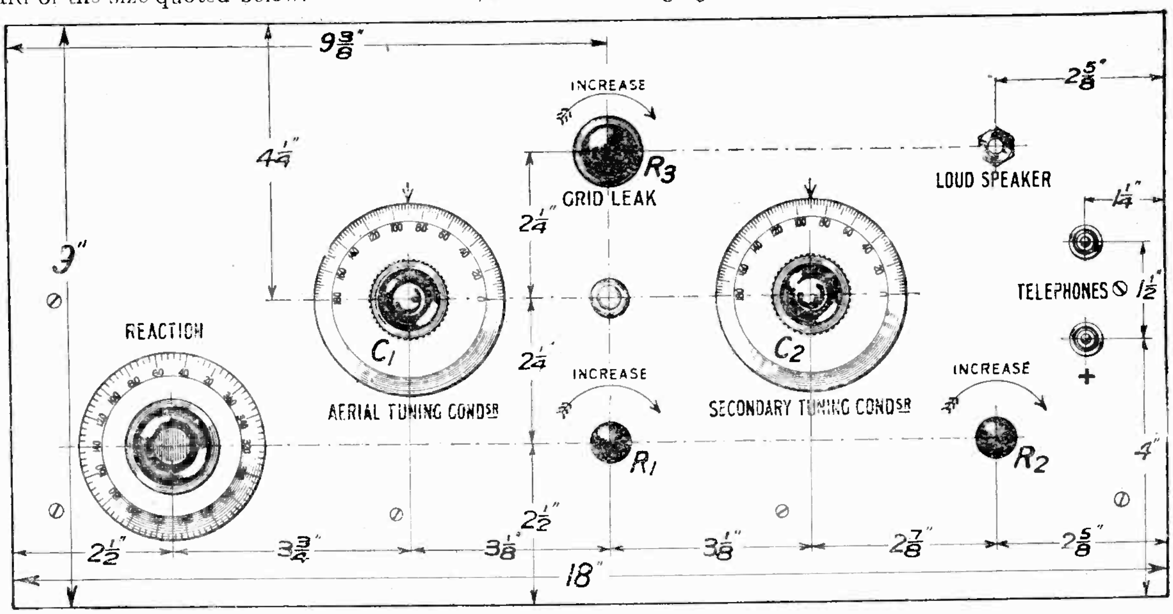
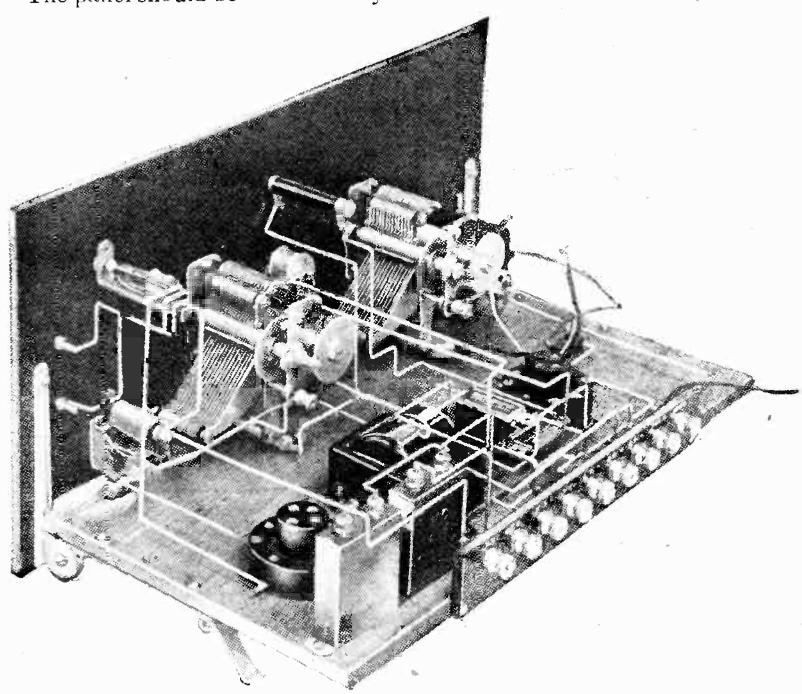


Fig. 4.—The panel layout will be seen from this figure. Blue Print No. 142a may be obtained on application. Price 1s. 6d. post free.



The wiring is executed in stiff square wire, which presents a very neat appearance.

Mounting the Components

At this stage the panel transfers may be fixed, as it is much easier to do this now than when all the components are mounted.

The components and the metal brackets should afterwards be secured to the panel, and it is advisable to fix the large components last.

The baseboard can be attached to the brackets and the other components secured to this by either wood screws, or by bolts and nuts passed right through the board. The baseboard is further held in position by two screws passing through the panel into the wood.

Wiring up

The wiring of the receiver must now be started. The aerial terminal requires only a piece of flex connected to it about 10 in. in length to reach the terminals of the tapped aerial coil. The same applies to the connection to the fixed vanes of the aerial tuning condenser, in this case the lead being taken to the tapped secondary coil.

The Reaction Coil

The grid circuits may be wired first, seeing that the wires are kept as far as possible from each other and any components.

The two flexible leads to the reaction coil are soldered to the ends of the tinned wire leads, these being held in position by a small block of ebonite, the dimensions of which are given in Fig. 6.

The grid condenser is supported on the square wire, this being amply sufficient to hold it in position. The same method of securing has been employed for the condenser shunted across the primary of the inter-valve transformer.

When the receiver has been wired it may be tested out.

Attach the appropriate leads to the aerial and earth terminals, insert the valves, and connect up the accumulator to L.T. + and L.T. —. Turn on the filament resistances and see if the valves

Testing Out

Keeping the reaction coil loosely coupled, slowly turn each of the condenser dials until signals are heard. Then leave the aerial condenser alone and tune the secondary condenser until maximum signal strength is observed, and finally tune the aerial condenser.

The reaction may now be brought up, slowly retuning each condenser

tivity being obtained when the leads are on the smallest number of turns on both the coils.

Valves Employed

The receiver was tested at the Elstree Laboratories and various valves were tried out in both stages, resistance bobbins being employed to suit the different types of valves.

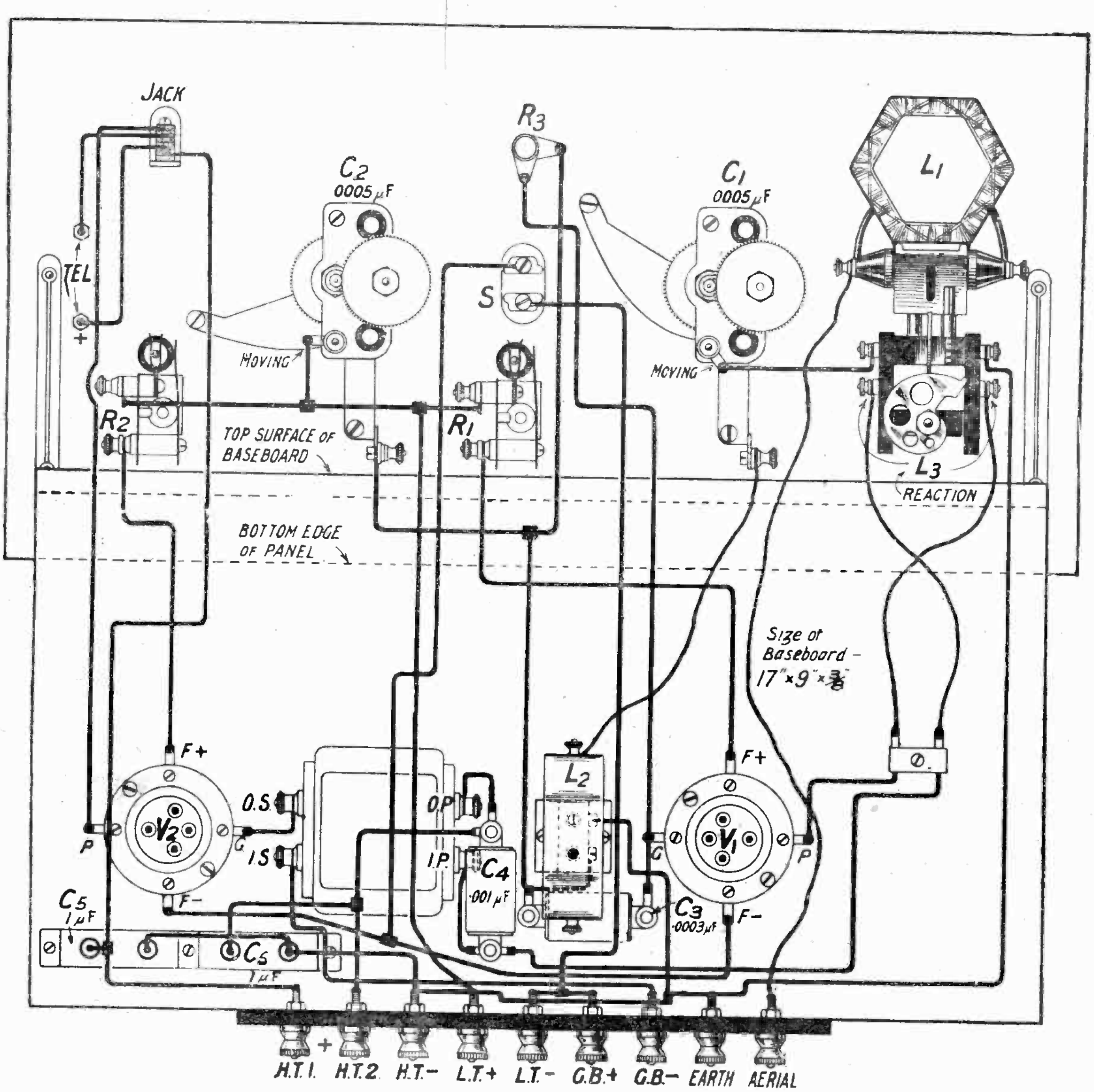


Fig. 5.—The wiring may readily be followed from this diagram. A Blue Print No. 142b may be obtained if desired. Price 1s. 6d., post free.

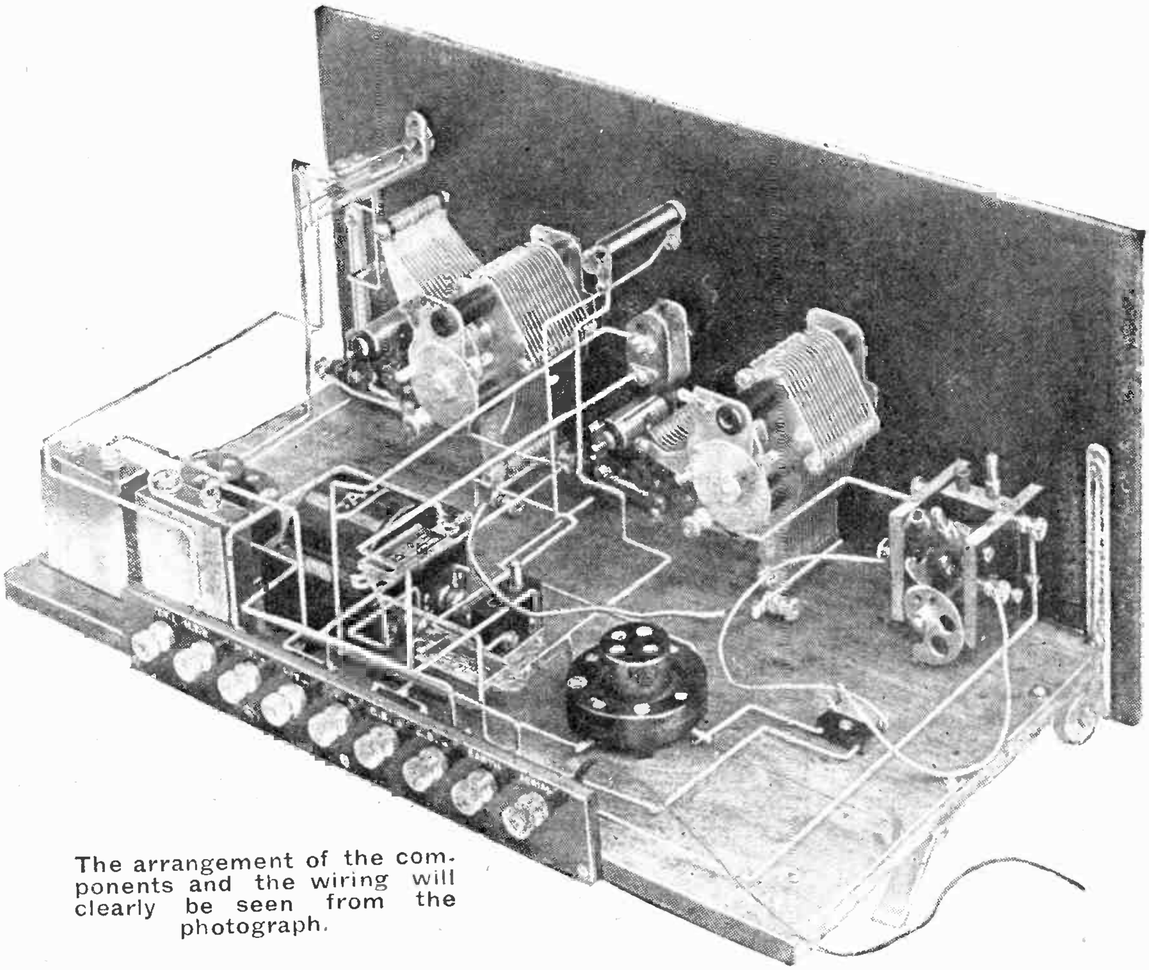
light. If they do, the H.T. and the grid bias may also be connected. Then attach the telephone tags to the telephone terminals, drawing the loud-speaker plug out of the jack.

Initially the flexible leads should be connected to the two largest tappings of their respective coils.

as required until maximum signals are obtained. Slight readjustments of the filament resistances may be required, and also of the variable grid leak to give the best results. When the set has been handled a short while and its working understood, the tappings to the coils may be altered, maximum selec-

The receiver operates successfully with either bright or dull emitter valves, and for purposes of filament current economy a 3 volt .06 valve (B.T.H. B5) was used for the detector valve and a 3 volt .12 amp. (B.T.H. B6) in the amplifying stage.

For good reproduction a 4½ volts



The arrangement of the components and the wiring will clearly be seen from the photograph.

grid bias was used on this valve, but the actual valve employed depends on the high-tension voltage.

Test Report

With a small aerial good loud-speaker results were obtained from 2LO, while this station could be

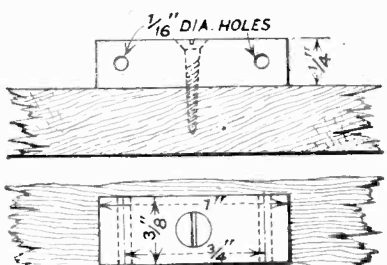


Fig. 6.—A small ebonite cleat is made to hold the flexible leads to the reaction coil.

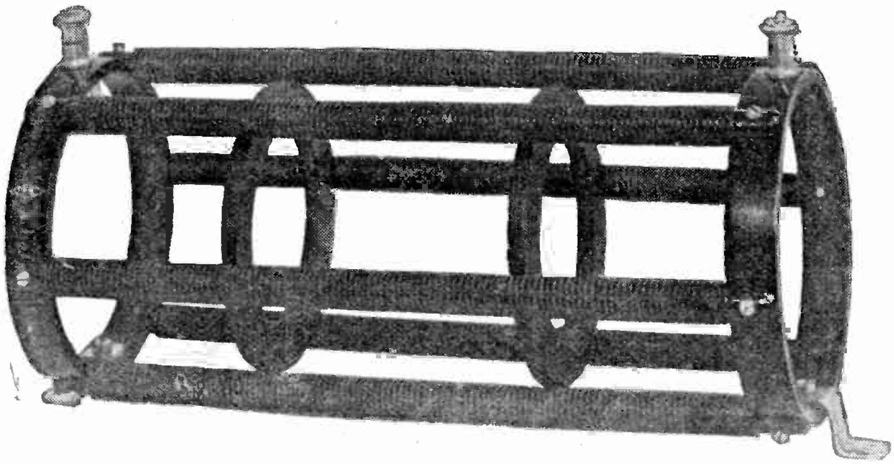
cut out completely by tuning either of the condenser dials a few degrees, or both of them by only a very small movement.

The usual British and Continental stations were also received at good strength and the tuning was found to be particularly sharp.

A definite log of the stations received has not been given, however, because the receiver is primarily intended for receiving the local station in areas where interference is experienced.

The receiver should be invaluable for those residing near the sea and who are troubled by interference from ship and shore stations.

How to Improve your Crystal Circuit.



By Major James Robinson
D.Sc., Ph.D., F.Inst.P., Director of Research.

Some interesting information on the relative merits of various types of coils in crysta' circuits.

IN the following article it is proposed to give some interesting results of measurements on a number of simple crystal circuits. It is not claimed that these results are new, but often a few practical measurements will explain what is happening in a circuit in a more convincing manner than proof by theoretical considerations.

The Normal Crystal Circuit

Let us first of all consider a simple straightforward crystal circuit, as shown in Fig. 1. It is well known that the tuning of such a circuit is very flat, and that with such a circuit it would be impossible to separate two equally strong signals unless their frequencies were widely different. It might be said that the selectivity of a crystal circuit is of little importance as only the local station is usually received. Selectivity and strength of signals, however, are often bound up together, and by improving the selectivity of a circuit one can often get greatly improved signal strength. Also the results obtained with crystal rectification will often be found to apply to simple valve circuits using cumulative grid rectification.

Damping of the Circuit Caused by the Crystal

As the crystal naturally has to absorb energy from the high-frequency part of the circuit in order to give an audible response in the telephones, it is obviously impossible to eliminate entirely its effect on the damping of the circuit. If, however, the damping effect of the crystal can be made more or less equal to the damping caused by the other resistance in the circuit, then it can be shown that the maximum signals will be obtained. In order to obtain some measurements on signal strength and selectivity various types of crystal circuit were supplied with current from a local oscillator and the rectified current was measured with a sensitive microammeter.

Fig. 1 shows the resonance curve of a simple circuit when supplied with voltage at constant strength but varying frequency.

The Effect of Different Gauges of Wire

The former on which the inductances were wound for these experiments is shown in the heading. A spiral groove is cut on the former so that the

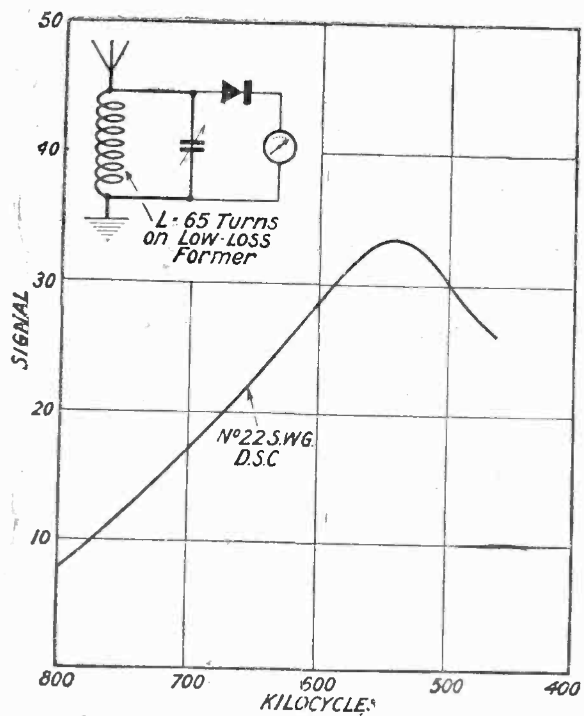


Fig. 1.—A resonance curve for a simple crystal circuit.

same spacing of the wire could be easily obtained with wires of different thickness. A number of inductances were wound up on this type of former, using copper wire varying from 18 S.W.G. to 36 S.W.G. The number of turns and the spacing of the wire were, of course, kept exactly the same in all cases. Fig. 2 shows the comparative resonance curves for inductances wound with copper wire of 18 S.W.G., 22 S.W.G. and 32 S.W.G., and when connected in the circuit of Fig. 1.

It will be seen from these curves that there is practically nothing to choose between any of the different wires used, either as regards selectivity or signal strength. The curves, of course, were taken with exactly the same coupling between the aerial and the oscillator, and also the same crystal setting. This means that there is practically no difference in the high-frequency resistance

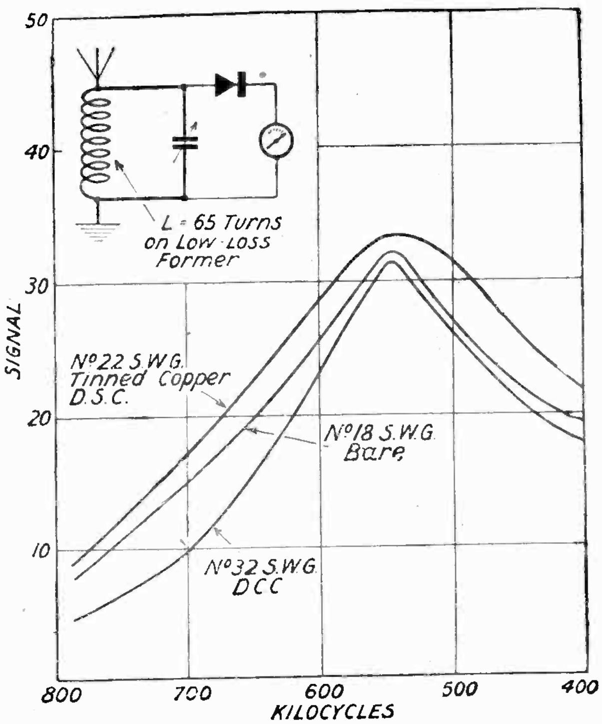


Fig. 2.—Varying the size of wire has little effect if the detector circuit is tapped across the whole coil.

of either of the coils used, or else that the damping caused by the crystal is so large that any effect on the circuit due to the difference in the H.F. resistance of the coils would be negligible in comparison. The latter explanation is more likely to be correct, so that in a circuit in which a crystal is put across the whole of the coil, there is little advantage to be gained by using heavy gauges of wire.

How the Effective Damping of the Crystal can be Reduced

The effective damping in the circuit caused by the crystal can be reduced by tapping the crystal across part of the coil only. At the same time, however, use is made of only a fraction of the available H.F. voltage across the inductance. It is obvious that if the crystal were tapped at the

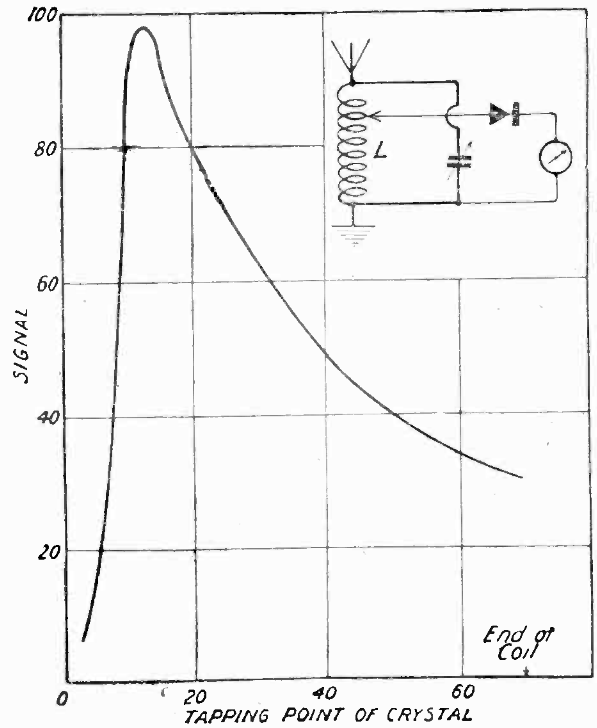


Fig. 3.—The effect on signals of varying the tapping-point was very marked.

bottom of the inductance, it would have no effect on the damping of the circuit, and there would be no high-frequency voltage across it, and consequently no signal would be received. By tapping

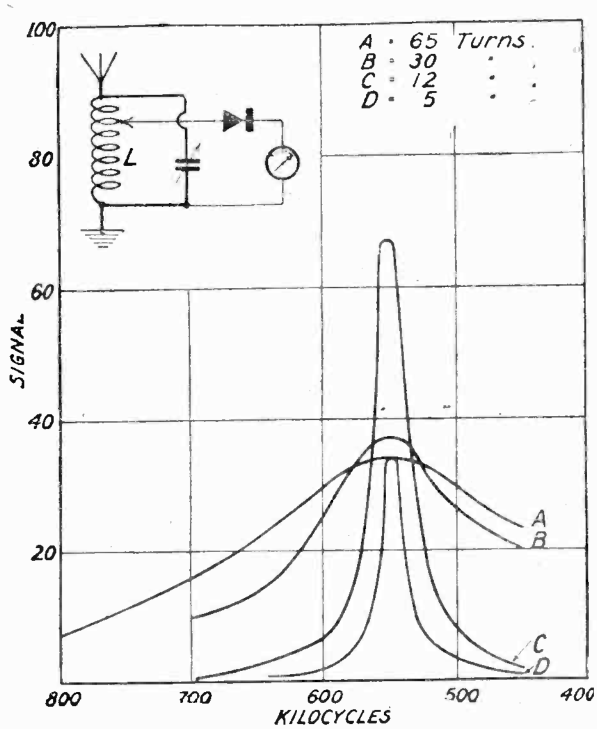


Fig. 4.—Reducing the number of turns across which the detector is tapped increases the selectivity.

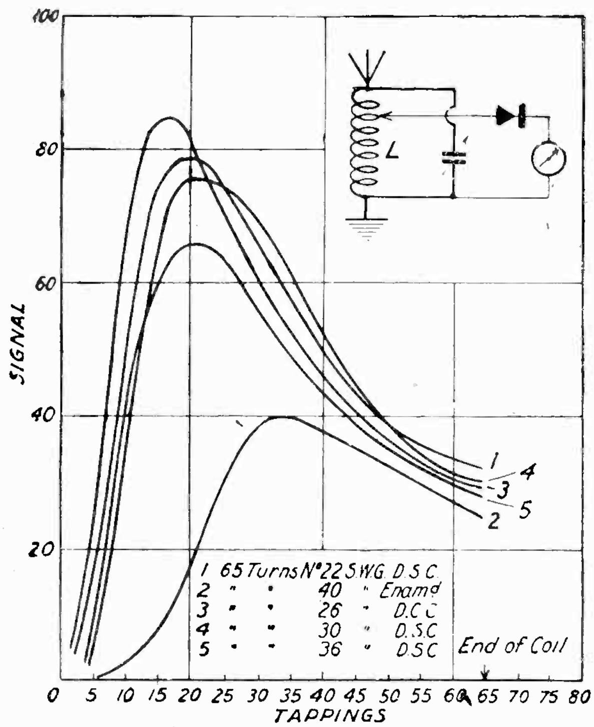


Fig. 5.—When the crystal tapping is varied, the size of wire may have considerable effect.

the crystal part way up the coil an optimum point can be found on either side of which the signal strength will fall off. If tapped above the optimum point, the signal strength will be reduced owing to heavy damping, and the resonance curve will be bad. If tapped below the optimum point, the signal strength will be less, as the reduction in the effective damping caused by the crystal is not enough to give a sufficient increase in the oscillating current in the circuit to counterbalance the loss in voltage across the crystal due to the lower tapping. This optimum tapping-point for the crystal, of course, depends upon a number of factors, such as type of crystal, crystal setting, aerial, tuning coil, etc.

Effect on Crystal Tapping

Fig. 3 shows the relative signal strength for different tapping-points for the crystal. The actual coil used for these measurements consisted of 65 turns of 22 S.W.G. copper wire, wound on a low loss type of former. It will be seen that in this particular case the optimum point for signal strength is about 12 turns out of a total of 65 turns.

On either side of this point the strength of the signal falls away quite rapidly. When the crystal is tapped across the whole coil, the strength of the signal is only one-third that of its optimum value.

Effect on Selectivity

We have seen from the above that tapping the crystal across part of the inductance improves the strength of signals. In what way does it affect the selectivity? The curves A, B, C and D of Fig. 4 are resonance curves plotted for tapping-points at 5, 12, 30 and 65 turns (full inductance). It will be seen from these that the selectivity greatly improves as the number of turns across which the crystal is tapped is reduced. There is no optimum point for the selectivity, which is the greatest with the smallest tapping.

Effect of Gauge of Wire

As the optimum tapping-point for the crystal is dependent on the resistance of the high-frequency part of the circuit varying the gauge of wire alters the tapping at which best signals are received. The curves of Fig. 5 show the signal strength plotted against the number of turns across which the crystal was connected, for inductances wound with various gauges of wire from 18 S.W.G. to 40 S.W.G. It will be seen from these curves that the wire giving the best signal strength, No. 26 S.W.G., requires the least number of turns across the crystal, whilst that giving the poorest signal strength, No. 40 S.W.G., requires the most number of turns across the crystal. It will be noticed that the difference between the wires as judged by maximum signal strength is much greater in this case than in the case of Fig. 2.

It should be remembered that in all these coils the spacing was kept constant. With finer gauges of wire, however, the spacing may be reduced, which enables a shorter coil to be used, with consequent increase in efficiency. This factor tends to discount the apparent advantage obtained with thicker wire.

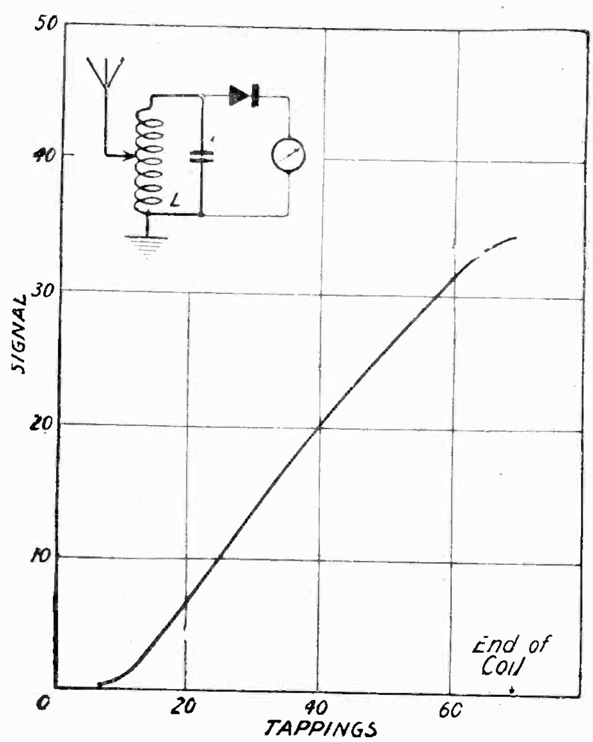


Fig. 6.—When the detector circuit was connected across the whole coil, the signal strength was continuously reduced as the aerial tap was reduced.

The Effect of Aerial Tapping

A circuit in which the aerial is connected to a tapping-point part way down the inductance is quite common practice (see Fig. 6). Measurements made on this type of circuit show that if the crystal is connected across the whole of the inductance, there is nothing to be gained by making an aerial tapping-point. In fact, as the number of turns in the aerial circuit is reduced, the signal strength becomes less and the resonance curve becomes flatter. Fig. 6 shows the relative strength for various aerial tapping-points, and Fig. 7 shows three resonance curves taken with 65, 50 and 30 turns in the aerial circuit respectively.

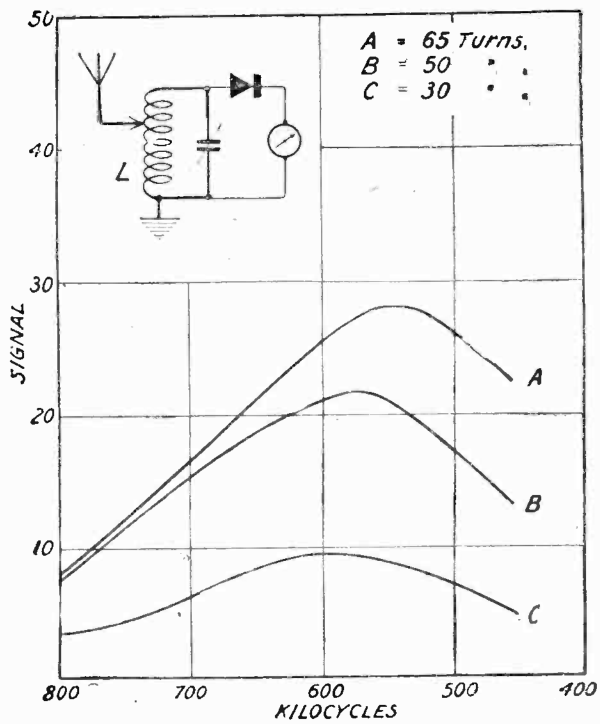


Fig. 7.—With the circuit shown the selectivity was made worse by tapping the aerial across part of the coil only.

Common Tapping-point for Aerial and Crystal

If, however, both aerial and crystal are tapped to the same point, an improvement immediately results.

The relationship between signal strength and tapping, as given by actual measurements, is shown in Fig. 8. It will be seen from this that the signal strength remains practically constant from the full 65 turns to about 25 or 30 turns. If the turns are reduced below the lower value, the signal strength falls away very rapidly. As regards selectivity, this improves as the turns are reduced. Thus with a tapping of about 50 turns the selectivity is good and there is little loss in signal strength. This would be the best point at which to work in practice. The relative shape of the resonance curves taken with tapping-points at 20, 30 and 40 turns is shown in Fig. 9.

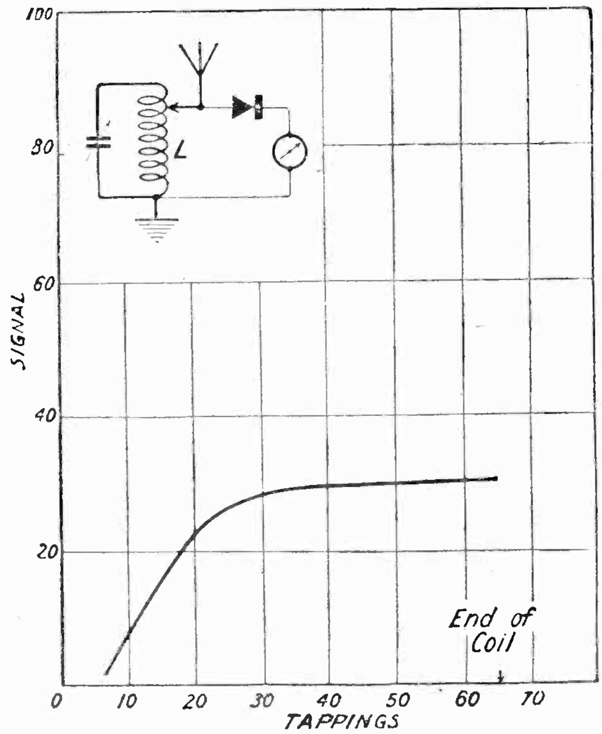


Fig. 8.—If aerial and crystal were both tapped the signal strength remained nearly constant until quite small tappings are obtained.

Conclusions

These results, however, must be regarded with caution, in that they were taken on a particular aerial and cannot be considered of general application. The curves showing the variation of signal strength with aerial tappings, for example, would be of a different character for varying types of aerial. Moreover when an aerial tap is used in practice the size of the coil is correspondingly increased.

As far as the present experiments are concerned, however, the results may be summarised as follows :—

(1) With a plain untapped arrangement the resistance of the coil is swamped by the damping due to the crystal.

(2) With a tapped arrangement a low loss coil is of advantage.

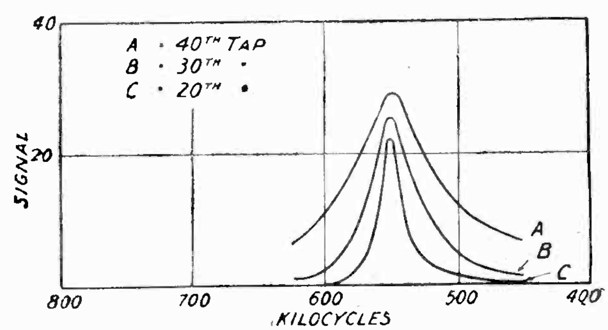
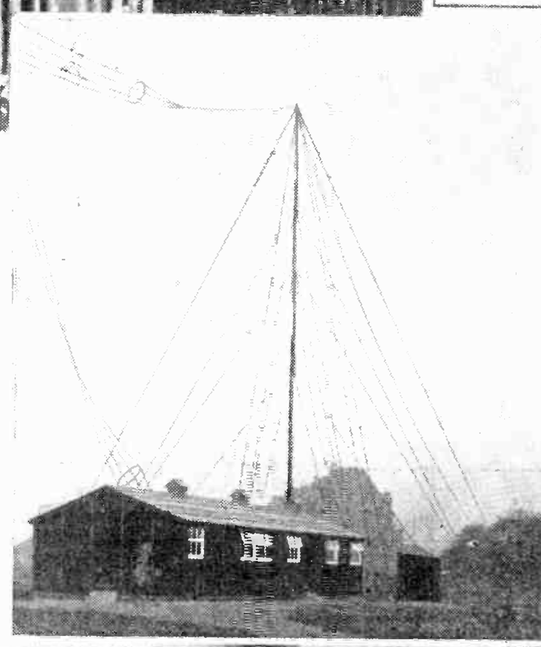


Fig. 9.—With a circuit such as that shown in Fig. 8 there is a definite advantage in using a tapped arrangement.

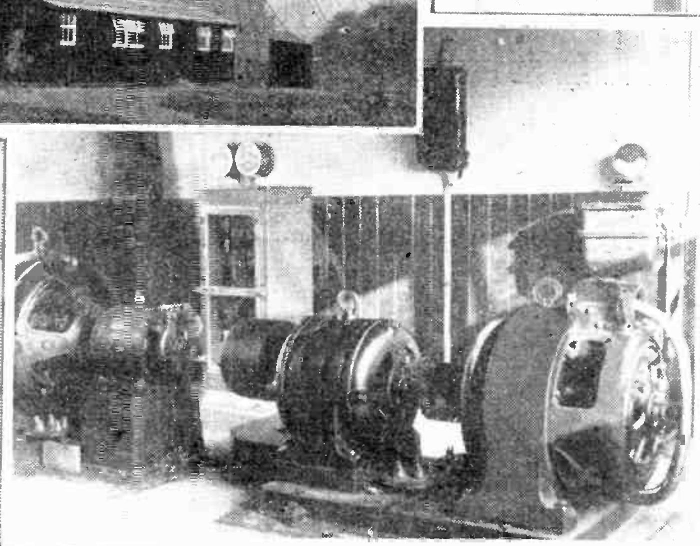
THE DUBLIN BROADCASTING STATION

Many readers will have heard 2RN, the Dublin Broadcasting Station, testing during the past few weeks. Here are some preliminary photographs.

The upper photograph shows the 6Kw. transmitter, while the view on the right gives some idea of the almost ideal site which has been chosen for the station.



This is a view of the motor alternators for supplying the high-tension voltage to the transmitting valves.

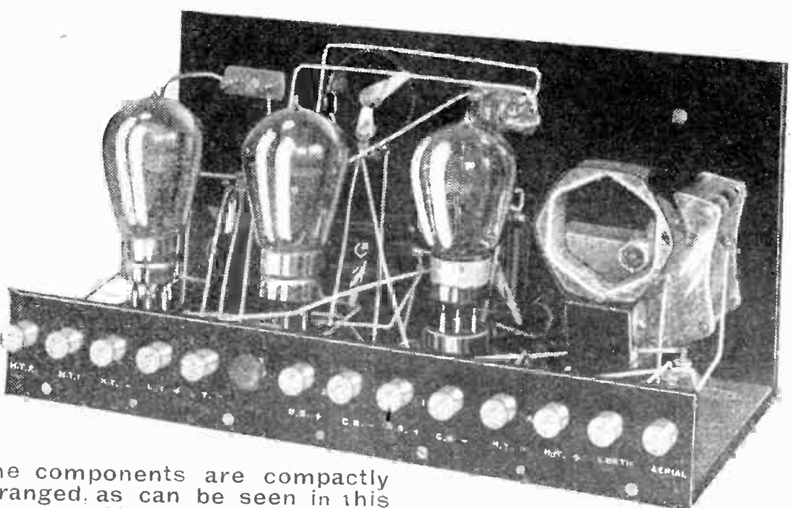


A THREE VALVE "PRINCE" RECEIVER

By A. S. CLARK

This receiver employs a form of trigger circuit due to C. E. Prince, and first described by G. A. Beddington. It is capable of giving signals of large volume with considerable purity of reproduction.

ALTHOUGH the "Prince" circuit, which is employed in this receiver, is not entirely new, it has only appeared once before in a constructional article. A two-valve "Prince" receiver by D. J. S. Hartt, B.Sc., was described in *Wireless*, Vol. 1, No. 5, and its action and origin were described by G. A. Beddington in *Wireless Weekly*, Vol. 6, Nos. 22 and 24.



The components are compactly arranged, as can be seen in this photograph.

Some readers consider that not enough attention has been given to receivers for obtaining the best reception from the local station, and that loud-speaker reproduction has been rather neglected. The receiver described in this article is not intended for distant reception, being designed to excel on the local station in purity and volume. It is ideal for the enthusiast who is anxious to obtain real loud-speaking with almost the purity of a crystal receiver.

Last Valve Optional

Jacks are provided by means of which either two or three valves may be used. The two valves will give ample volume for ordinary loud-speaking in an average room, whilst the three will give as much volume as can possibly be desired in the home. The volume on the three is easily enough to dance to, and in fact sufficient with a large loud-speaker for demonstration work in small halls. In spite of this great volume it is possible to follow every word of the announcer at a considerable distance from the reproducer.

Circuit not Complicated

The circuit is not complicated, although it is unconventional; in fact it is perhaps more simple than a straight three-valve set. Only one fixed condenser is required, since this seems to be a component for which the set has no liking. No improvement is made by shunting one across various parts of the circuit, such as the primary of the transformer or the loud-speaker. The extra expense of having two H.T. and two G.B. batteries is easily compensated for by the wonderful reproduction obtained, which must be heard to be fully appreciated.

The Tuning Arrangement

Referring to the theoretical circuit diagram, it will be seen that tuning is obtained by means of a variable condenser in parallel with an inductance coil which is of the standard plug-in type. This tuning circuit is shunted across the grid and filament of the first valve, the grid of which is given a negative potential by means of the grid bias battery 1. Fine adjustment of the potential of this grid is obtained with the potentiometer across the L.T. battery.

In the plate circuit of the first valve we have the H.T. battery A, the negative side of which is connected directly to the grid of V_2. It is in this battery that the secret of the circuit lies. When the grid of V_1 is highly negative, this valve is non-conducting. The H.T. battery A therefore cannot complete its circuit and the grid of V_2

behaves just as if it were disconnected. There will be a steady anode current flowing depending on the value of the grid leak R5. On the arrival of a signal, however, V_1 becomes conducting and the battery **A** applies a large negative potential to the grid of V_2, which reduces the anode current of this valve practically to zero. Thus a

lead, whilst the third valve being a standard arrangement has its filament resistance in the negative lead. The resistance R_4 is a fixed resister which is placed in series with the filament rheostat of V_1 because as a rule this valve has to be burnt at a less brilliance than usual.

The set is of quite a moderate

The "On" and "Off" Switch

With the terminals at the back of the set, an "on" and "off" switch is provided in the low-tension negative, so that when the set is once adjusted it may be turned off without upsetting the adjustment of the filament resistances. This switch also cuts the potentiometer out of circuit which

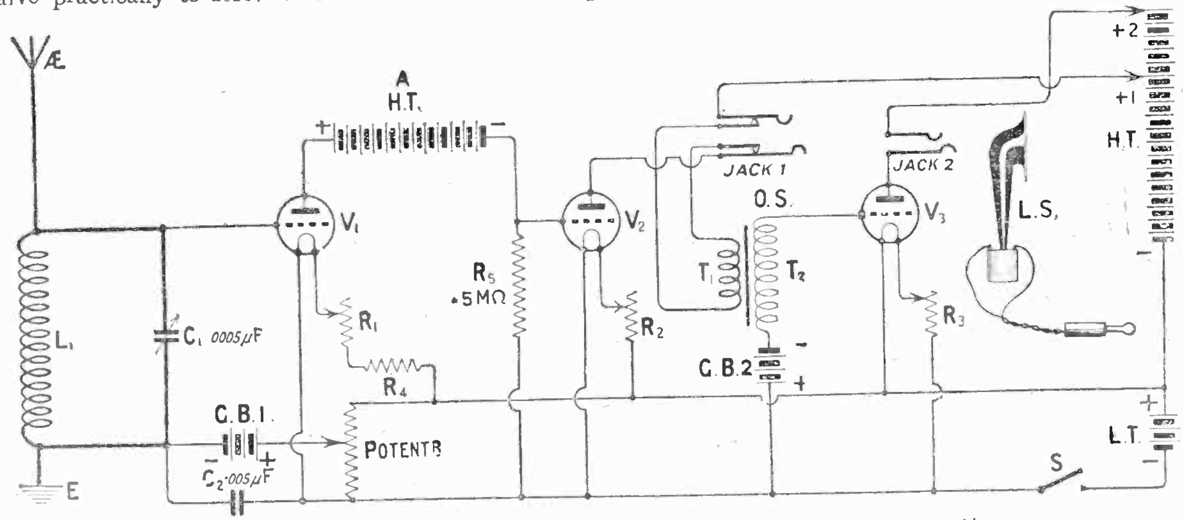
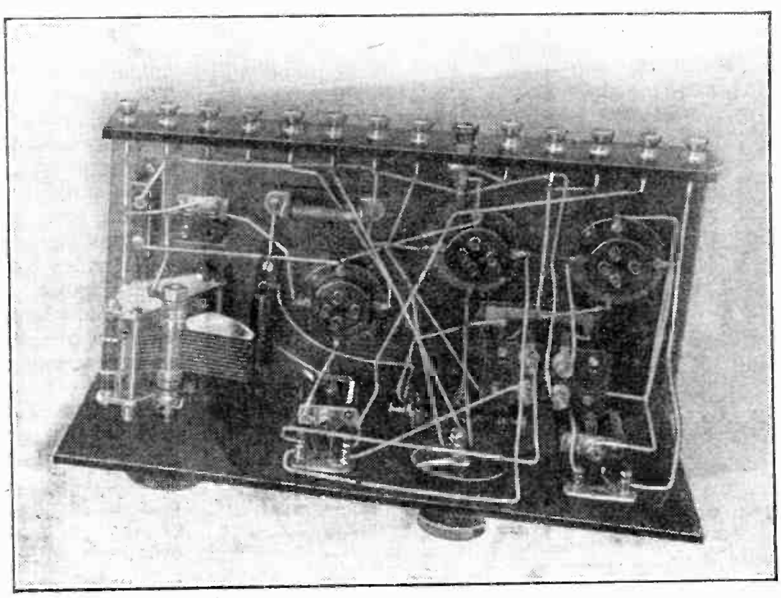


Fig. 1.—The circuit employed makes use of a trigger action between the valves V_1 and V_2.

trigger action is set up, this battery acting as the trigger, and due to this the circuit is sometimes called a "trigger circuit." The current flowing in the plate circuit of the valve V_2 is fairly small, and this helps to compensate for the extra H.T. battery which has to be used.

After the plate of the valve V_2 the circuit is a conventional note-magnifier, except that no fixed condensers are incorporated. The Jack connects the primary of the L.F. transformer in the plate circuit of V_2 when no plug is inserted. When the plug is inserted with a loud-speaker attached, the primary is completely cut out of circuit and the loud-speaker inserted instead. The Jack is a single circuit jack and enables the loud-speaker to be put in the plate circuit of V_3 when desired.

In accordance with the original circuit the first two filament resistances are placed in the positive



Enough space must be left around the valve-holders to enable the valves to clear the wiring.

size and unobstrusive. All the components have been placed as close together consistent with good working as possible, thus making the receiver very compact. The set has a pleasing appearance, there being no terminals in the front, and a slightly different cabinet to the usual being employed. The plain top to the cabinet suits the panel layout very well.

is directly across the low-tension. The switch should therefore always be used for switching the set off, because if it is done with the resistances, a steady current will be passing through the potentiometer.

Components

The following list shows the complete set of components required to build the receiver, and in accordance with the usual practice we give the makers of the original parts used. It is not however strictly necessary to adhere to this list, as other suitable components of good make may be employed.

Black panel 14 in. by 7 in. by $\frac{3}{16}$ in. (American Hard Rubber Co., Ltd.).

Cabinet to take same with 6½ in. deep baseboard (Carrington Manufacturing Co., Ltd.)

·0005 μF variable low-loss condenser (Igranic Electric Co., Ltd.).

3 dual filament rheostats (Falk. Stadelmann and Co.).

Intervalve transformer (Type C. Efesca, Falk, Stadelmann and Co.).
Potentiometer (L. McMichael, Ltd.).
Single circuit telephone jack (General Radio Co., Ltd.).
Double circuit telephone jack (General Radio Co., Ltd.).
"Push pull" switch (General Radio Co., Ltd.).

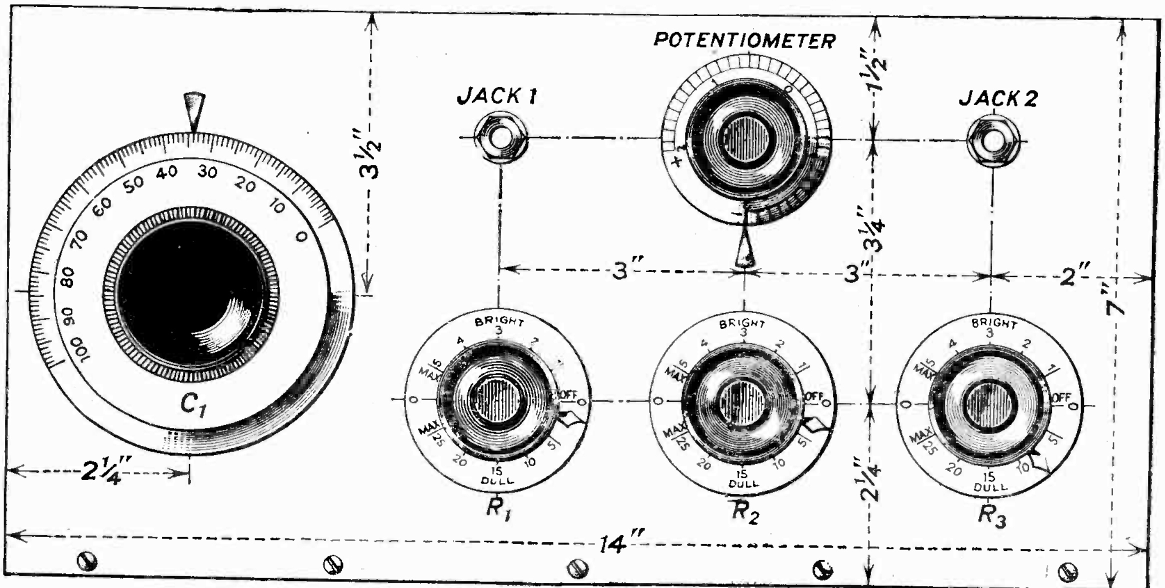


Fig. 2.—This drilling diagram of the front of the panel shows how few holes are required. A full size blueprint may be obtained at 1/6 post free. No. 141a.

3 Magnum Vibro valve holders. (Burne-Jones and Co., Ltd.).
Coil socket (Burne-Jones and Co., Ltd.).
·005 μF fixed condenser (Telephone Condenser Company).
5½ Megohm Grid-leak with mounted clips (Dubilier Condenser Co., Ltd.).
Fixed resistor A.J.S. type D (A. J. Stevens and Co., Ltd.).
This is for DE5 Valves. For .06 valves type DE resistor is used.
Terminal strip 14 in. by 2 in. by ¼ in. for 13 terminals and one switch (Burne-Jones and Co., Ltd.).
16 gauge Glazite wire (London Electric Wire Co., and Smiths Ltd.).
2 packets Radio Press panel transfers.
2 Decko dial indicators (A. F. Bulgin and Co.).
Mount for fixed resistors.
Screws, nuts and bolts, etc.

Construction

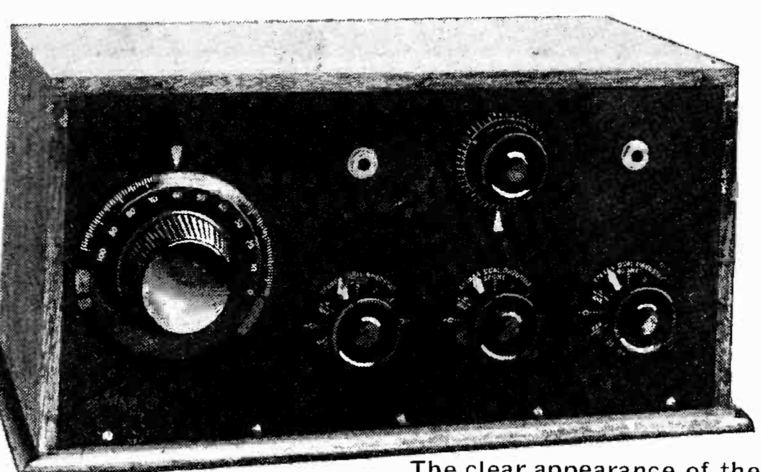
Having gathered together these components the constructional work may be commenced. The first thing to do is to make sure the panel will fit into the cabinet, if it is not supplied with it. If it will not, the edges should be scraped with a knife or filed until it will. Attention is now turned to drilling the panel.

Fig. 2 is a drilling diagram of the receiver, from which the panel may first be marked out and then drilled. All the components exce t the variable condenser are of the one-hole fixing type, therefore six ⅜ in. holes are all that are required, apart from those for the condenser and the dial indicators. Hence the drilling of the panel is simplicity itself. In order to prevent the polished surface of the panel from becoming scratched while drilling, the panel should be laid on several thicknesses of soft paper. The small holes at the bottom of the panel are for screwing it to the baseboard. The small weight on the panel and its length in respect to its height, make the use of panel brackets unnecessary.

Mounting Components

When the panel is drilled, mount those components which go on the panel. The middle resistance is placed the opposite way round in relation to the others in order to allow more room for the potentiometer. Make sure that the contacts to the potentiometer are at the bottom, or the wires to this component will be unnecessarily long.

Having mounted those components which are fitted on the panel, attention may be turned to those for the baseboard. All these should be mounted except the transformer, for which the fixing hole should be drilled. Do not mount it, because some of the wiring has to be done before this component is fixed into position. The diagram of Fig. 4 shows details of the mount for the A.J.S. fixed resistor. These resistors are provided with two valve pins, and so two valve legs are fixed to a small piece of ebonite which is screwed to the baseboard. Two soldering lugs should be placed under the valve legs, and two terminal screw tops are used to lift



The clear appearance of the panel is obtained by putting only necesary controls on it.

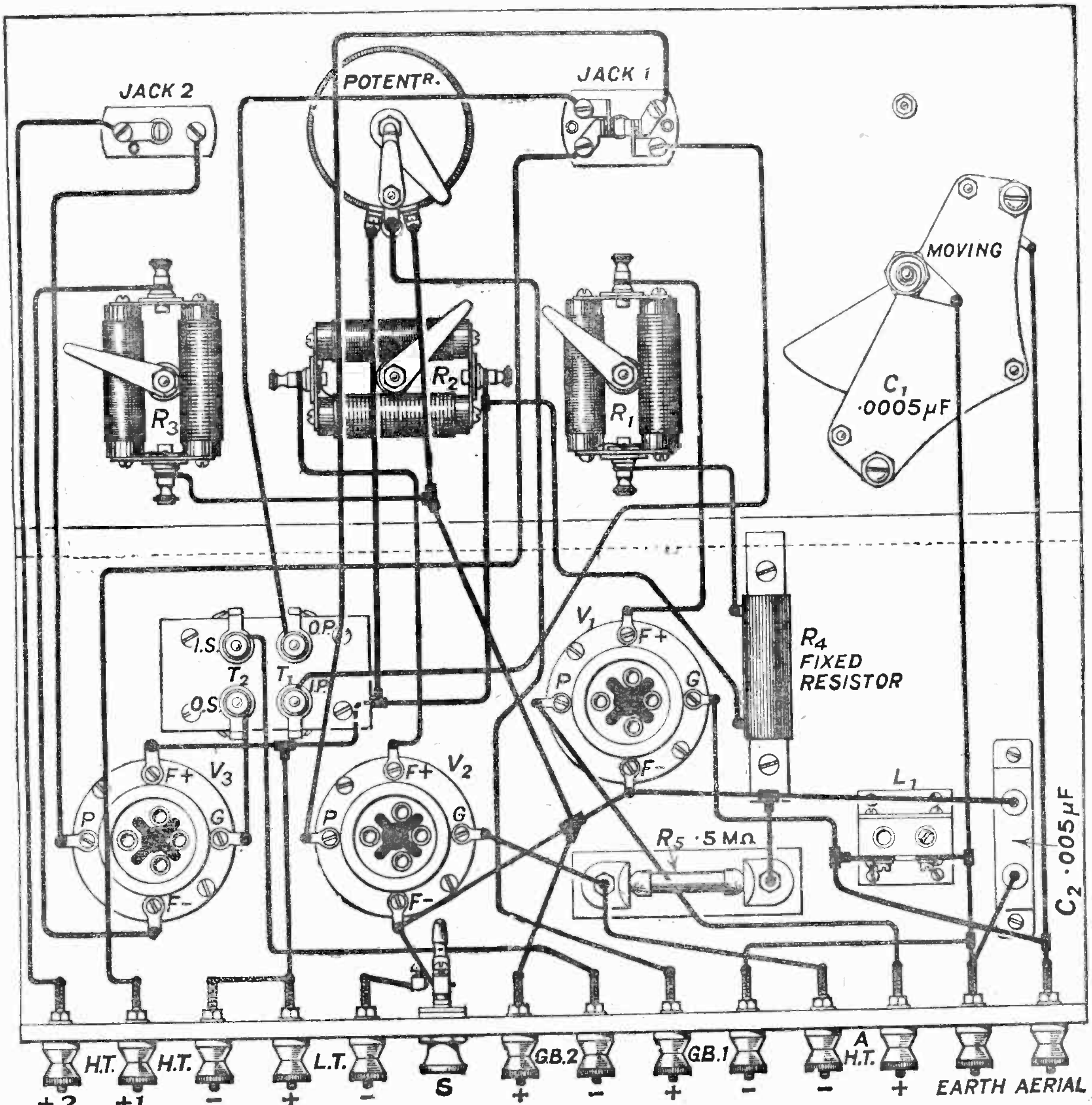


Fig. 3.—The wiring of the receiver should be carried out in accordance with this diagram, a full-size blue print of which may be obtained for 1/6 post free. No. 141b.

the mount off the baseboard, to which it is fixed by means of two wood screws. The layout for the baseboard components is given in Fig. 3, and it should be carefully followed, or there will not be enough clearance for the valves when the large types, such as a D.E.5, are employed.

The Terminal Strip

Having proceeded thus far, the switch may now be attached to the terminal strip. If a hole is not provided, one of the terminal holes can be enlarged to take it. The sixth hole from the left, looking at the front of the strip, is the correct one. Before screwing the terminal strip on it will greatly help in the soldering of the set if the ends of all the terminal shanks are filed bright and heavily tinned. After screwing on this terminal strip and screwing the panel to the base-

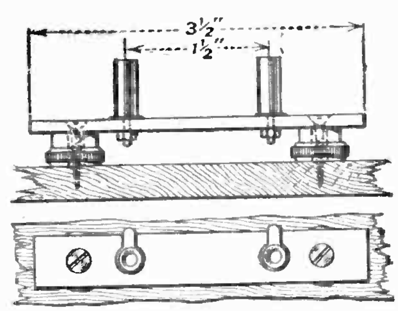


Fig. 4.—Details of the mount for the fixed resistor.

board, which should be done with both of these in the cabinet, the set may be wired.

Wiring

All points to be soldered should be tinned in the same way as the shanks of the terminals on the terminal strip before wiring is commenced. The filament circuits should receive attention first. The connections to the filament rheostats must be made before the transformer is mounted as already stated, the terminals on these resistances being tightened up with a pair of pliers. Apart from this point the wiring should present no difficulty.

Do not forget while wiring that a certain amount of space must be left around the valve holders and coil socket. It is as well to keep a large valve handy while wiring, which may be inserted in the sockets occasionally to make sure that it does not foul any of the connections. Also make sure that the wires to the filament resistances allow room for the contact arms to be rotated.

The only constructional detail which remains after the wiring is to affix the panel transfers. This should be done in accordance with the lettering against the terminals in the wiring diagram.

Valves to Use

Before describing how to test and work the set, it will be as well to give a short description of the valves to use. At least one power valve will be required, and it is advisable to use two if possible owing to the large power to be handled.

The first valve should be a D.E. 3B or a D.E. 5B. The second is much more preferable, and goes very conveniently with D.E. 5's in the second and third valve holders.

Batteries

The first high tension battery should be a 36 volt one, about 18 or 20 volts usually being sufficient. Often best results are given with about 18 volts in this position. Both grid bias batteries should go up to 9 volts, in steps of $1\frac{1}{2}$ volts. In the case of the first one as the H.T.A. volts are increased, so it becomes necessary to increase the grid bias. In the case of the two last valves the H.T. should be as high as the particular power valves used will take, and less than about 72 volts on the second and 100 volts on the last is not advised. None of these values are critical except that of the first grid bias. The first filament resistance adjustment is also sometimes critical, but not to a very great extent.

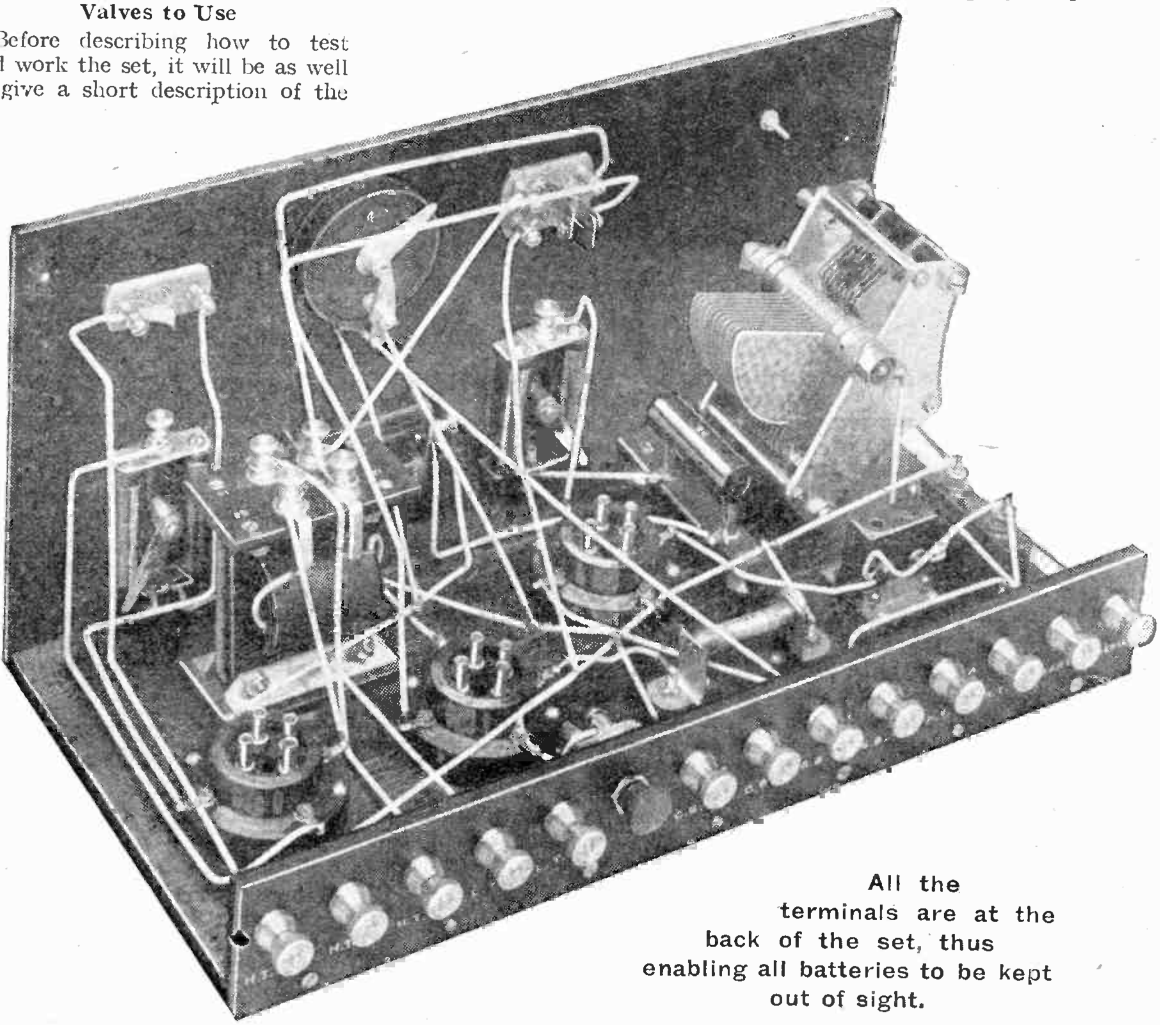
Testing the Receiver

Connect the aerial and earth, and all the batteries to their correct terminals. Plug a suitable coil in the coil socket, say a No. 35 or No. 50, and if a D.E. 3B valve is used as the first, put the D.E. fixed resistor in, but if the D.E. 5B, put in a D. This resistor has almost a dead short between its pins.

Try at first with two valves by plugging the loud-speaker on to jack 1. With a given H.T.A. value, and the correct grid bias, it will be possible almost completely to lose the signals by turning the potentiometer either way. If this does not happen, different grid bias values should be tried until it does. Signals may be brought to their loudest by trying different combinations of H.T.A. and G.B.1.

The tuning of the aerial is the same as usual, except that it will generally be found that distortion is introduced if the set is detuned in either direction.

When trying three valves, the loud-speaker plug is put in the second jack. The G.B. 2 should be adjusted until loudest and purest signals are obtained, and it should be kept as negative as possible, since this will help to keep the anode current down, which is inclined to become rather large.

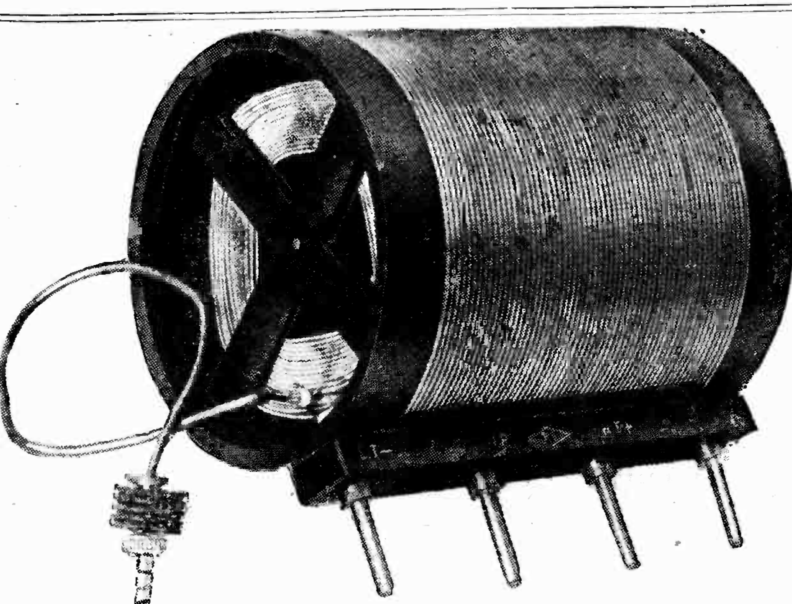


All the terminals are at the back of the set, thus enabling all batteries to be kept out of sight.

Results

The best results were obtained by the author, when using a D.E. 5B and 2D.E.5 valves with 18 volts for H.T.A. and $4\frac{1}{2}$ volts for G.B.1. On the last two valves 120 volts were employed with 9 volts grid bias.

Those who have been looking for some advance in loud-speaker set design will find in this receiver just what they require, and reports on results will be very welcome to the author.



High-frequency Transformers for the "Special Five"

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

As a number of inquiries have been received for further details of the high-frequency transformers used in the "Special Five" receiver by readers who desire to make their own, the following particulars may be of interest.

The Primary Winding

The primary consists of two coils of wire in series, wound side by side on an X former of ebonite in two separate slots. It has been found an advantage to separate these slots by a space of ½ in., although in the first transformers the two windings were closer together than this. There is room for a great deal of experiment with regard to these primary windings, and they may with advantage be of a gauge as small as 30 S.W.G. There are 20 turns on each X former.

The two coils are joined in series, one end of the pair of coils going to the anode, the middle point to the positive high-tension, and the other end to the neutralising condenser. The design of these transformers is such as to keep the capacity coupling between the primary and secondary as low as possible.

The Secondary Winding

The secondary of the transformer is a single layer winding of the outside of a 3 in. ebonite tube, at one end of which the X former carrying the primary and neutralising coil is placed. The wire used is No. 20 S.W.G, enamelled and spaced a distance equal to the thickness of the wire by being wound in a groove turned on the tube. As the turning of such a groove is beyond the ability of the average amateur who does not possess a lathe, a similar effect can be obtained by winding the enamelled wire and string of equal thickness simultaneously, the string thus serving as a separator for the adjacent turns.

An Improvement

The transformer thus comprises a solenoid secondary with a primary loosely coupled to it in such a fashion as to have very little capacity coupling. At my suggestion Messrs. Peto-Scott have now produced a modification of this transformer with more turns on the primary, but with the primary mounted in such a way as to allow it to rotate, thus varying the coupling between it and the secondary. I am now experimenting with this, and it is giving some very interesting results.

Valves to Employ

The transformer as now made is particularly suited to the ¼-amp. type of small-power valve, with which it oscillates readily. In using these transformers the feed-back is sufficient to set up the required self-oscillation, which is checked by means of the neutralising winding and condenser. Some kinds of valve, particulary some bright emitters, do not oscillate so readily, and the feed-back is insufficient to produce oscillation, or even sufficient reaction effect to make the receiver really sensitive. For this reason I strongly recommend the use of ¼-amp. small-power valves in this receiver.

Lower Frequencies

With regard to the reception of 5XX and Radio - Paris on this receiver, I have not arrived at a point when I can recommend suitable windings for this range, using both stages of high-frequency. Experiments are proceeding, and results will be published as soon as possible.

Winding Coils at Home

The beginner is apt to think that the winding of a tuning coil is an operation rather beyond his resources and capabilities, but as a matter of fact some of the most effective types can be made with the utmost ease, and without any elaborate appliances.

Home coil winding is a most fascinating branch of wireless, and the monetary saving effected by being able to wind a coil for, say, Daventry, at a cost of perhaps a shilling, with the aid of a round piece of wood and a few nails is obvious.

All that is required is a source of clear and dependable instructions for winding the various types of coil, indications of their suitabilities for various purposes, and so on, with definite information as to turn numbers; and all these points will be found to be fully covered in a book published by Radio Press, Ltd., entitled "Tuning Coils and How to Wind Them" (1s. 8d. post free), by G. P. Kendall, B.Sc.

Wave Traps and Their Uses.

By J. H. REYNER, B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

For those who already have sets, and who wish to try long-distance reception, the local station often proves a serious source of jamming. The use of one of the several types of wave trap described in this article will prove distinctly beneficial.

IN the quest for selectivity any device which will reduce the effect of local jamming is eagerly welcomed by the great majority of listeners. In order to reduce such jamming there are two methods available. One of these is to increase the number of tuned circuits in the receiver, but this proceeding has the disadvantage

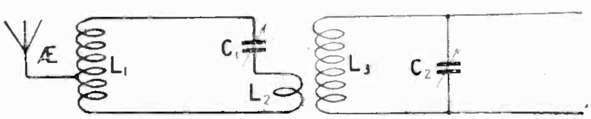


Fig. 1.—The use of coupled circuits increases the selectivity of a receiver.

that if more than two circuits are employed it is usually necessary to employ high-frequency amplification to make up for the signal strength which is lost in transferring the energy from one tuned circuit to the next.

On the other hand, there are many people who desire to improve their selectivity in so far as the elimination of jamming from the local station is concerned, without necessarily increasing the number of valves in their receiver or indeed without altering to any considerable extent the present arrangements.

What is a Wave Trap ?

In such cases a suitable wave trap may be of considerable advantage. A wave trap is a device which is connected in a suitable portion of the circuit usually in such a manner as to act as a more or less complete barrier to currents of the frequency of the local station, which it is desired to eliminate, without affecting other frequencies to any appreciable extent. In certain cases circuits are employed for this purpose which achieve the desired result by increasing the elimination of *any* frequency other than that which is desired, but although these circuits will be discussed later, they are not, strictly speaking, wave traps.

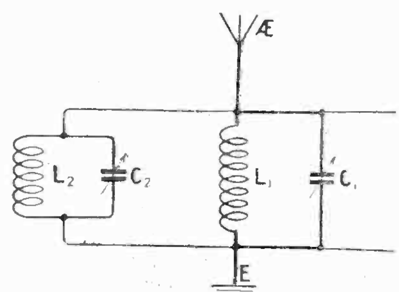


Fig 3.—A type of rejector circuit sometimes used as a wave trap.

Loose-Coupled Circuits

The question arises as to whether a wave trap is more effective than the addition of another tuned circuit. In any case, it is necessary to employ an extra tune, and it might at first sight be thought that the same advantages could be gained by providing a loose-coupled tuned primary and inserting this in the front of the receiver. Such a circuit is shown in Fig. 1, and, suitably designed, there is no doubt that a material improvement in selectivity would result.

The disadvantage of this circuit, however, is that the signals from the wanted station will suffer slightly in strength due to the transfer of energy from the one circuit to the other. Although this may not be important on nearby stations, it may make all the difference between satisfactory reception or the reverse in the case of reception from

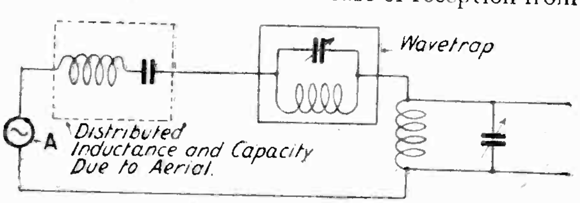


Fig. 2.—This is an equivalent circuit to an aerial with a series rejector wave trap in position.

distant stations. It is this disadvantage which has led to the use of extra high-frequency valves when using a chain of tuned circuits, the function of these high-frequency valves being more to make up the loss of energy at each stage, rather than to provide any very considerable overall amplification.

An additional disadvantage of this arrangement lies in the fact both circuits have to be adjusted for each station tuned in.

Advantages of Wave Traps

A wave trap, however, can be designed so that the signal strength of the wanted station is only affected to a very small extent. Moreover, with a suitably designed arrangement the setting of the wave trap only requires to be adjusted once and for all at the beginning of the operations, so that it can hardly be considered as an extra tune in the ordinary sense of the word.

Operation of a Wave Trap

The actual functioning of a wave trap is not quite as simple as it would appear at first sight. Fig. 2 is a simple diagram representing the condition of affairs in an aerial circuit provided with one of the simplest types of wave traps. The alternator A is providing a small source of voltage which represents the incoming wireless signal. At first sight one would imagine that the wave trap inserted as shown could simply be tuned to reject or trap a certain frequency, and that all other frequencies would be passed without being appreciably affected.

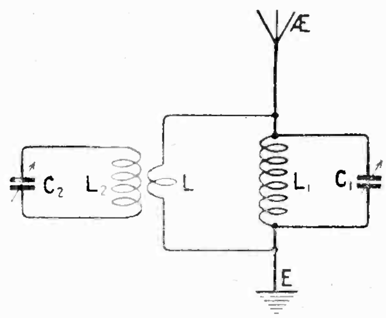


Fig. 4.—In this circuit the trap is coupled to the coil L_3. L_2C_2 is tuned to the same station as L_1C_1.

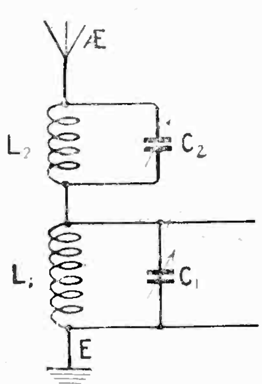


Fig. 5.—A simple series rejector type of trap. L_2C_2 is tuned to the interfering signal.

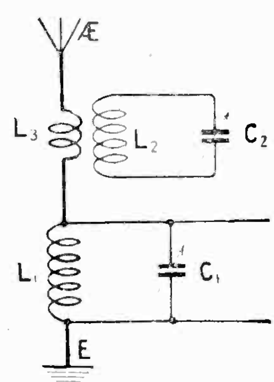


Fig. 6.—A modification of Fig. 5, the trap circuit being coupled to the coil L_3 in the aerial circuit.

A little consideration, however, will show that the wave trap is really only one part of a somewhat complicated arrangement of tuned circuits, some in series and some in parallel. Because of this the wave trap produces an effect on the whole circuit, but by suitable design it can be arranged that the effect on the tuning of the receiver is comparatively small. The effect is then that the receiver tunes in the normal manner, but the whole circuit presents a very high impedance to one particular small band of frequencies only.

The actual consideration of the effects of a wave trap on the whole tuning circuit is by no means simple, and I do not propose to discuss this aspect of the subject here. With these few preliminary remarks therefore, we will pass on to the consideration of several types of trap in actual practice.

Desirable Features

First of all let us summarise the desirable properties of a wave trap. In the first place the tuning of the wave trap should affect the tuning of the set as little as possible. The ideal case is one in which the wave trap could definitely be adjusted to the unwanted station and left there, after which the set itself may be tuned in to any other station which may be required without affecting the setting of the wave trap in any way. This property is one which can easily be obtained with a suitable circuit. Another feature is that the effect of the insertion of the trap on the signal strength of any other station should be as small as possible. That is to say, in cutting down the unwanted station, the stations required should not be appreciably affected. These are the main points and we can now consider how they are carried out by the various types of circuits.

There are four principal types of wave trap. These are :—

(*a*) *The series rejector type.*—Here a rejector circuit is inserted in the aerial in series with the tuned circuit connected to the set.

(*b*) *The parallel rejector type.*—In this case a tuned circuit is connected in parallel with the circuit of the receiver.

(*c*) *The acceptor type.*—Here a series tuned circuit is connected in parallel across the tuned circuit of the set.

(*d*) *The absorption type* in which a tuned circuit is loosely coupled to the tuned circuit of the receiver.

Of these, the first and last two are the most satisfactory types. These are all tuned to the interfering stations, whereas the parallel rejector type is tuned to the same frequency as the set itself, and therefore simply assists reception by increasing the selectivity of the receiver and requires readjustment for each alteration of the setting of the receiver itself.

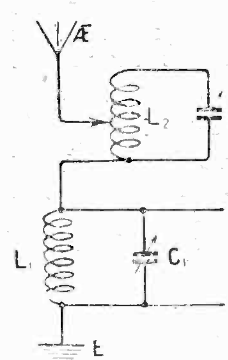


Fig. 7.—In this case the aerial is tapped across a small portion of the trap coil L_2.

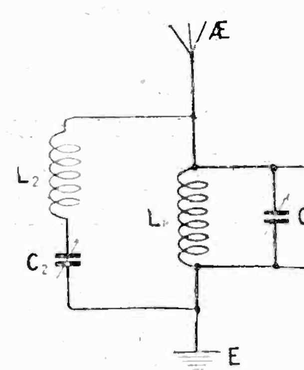


Fig. 8.—An acceptor type of trap. L_2C_2 is tuned to the interfering signal and forms a by-pass.

Rejector Circuits

Fig. 3 shows this type of circuit, and it will be realised from what has been said that this circuit does not comply with either of the desirable features outlined above. The variation of the trap condenser C_2 will cause a variation of tune and the fact that it has to be adjusted afresh for each variation made to the set renders it somewhat less satisfactory than the other types. It does, however, produce a marked increase in the selectivity and has the advantage over the loose-coupled arrangement shown in Fig. 1 in that the rejector circuit L_2C_2 can be cut out while preliminary tuning is effected and subsequently cut in and tuned to the wanted station.

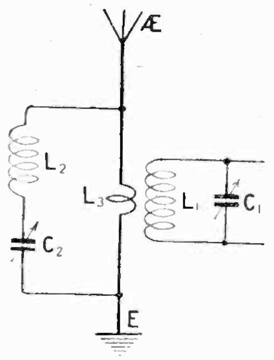


Fig. 9.—The acceptor type of trap works better with a tight-coupled aerial.

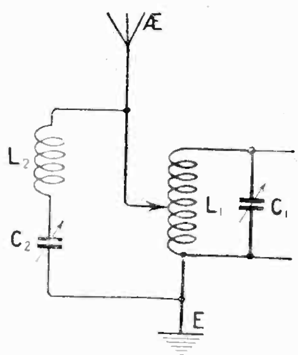


Fig. 10.—An auto-coupled aerial may be used, but the trap is not then so effective

Coupled Rejector Arrangement

A modification of this circuit is shown in Fig. 4. Here the trap circuit instead of being connected across $L_1 C_1$ is coupled to a coil L_3 shunted across $L_1 C_1$. This circuit is rather more difficult to adjust than that of Fig. 3, because there is a tendency for the wanted signals to slip through L_2 as well as the unwanted signals. When suitably adjusted, however, this trap is capable of giving exceedingly good results. L_2C_2 and L_1C_1 are both tuned to the desired signal, L_1C_1 being tuned first without the coil L_3 connected.

Series Rejector

The circuit in Fig. 5 is a simple series rejector type of circuit. This circuit when suitably arranged has little effect on the wanted signals provided they are not too close to the frequency which is being eliminated. The tuning of this circuit of course depends on the coil employed. The lower the resistance the sharper will be the tuning, and stations quite close to the local station can be received satisfactorily.

The circuit behaves to a large extent as a series condenser in the aerial circuit, so when the trap is inserted L_1 has to be increased somewhat, a size larger being employed if plug-in coils are used. When this alteration has been effected, however, the interaction between the trap circuit and the receiver tune is quite small, and the tuning can be made very sharp.

Practical Results

This circuit is one of the several types which can be arranged with Mr. G. P. Kendall's *A B C Wave Trap*, and using this type of trap, 2LO can be cut out and 2ZY received quite easily at 7 miles from 2LO with a receiver of average selectivity.

This circuit, however, is not the only one that can be obtained, utilising this parallel rejection principle. The circuit shown in Fig. 6 is electrically similar to that in Fig. 5. In this case, however, the trap circuit $L_2 C_2$, instead of being connected direct to the aerial circuit, is coupled to a small coil L_3 in the aerial lead. The coupling between these two coils is kept comparatively weak, and with this arrangement the interaction between the circuits is somewhat reduced, although the effectiveness of the arrangement as a trap is somewhat impaired.

Use of Aerial Tappings

A modification of this circuit is shown in Fig. 7. Here instead of loosely coupling the trap circuit, the aerial circuit is tapped across a small portion of the coil L_2. This type of circuit is capable of giving exceedingly good results. The coil L_2 should be a size larger than L_1, C_2 being a ·0005 μF condenser. For L_2 a 70-turn coil on a 3-in. former may be employed, or alternatively a Lissen 60 X coil, the tapping point on the X coil being used for connection to the aerial.

The Acceptor Trap

We now have to consider the next type of circuit, which is the acceptor circuit. An example of this circuit is shown in Fig. 8. Here it will be seen that a coil L_2 and Condenser C_2 are connected in series across the aerial and earth. If L_2C_2 is tuned to the frequency of the unwanted station this arrangement will form a low-resistance path across the tuned circuit L_1C_1. The circuit L_2C_2 will have a comparatively high impedance to any other frequency so that the required signals will tend to go through L_1C_1 as required.

Undesirable Effects

This type of circuit, however, as shown, is not satisfactory. For one thing the tuning of C_2 has considerable effect on the tuning of the set and

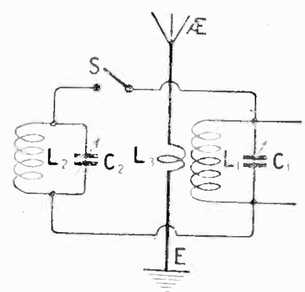


Fig. 11.—A parallel rejector is very effective with a tight-coupled aerial.

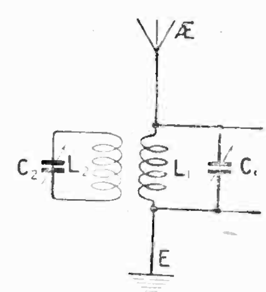


Fig. 12.—The absorption trap as shown here gives good results.

vice versa. Secondly, the tuning is not very sharp, and the signal strength with the trap in place is not as good as without it. Moreover, it is usually found that subsidiary tuning points are obtained which may coincide with the very frequency which it is desired to receive. These effects are due to the fact previously mentioned that the trap is really part of a complex system of inductances and capacities and the arrangement must be considered as a whole.

Tight-Coupled Aerials

Very much better results are obtained by using this trap when a tight-coupled aerial is employed, such as is shown in Fig. 9. Here owing to the removal of the tuned circuit $L_1 C_1$ from the aerial circuit, the energy simply being transferred via the small coupling coil L_3, it is found that the tuning of the acceptor trap is very much better and quite good results can be obtained. The tuning of C_1 and C_2 is largely independent.

Fig. 10 shows a circuit employing a series acceptor circuit with an auto-coupled aerial. This arrangement is satisfactory, but not so good as that shown in Fig. 9.

Rejector Circuits with Tight-coupled Aerials

The parallel rejector may be used very effectively in case of a tight-coupled aerial. Such a circuit is shown in Fig. 11. As previously stated the trap circuit $L_2 C_2$ requires to be tuned to the frequency of the wanted station and must be altered for any variation in the tune of the set, but in this circuit the sharpening of tune is particularly marked. C_2 should be at least ·001 μF and L_2 proportionately smaller, depending upon the frequency being received.

The Absorption Trap

The last type of trap is the absorption type. This type is in many ways the most satisfactory, its primary advantage being that the effect upon the whole aerial circuit is less than with any other form of trap. The resonance curves of this type of circuit are almost perfectly regular and there are no subsidiary effects such as are obtained with almost every other kind of trap.

Damping Necessary

This type of trap, however, differs from the others considered in one rather important particular. The circuit $L_2 C_2$ is tuned to the interfering signal and is designed to absorb energy from the receiving circuit itself at the particular undesired frequency. Now in order to do this it must have a certain amount of damping. On the other hand, the less the damping the sharper the tune. Consequently a compromise must be adopted, a fairly sharp tune being employed with a fairly efficient absorption. The effect is that the actual tuning of the arrangement is not quite as sharp as can be obtained with some other arrangements, but this difficulty causes little trouble in practice. For this type of circuit L_2 can conveniently be an ordinary 75 plug-in coil and C_2 a ·0003 μF condenser.

Weak Coupling

The coupling between the coils L_1 and L_2 should be kept exceedingly weak, as otherwise the trap circuit absorbs energy at frequencies other than that of the interfering station, *i.e.*, the wanted signals are also reduced. The coupling should be made as weak as possible therefore, the best position being found by trial. It has sometimes been found that best results are obtained in positions where the coils do not appear to be coupled at all.

Recommended Types

These are a few of the various types of trap circuit which may be employed. The recommended ones are the types shown in Figs. 5 or 7 for tuned aerial working, while Fig. 12 is a good third. For tightly coupled aerial work the circuit shown in Fig. 9 is probably the most satisfactory. Various modifications will suggest themselves to readers, but the remarks which have been made at the beginning of this article indicate that the operation of a wave trap is not as simple as it would appear at first sight, and that the tuning of the whole of the aerial circuit must be taken into account.

A Frame Aerial Cabinet Set

(Concluded from page 441.)

The Frame Aerial

The frame aerial is wound upon the back of the cabinet, which is detachable for the purpose. Diagonals are drawn across the inside of this back, and small brass screws are driven in at suitable intervals, their heads being left projecting slightly. Under the heads the turns of the winding are held, the net result being seen in one of the photographs and Fig. 3.

The number of turns on the frame will depend upon the station which is to be received, and this is best ascertained by simple trial and error, aiming at such a number that the station is tuned in at only about 20 to 30 degrees of the frame condenser.

The interval between the screws should be half an inch, and fifteen turns should be adopted for the first trial for a station between 875 k.c. (350 metres) and 750 k.c. (400 metres), and twenty for one between 750 k.c. (400 metres) and 600 k.c. (500 metres), turns being added or subtracted as required until the desired condition is achieved. For a relay station, try twelve turns, and space the screws ¾ of an inch. In each case make the outer turn as large as possible, and work inwards, securing the ends by gripping them under small blocks of wood or ebonite.

Daventry

No provision was made in the original set for receiving Daventry, but this station is easily obtained is desired with the aid of an outside aerial of small size, or a good indoor aerial. Place a single coil socket inside the battery compartment, with a pair of flexible leads which can be brought up and connected to the terminals A and earth instead of the leads from the frame. Insert a No. 150 coil, or its equivalent, in the socket, use suitable plug-in transformers, and attach aerial and earth to the pair of terminals mentioned above.

Valves

To obtain good results, the two H.F. valves should not be of a type which oscillates extremely readily; *i.e.*, do not use one of the quarter-ampere power valves which are suitable for some types of H.F. amplifying circuits. Practically, any general purpose valve, bright or dull emitting, will work satisfactorily.

For the first L.F. valve a D.E.5B or D.E.3B type was found preferable, while the last valve should be of the small power type.

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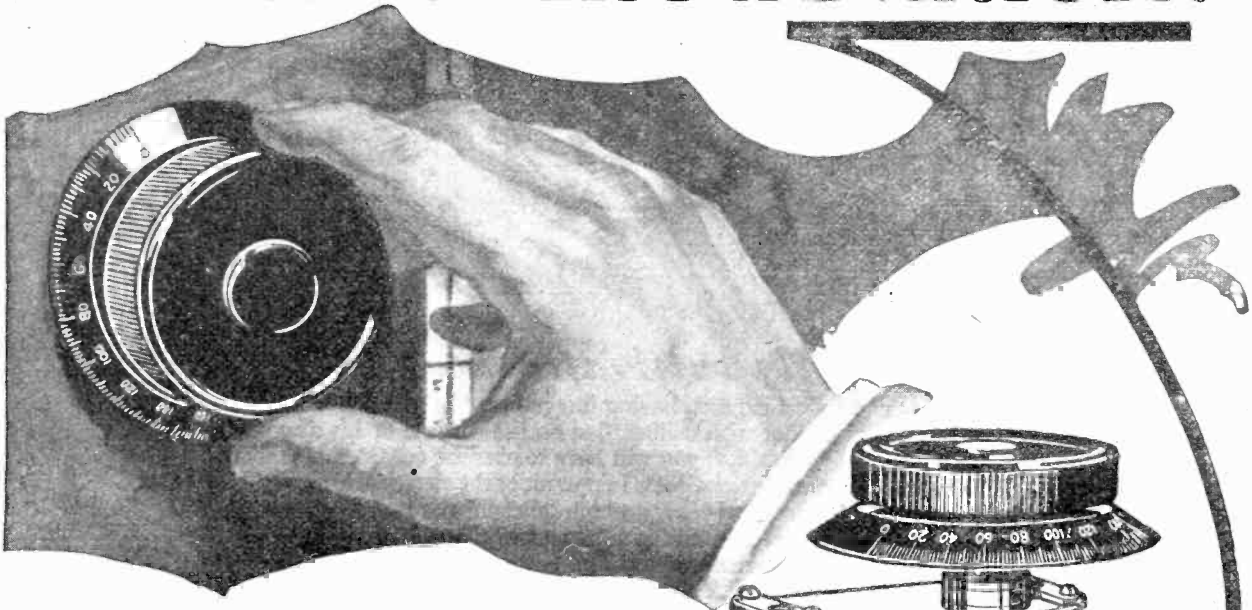

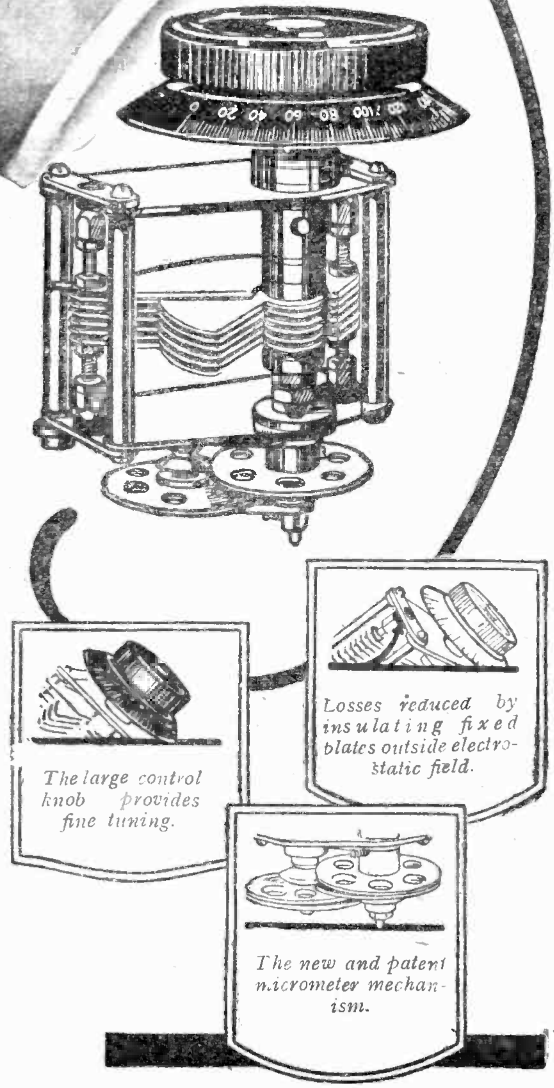

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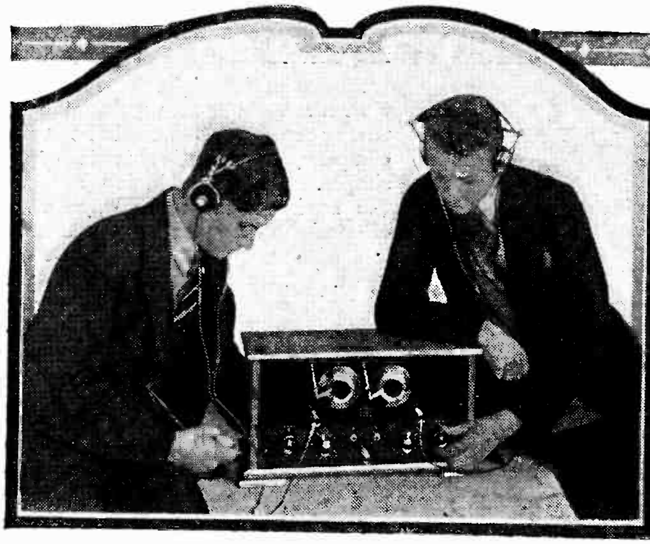


Simultaneous Reception of Two Stations

By
THE RADIO PRESS
LABORATORY STAFF

This receiver is designed to receive both the local and Daventry stations simultaneously. The circuit was originally suggested by Mr. John Scott-Taggart, F.Inst.P., A.M.I.E.E., and has been developed at the Elstree Laboratories.

It often happens when a wireless set is in general use that one member of the family wishes to listen to the local station, while another would prefer to receive an alternative programme from 5XX. It is not very difficult to design either a crystal or valve circuit to receive both stations at the same time, and thus to satisfy both parties.

Various circuits may be employed, but the majority of these suffer from serious disadvantages. A really satisfactory circuit must enable both stations to be received without any trace of mutual interference, while the tuning of each must be entirely independent of that of the other.

A number of circuits were tried out at our Elstree laboratories in an endeavour to find the most satisfactory.

The circuit shown in Fig. 2 was tried out first. Both stations could be received without mutual interference, although the tuning adjustments were not independent. The alteration of tuning of one circuit, as the condenser of the other was rotated, became less as the aerial coupling was loosened. It was, however, found impossible to make the tuning quite independent, and the use of reaction complicated matters considerably.

It was therefore decided to discontinue experiments on this circuit and to try a paralled tuned arrangement as in Fig. 1. It will be seen at once that this circuit has considerable theoretical advantages over the other two. Thus a choke is provided on the long wave side to prevent the short waves passing, while a small .0001 μF. condenser on the short wave side provides a much higher impedance to the low frequency than to the high frequency which it is desired to pass.

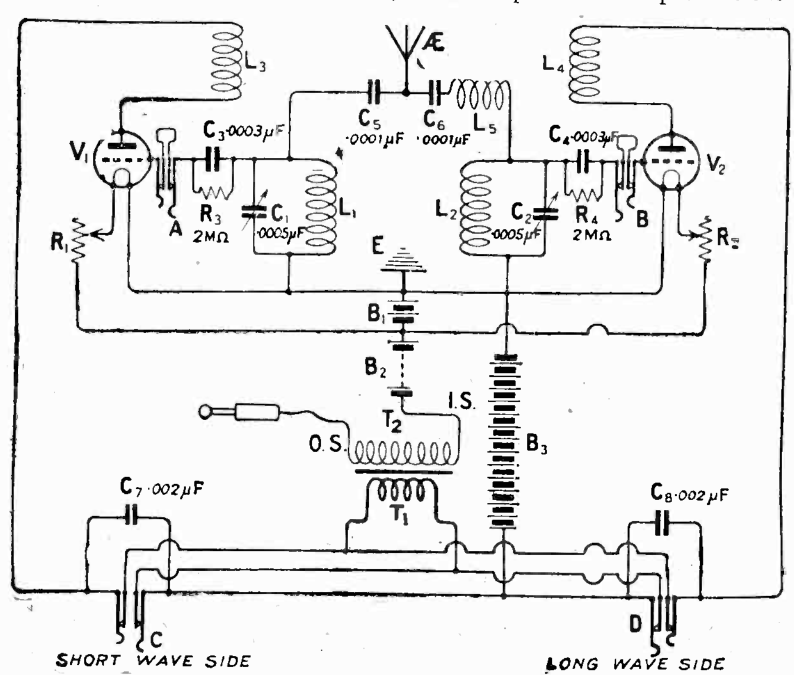


Fig. 1.—The circuit of the receiver is arranged so that if only one station is being received the other valve may be used as a note magnifier.

Effect on Tuning

When first tried out, this circuit suffered from the serious drawback that if an adequate choke was employed on the long wave side, e.g., a No. 200, then it was only possible to tap the valve circuit across a No. 75. This was found to weaken signals very considerably, and slight interference took place between the two circuits. Both these faults were remedied by placing a .0001 μF condenser in series with the choke L_5. It was then found that there was no interference between the two sides of the

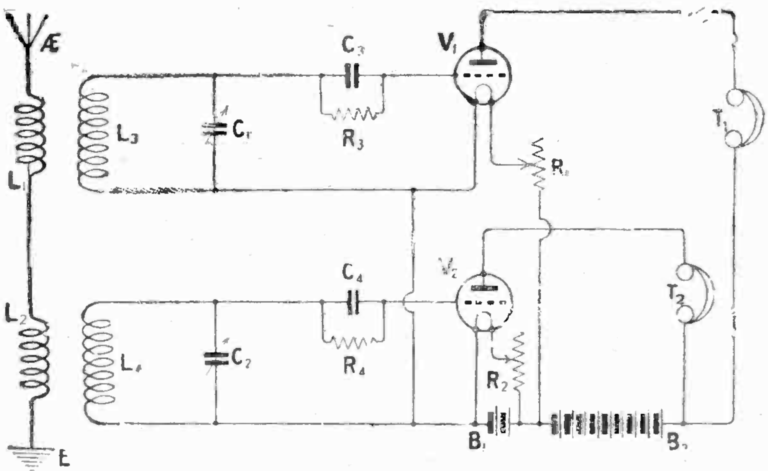


Fig. 2.—The first circuit tried employed a series arrangement.

Daventry on a detector and note magnifier.

Although it might be imagined that a switching arrangement with these capabilities would be very complex, in practice it is quite simple. The terminals are at the back of the receiver, so that all unsightly connecting wires and batteries may be kept out of sight. The plugs employed are those in everyday use, the jacks being of the kind known as double-circuit telephone jacks.

Switching Arrangements

In the case of jacks A and D the inner strips are connected to the primary of the transformer while the outer ones go respectively to the reaction coil and to the H.T.

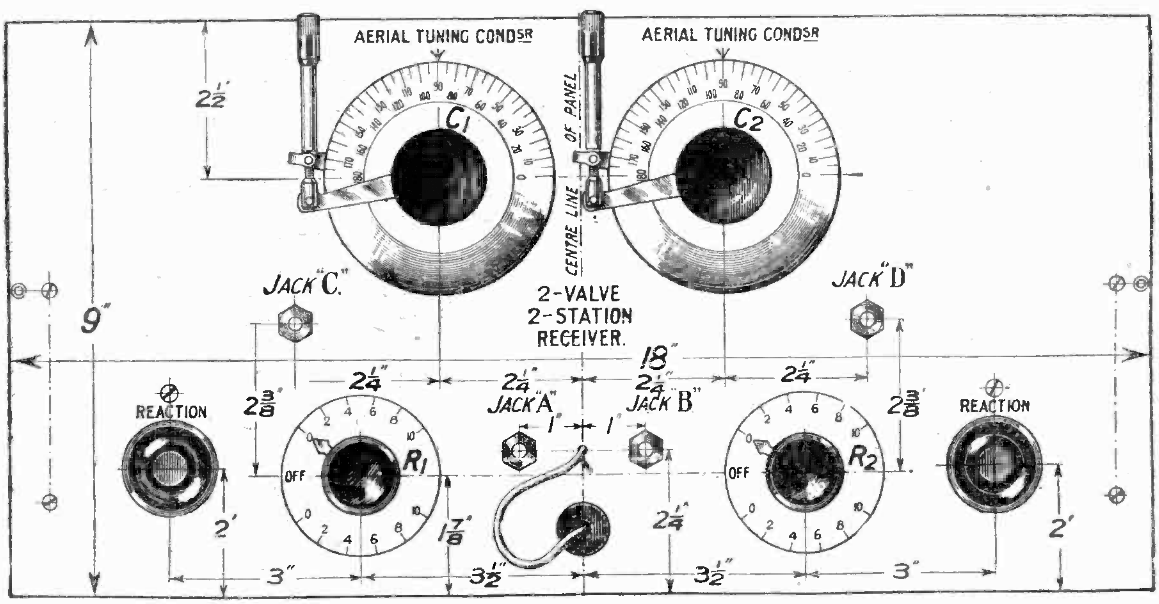
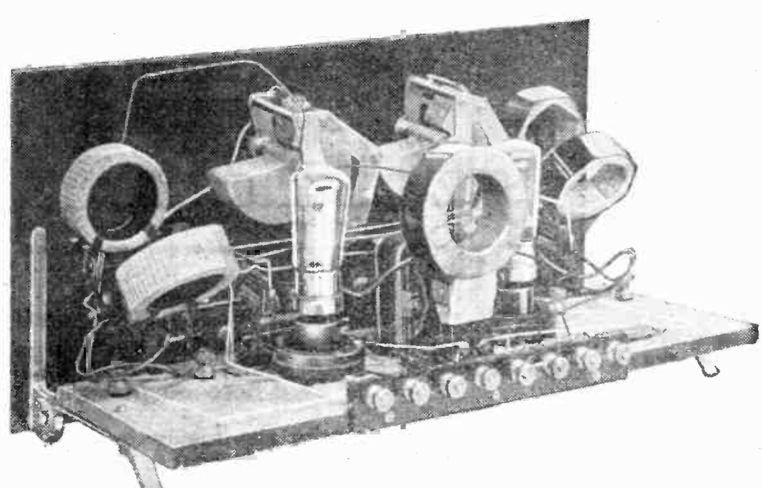


Fig. 3.—The panel layout may be obtained from this diagram. A blue print may be obtained on application, No. 143a, price 1s. 6d., post free.

circuit, and that the tuning of one side in no way affected that of the other. In other words, the two halves of the circuit behaved as if they were connected to two separate aerials between which there was no mutual interference.

Low Frequency Amplification

The two-valve set to be described is based on the circuit in Fig. 1, but has the additional advantage that when only one station is being received the other valve can be used as a low frequency amplifier to provide loud-speaker reception. An ingenious switching arrangement provides for using either valve as a detector alone, for using both valves for duplex reception on long and short waves respectively, and for receiving the local station or


The two sets of tuning coils, one for each station, can be seen at either end of the receiver.

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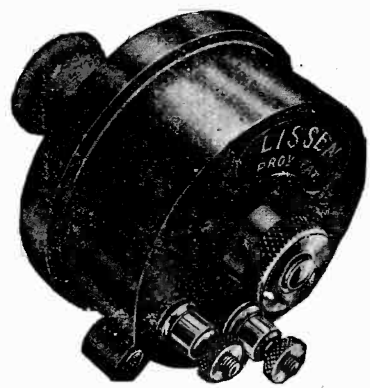

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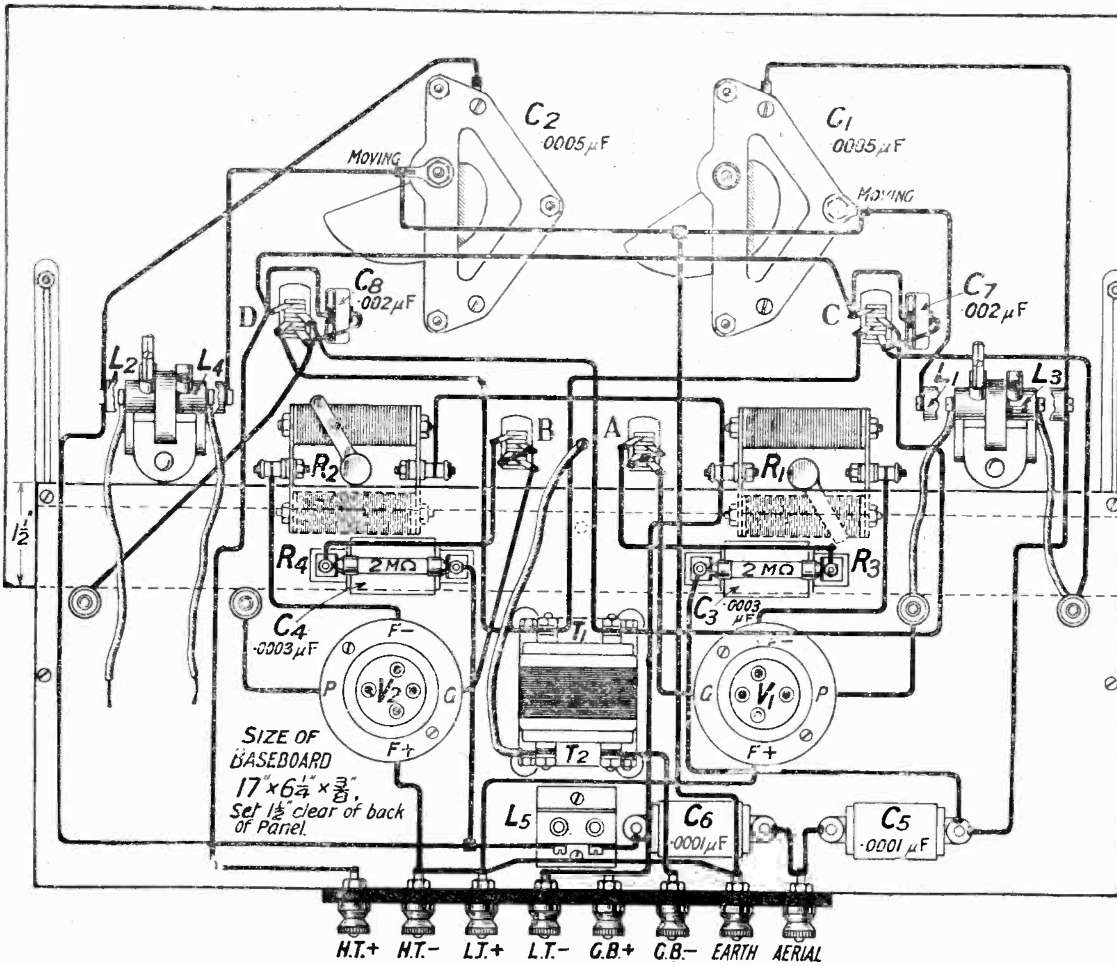


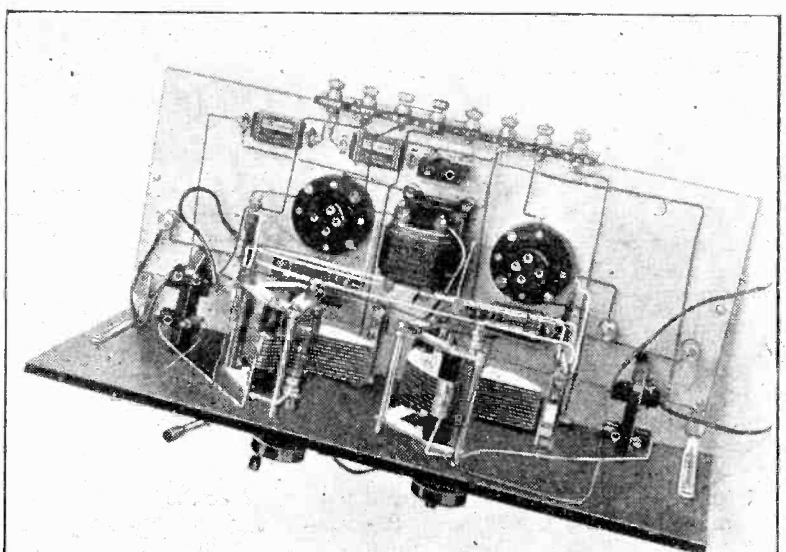
Fig. 4.—The wiring can be seen from this figure, but wiring up will probably be facilitated by the use of blue print No. 143b. Price 1s. 6d., post free.

battery. When the plug is inserted the primary of the transformer is disconnected from the valve in the same circuit as the jack, and the telephones or loud-speaker take its place.

To receive the local station a telephone plug should be plugged into A, while for Daventry it should be plugged into D. By plugging into both at the same time both London and Daventry can be received. For loud-speaker reception on short waves the valve which previously functioned as a long wave detector is now employed as a note magnifier. For this purpose the telephone plug must be withdrawn from A, and the plug shown connected to the secondary of the transformer plugged in at C. A loud-speaker plug should of course be substituted for the telephone plug in D. Finally, Daventry can be obtained on the loud-speaker by putting the loud-speaker plug in the jack A and the transformer plug in B. In the actual receiver A and B are placed one side of the panel, while C and D are on the other. This makes it easier to memorise the various arrangements, since for loud-speaker work the plugs in use are always on the same side.

Components

The constructional work of this set is quite simple, and no difficulties should be encountered. It



This view shows the wiring very clearly.

is desirable, however, to mount and wire the panel components first. The components listed below were found to give good results, but other makes could probably be employed with equal satisfaction.

One ebonite panel, 18 in. by 9 in. by ¼ in. (Peto Scott Co., Ltd.)

One ebonite panel, 1½ in. by 8 in. by ¼ in. (Peto Scott Co., Ltd.)

Two ·0005 μF variable condensers (Victoria Electric Co.).

Two two-way coil holders (Goswell Eng. Co.).

Two ·0001 μF fixed condensers (Igranic Freshman).

Two ·0003 μF fixed condensers (Igranic Freshman).

Two ·001 μF fixed condensers (Igranic Freshman).

Two two-megohm leaks (Mullard).

Two valve holders (Radio Instruments, non-microphonic).

Two filament resistances, dual type (Radio Instruments).

One first stage L.F. transformer (B.T.H.).

Four plugs and jacks (Ashley Radio).

Twelve terminals.

Four ebonite bushes.

Two pieces ebonite to mount grid leak.

Four grid leak clips.

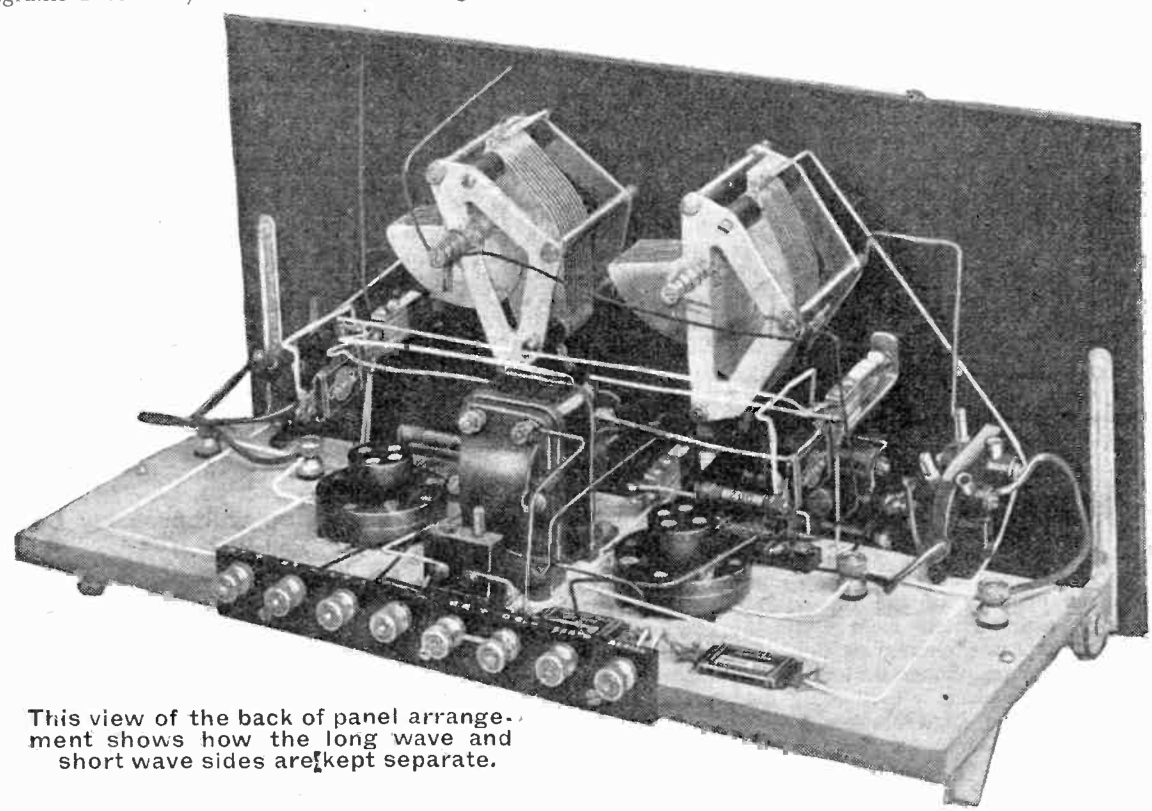
One cabinet, 18 in. by 9 in.

One baseboard, 17 in. by 6 in.

Two panel brackets (Formo).

Valves to Use

It is preferable to use two similar valves, which may be either general purpose valves or small power valves. If the latter are employed, then rather smaller reaction coils are desirable. The coils given are intended to be used in conjunction with general purpose valves. Owing to the presence of the ·0001 μF condensers which act as constant aerial tuning condensers, the size of coils to employ is practically independent of aerial characteristics, so that the coils mentioned below can be employed on any aerial. On the short wave side No. 50 coils should be used for both tuning and reaction purposes, while for long waves a No. 150 coil should be employed on the choke socket, a No. 250 for tuning, and a No. 200 for reaction.



This view of the back of panel arrangement shows how the long wave and short wave sides are kept separate.

Operation of Receiver

To operate the receiver, first tune in the short wave station. For this purpose plug a pair of telephones into the jack A, and turn on the rheostat on the left. Then rotate the left-hand condenser knob until the local station is heard. This may then be brought up to the desired strength by the use of reaction. It will be noticed that all the controls for the local station are on the left, while those for Daventry are placed on the right-hand side of the panel. Another telephone plug should now be inserted in D. Daventry may then be tuned in, and brought up to full strength by means of reaction as in the case of the local station. It will be found that this will have caused no difference whatever to the setting of the latter.

We are now in a position to obtain either station on the loud-speaker by employing either of the other two combinations. By inserting the transformer plug at C and a loud-speaker plug at D we can listen to the local station, while by employing the jacks B and A respectively Daventry can be obtained.

Test Report

The receiver was tested out on an average aerial at our Elstree laboratories. Good telephone strength was obtained simultaneously from London and from Daventry. Altering the tuning or reaction on one station made no detectable difference to the other.

Even when one side was made to oscillate the other side was not affected, except when a harmonic was heterodyned. When the detector and low frequency combinations were employed good loud-speaker strength was obtained from both London and Daventry. With small power valves (D.E.5's) moderate to weak loud-speaker strength was received simultaneously from London and Daventry.

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TYPE D.E.3. Filament Volts 2·8. Filament Amps. 0·06. Anode Volts 20-80. Impedance (ohms) 22,000. Amplification Factor 7. PRICE 16/6

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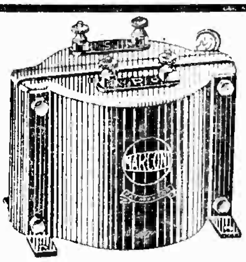

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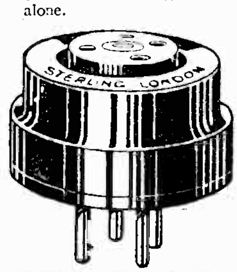

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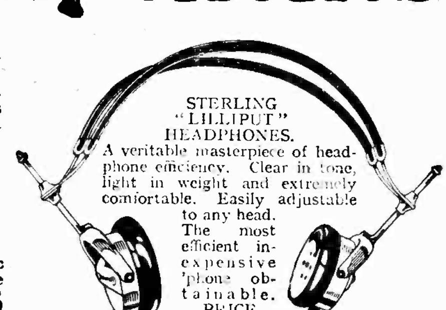

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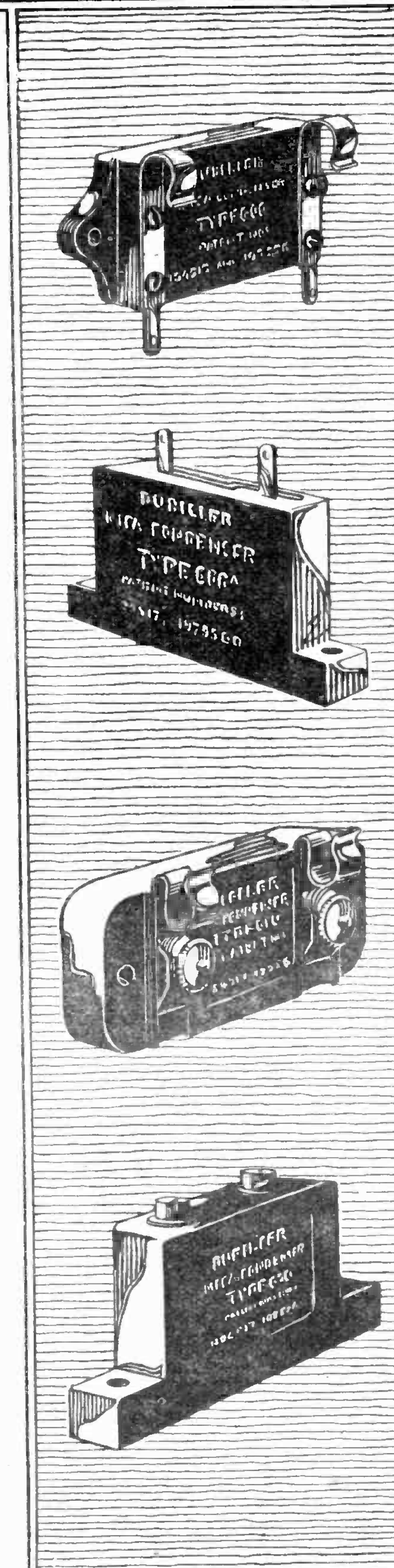

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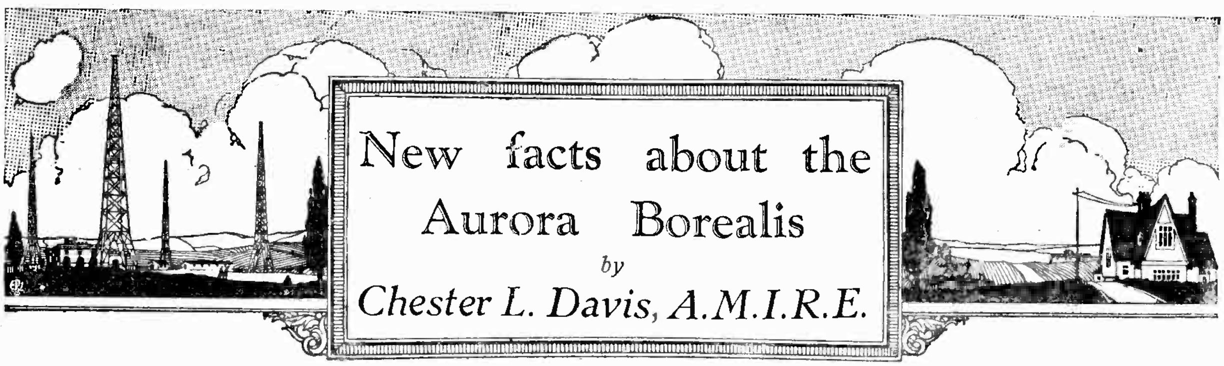


New facts about the Aurora Borealis

by

Chester L. Davis, A.M.I.R.E.

How many people realise that the Northern Lights produce an alternating voltage in receiving aerials? This article, which describes some tests carried out in America, provides much food for thought.

MANY people are familiar with the phenomena of the Northern Lights. Probably most people know less about the Aurora Borealis than they do about the sun, moon and stars. In fact, most people know nothing about it, other than the fact that they are aware of the sky's being of a peculiar hue. It is very much regretted that the Aurora Boreal's is not present in this country for any great length of time.

The experiments herein described and observations given seem to prove that the Aurora Borealis produces an alternating voltage on receiving aerials. This alternating voltage is of a frequency lower than any that is used in the commercial world. It was found that it required 15 minutes for the voltage to travel from maximum reading on one-half of the cycle to maximum reading of opposite polarity. During the tests the maximum voltage observed with the apparatus employed was 28 volts. This value was not constant. The experiments as they were conducted will be described in the order that they were performed.

The sky was streaked with light. Sometimes the light would flash and often would change its position in the sky. Telegraphs, telephones and wireless stations were troubled with paralysation of their instruments. The first experiment was conducted on my radio receiver. A voltmeter was connected to the antenna and ground, but no reading was obtained. The antenna in use was 80 ft. in length. After this test, an ordinary 25-watt lamp bulb was connected to the antenna and ground connections. No effect was noticed. The third experiment was the same, excepting that a flashlight bulb replaced the larger one, but nothing happened. The next experiment was the one which disclosed some remarkable facts about the nature of the Aurora Borealis. A full description of all apparatus used in this experiment will first be given.

The Voltage Test

The apparatus used in this experiment was a telephone testing board and a cross-country telephone line. The testing board was one constructed of Western Electric apparatus of a standard pattern. The apparatus on this board were a Jewell D.C. voltmeter scale 0.30, polarity reversing switch and other switches necessary to obtain a reading of the voltmeter. The telephone line used was the one with which we obtained the highest voltage reading. This telephone circuit was of the ground return type. On it were 14 bridging telephones, each having a resistance of 1,600 ohms between the metallic and ground circuits.

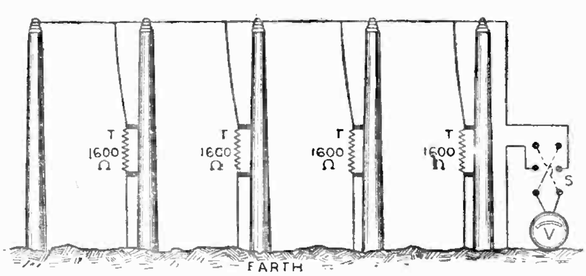


Fig. 1.—Experiments were made with an elevated conductor of this description to find the voltage produced by the Aurora effect.

The circuit used in making the test is shown in Fig. 1. The telephone testing switchboard was connected to one of the lines on which the interference was most noticeable and annunciator drops on the switchboard were falling, as though someone were ringing the operator. When the line was connected to the testing board and the voltmeter switch thrown, the voltmeter needle rose slowly. I continued to watch it rise until it had reached a reading of 28 volts. It remained at this value for no length of time, but began to slowly fall to zero. I waited patiently for a considerable time, all the while wishing that the voltage would return. After waiting for nearly 15 minutes the needle again began to rise. After the needle had returned to zero once more, and a period of 15 minutes had elapsed, the needle performed as before. It was the regular reading of the voltmeter and the regular occurrence of the waiting of 15 minutes that suggested to me the idea that probably the voltage was of an alternating polarity. Anyway, that would explain what was taking place during the 15 minutes of waiting. A polarity reversing switch was employed to reverse the polarity of the voltmeter and the voltage was found to duplicate the performance. Whenever the voltmeter needle fell to zero the polarity on the voltmeter was reversed and reading on each half of the cycle was obtained in this manner. The experiment suggested to me the simplest apparatus to illustrate an alternating voltage.

Only one characteristic was obtained in regard to the amperage. A simple electric door-bell was connected, as was a small lamp bulb, to the circuit, but no indications of voltage were noted by the bell and lamp test. Other than the fact that there was sufficient amperage to cause the relays on the telephone switchboard to work, I discovered nothing about the amperage developed.

An Explanation

The theory I have advanced regarding the phenomenon is as follows :—

Let us suppose the earth to be negatively charged. This is recognised by scientists, since the electrons are of negative polarity. Now suppose the atoms of the world are caused to throw off these electrons into the space in which the earth revolves. These free electrons will be attracted by the atmospheric layer where they are needed to complete the quota of electrons which are missing. This would give the earth a lower negative polarity and the negative polarity of the atmosphere would be increased. Since the atoms which lose their electrons are of positive polarity, because of their nuclei, there would be a potential difference. If we consider the earth to be one plate of a condenser and the atmospheric layer the other plate, we may say that the condenser is building up and discharging its voltage of one polarity and then charging and discharging the opposite polarity. This would be a simple oscillating circuit and the frequency was found to be very low.

Owing to the fact that in some parts of the country the Aurora Borealis is barely visible, uniform voltage would not be found. I noticed that when the sky began to darken again the voltage was not so great, and when the hue in the sky had vanished the voltage reading was zero. The change in the position of the streaks of light in the sky explains the various voltage readings I received. Even when the voltage was barely noticeable the frequency of oscillation was not varied in the least.

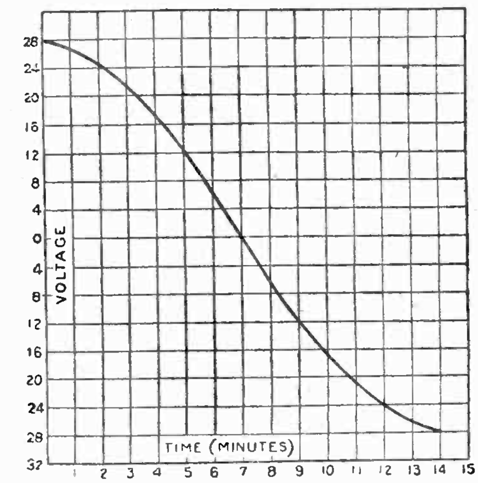
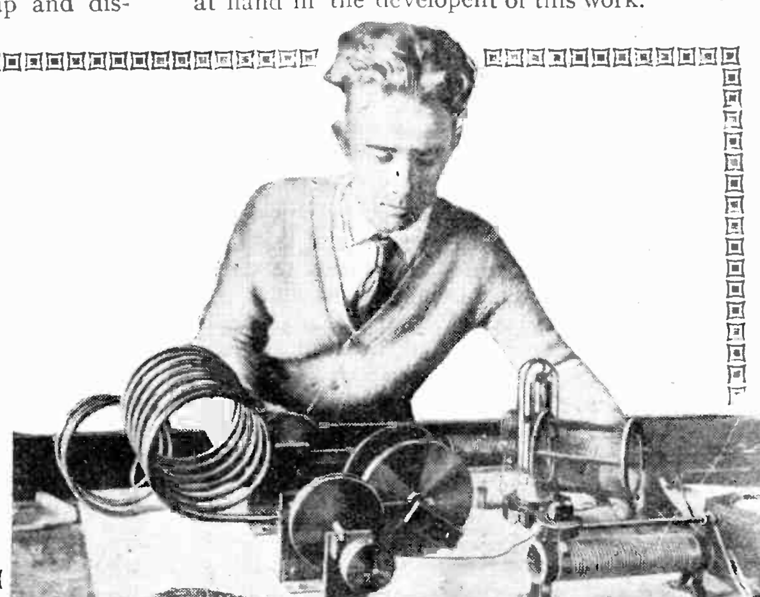


Fig. 2.—The voltage fell from maximum to zero in 15 minutes the variations being approximately sinusoidal in character.

An Oscillating System

It is evident that when the Aurora Borealis is not present the earth and the atmospheric layer each have their proper number of electrons and there is no potential difference present. But when the earth is caused to throw off those electrons and is in a state of oscillation with some other body, a potential difference exists until the two bodies resume their proper charges and a state of rest occurs. These experiments were conducted during the last appearance of the Aurora Borealis in this vicinity, in the year 1919. There is, at present, much discussion on the utilisation of atomic energy. Recent developments have also shown that the Aurora may take some part in the electrification of the upper atmosphere which is responsible for so many of the curious phenomena obtained in wireless, and I hope that these experiments will add to the data already at hand in the developent of this work.

Interesting developments are anticipated from the experiments of Mr. W. W. Salisbury, who is perfecting a system of secret communication using very high frequencies. He hopes to be able to direct signals to a given spot within a few miles either way. This photograph shows Mr. Salisbury with his apparatus.



Warning.

IN THE HIGH COURT OF JUSTICE, CHANCERY DIVISION.

BROWN BROTHERS, Ltd.

PLAINTIFFS,

AND

THOMAS WILLIAM BELL and ALFRED PUGH

DEFENDANTS.

On the 4th November, 1925, Mr. Justice Romer on the application of Brown Brothers, Limited, of Browns Buildings, Great Eastern Street, London, and elsewhere, Wholesale Motor Aircraft Cycle Tool and Radio Manufacturers and Merchants, granted an injunction against Thomas William Bell and Alfred Pugh, of 117, Adelaide Road and 43, Renshaw Street, Liverpool, restraining them from carrying on under the name of Brown Brothers or any similar name or any name of which such words form part any business of a similar nature to any business carried on by Brown Brothers, Limited, and from using the name of Brown Brothers or any similar name or any name of which such words form part calculated to lead to the erroneous belief that the business of the said Thomas William Bell and Alfred Pugh is or is in any way connected with the business of Brown Brothers, Limited.

It was also ordered that the said Thomas William Bell and Alfred Pugh should pay to Brown Brothers, Limited, their costs of the action.

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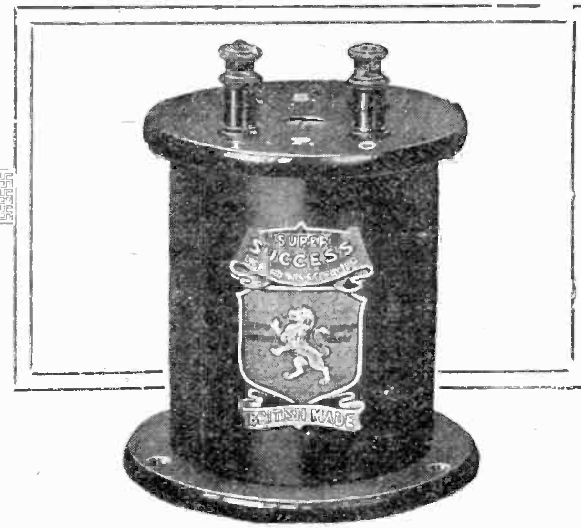

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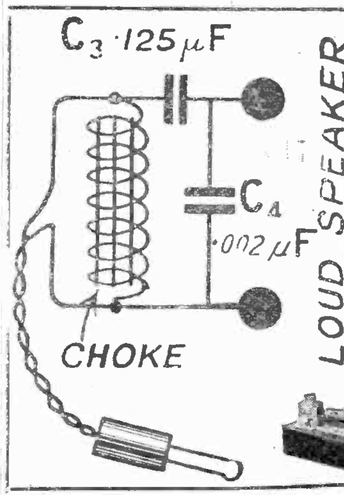

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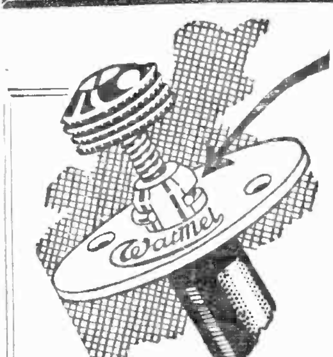

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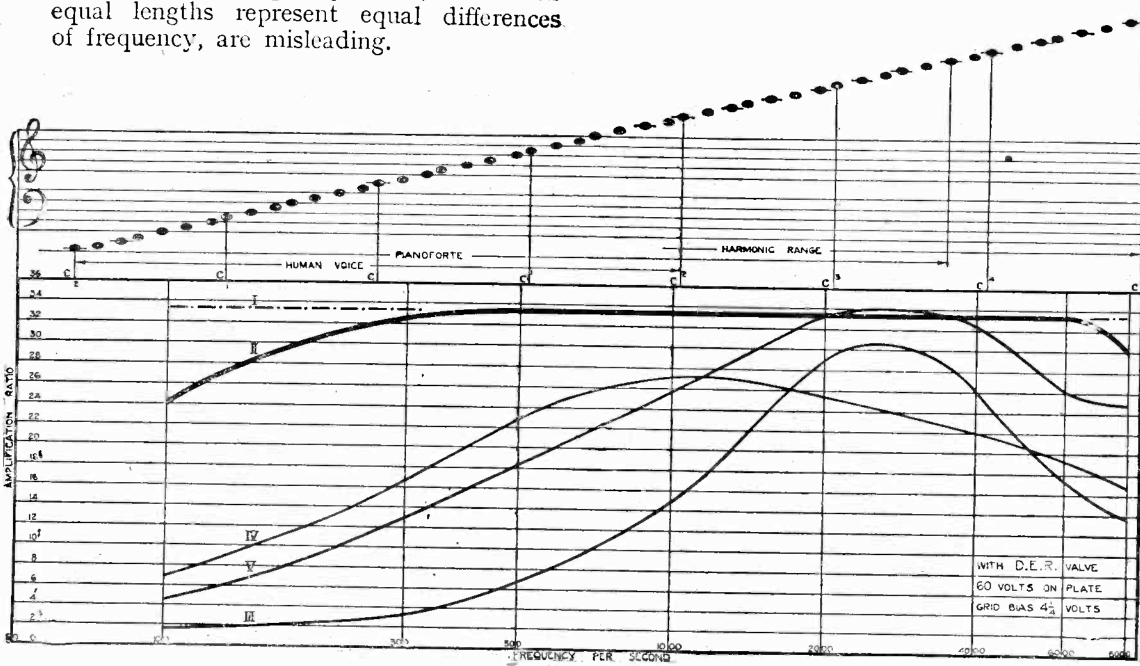

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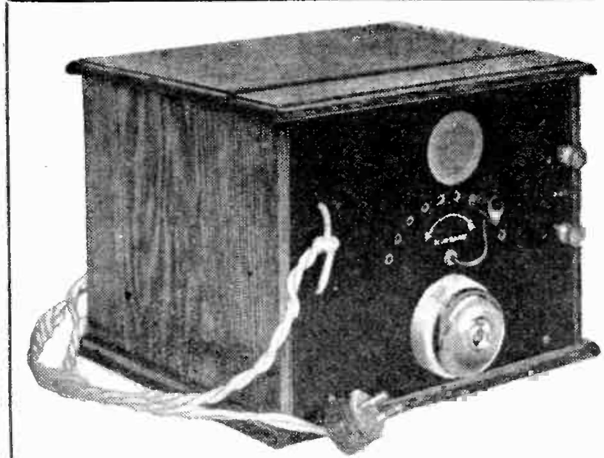


A Simple Unit for Obtaining H.T. from 220 volt D.C. Mains

Constructional details of the smoothing unit described in our last issue

THE unit described below is capable of delivering 20 or 30 milliamps from 220 volt mains for indefinite periods, without any noise being experienced. A further advantage of this unit is the entire impossibility of fusing any valves in the receiving set, as the unit can pass no more current than is passed from filament to anode of the smoothing valve employed. The primary purpose of this valve is to smooth the ripple that is present in nearly all mains (caused by the generators employed at the power stations).

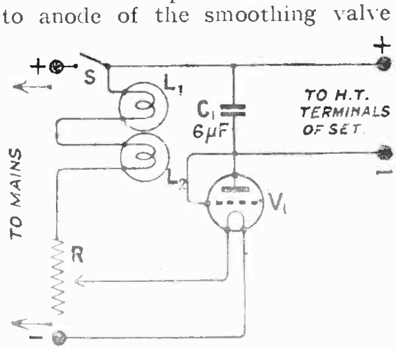


Fig. 1.—The circuit of the smoothing device.

Valves To Use

The smoothing valve employed in this unit is of the .25 ampere small power valve type, such as the Marconi DE5, BTH B4, Mullard DFA1, or the Burndept L525. On no account must a valve with a filament current of lower value be used, as there is a risk of fusing the filament. Again, valves which require larger filament current would probably not give sufficient emission under these conditions.

The Circuit

The circuit employed is shown in Fig. 1. From this it will be seen that the valve is used as a two-electrode valve by connecting the anode and the grid together, and in this way a larger current is passed. The filament of the smoothing valve is lighted from the mains by placing it in series with the lamps L_1 and L_2 and the resistance R. The lamps employed in this unit are two 220 volt 60 watt ordinary metal filament lamps in series, and the resistance R is tapped, the total resistance of R being 190 ohms. It is important that these lamps should be used, as otherwise the valve may be damaged.

Condenser in the Earth Lead

The condenser C_1 consists of three Mansbridge type 2 μF condensers in parallel, and is employed as a reservoir condenser across the output of the unit. The rest of the circuit is quite clear from the accompanying diagrams. Care must be taken, however, to put a small condenser of about .0003 μF in series with the earth lead and the set as in Fig. 4, otherwise the mains will probably be fed direct to the set without passing through the smoothing valve, as usually one or other pole of the mains is earthed.

Components Required

The components required are stated below. The manufacturer's name is given in each case, but similar good quality components may be used if desired.

1 Valve holder, of anti-vibratory pattern (Radio Instruments, Ltd).
1 Valve port (Aermonic).
1 Ebonite panel, 9 in. by 7 in. by $\frac{3}{16}$ in. (American Hard Rubber).
3 Mansbridge type condensers, 2 μF. (T.C.C.).

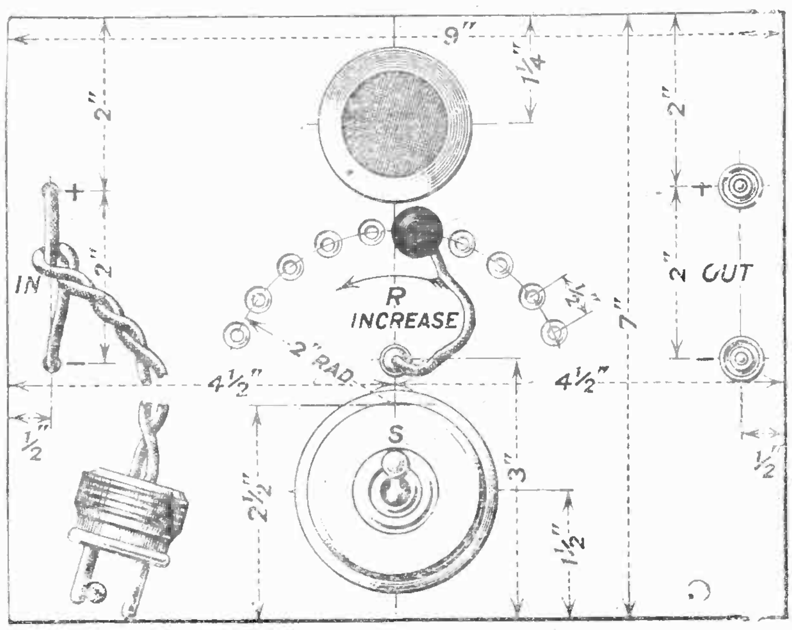


Fig. 2.—The layout of the panel is simple and can readily be followed.

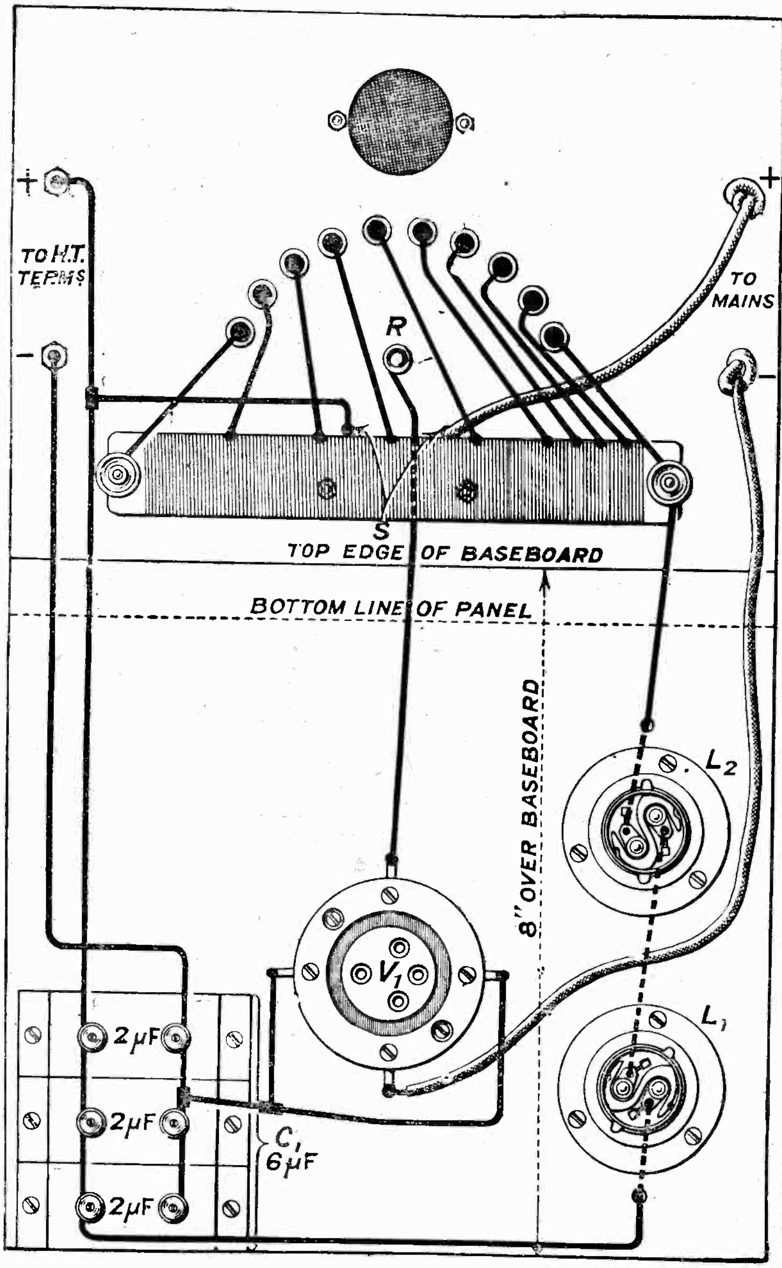


Fig. 3.—The wiring will readily be followed.

2 ordinary bayonet cap lamp holders (obtainable from any electrical stores).
11 Sockets (Clix).
1 Wander plug (Ever Ready).
1 ordinary type switch as employed in house lighting circuits. (This is also obtainable from any electrical stores.)
1 oz. 36 S.W.G. enamelled Eureka wire.
1 Strip 7 in. by 1 in. of slate, or an asbestos cement such as Poilite or Uralite. (Obtainable from any builders' merchants.)
2 Terminals.
1 Cabinet and baseboard, internal dimensions 9 in. by 7 in. by 8 in. (Carrington Manufacturing Co.)
1 Plug adapter (also obtainable from any electrical stores.)

Construction of the Unit

The first item to be attempted is the marking and drilling of the panel. The position of the holes to be drilled can be seen from the accompanying diagrams. (Note that the resistance we have employed is mounted in position by tapping the panel and screwing the shanks of the terminals on the resistance in, but it is not essential that it should be secured in this way, as it can be fixed by ordinary bolts through the panel. The holes for the sockets should be countersunk from the front of the panel in order to take their heads.

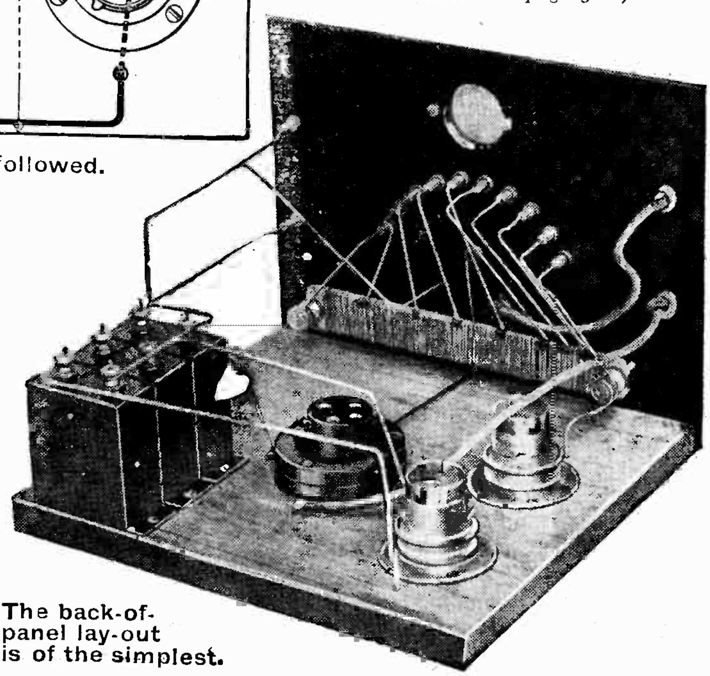
The Resistance

The resistance should now be constructed. This is done by taking the strip of Poilite (or, other suitable material) and drilling a hole at each end for the terminals, which should be secured in position. Now wind the 36 gauge Eureka wire on tightly, leaving a small space between each turn, until 190 turns are wound on. Secure the ends of the wire to the terminals at each end.

Now mount this and the other components on the panel, and commence tapping the resistance, starting from the right, tap the first 40 turns at every ten turns and take them to the first five Clix sockets. The remainder of the resistance is tapped at every 30 turns,and taken to the remaining five sockets. Both ends of the resistance come to the end sockets, numbers 1 and 10 respectively. The remainder of the components should now be mounted on the baseboard, and the panel screwed in position.

The wiring can now be completed from the accompanying diagrams

(*Continued on page* 526)



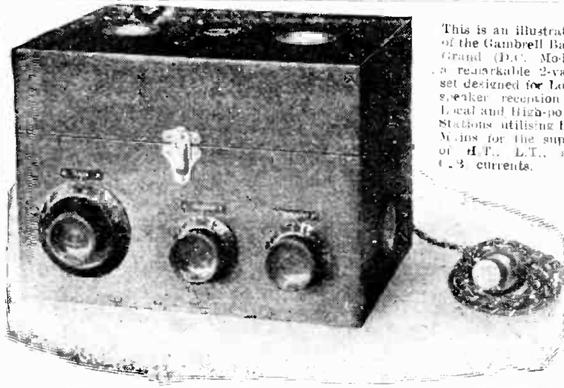
The back-of-panel lay-out is of the simplest.

NO BATTERIES OR ACCUMULATORS

Required with

THE GAMBRELL BABY-GRAND.

Price (which includes Valves, coils for 300/500 metres and Daventry, length of flex and adaptor) ... **£15 15 0**
Royalty **£1 5 0**



This is an illustration of the Gambrell Baby-Grand (D.C. Model), a remarkable 2-valve set designed for Loud-speaker reception of Local and High-power Stations utilising D.C. Mains for the supply of H.T., L.T., and G.B. currents.

Where D.C. Electric light mains are not available the ideal 2-Valve Set is **THE GAMBRELL BABY-TWO.**
Price, including coils (300/500 metres) ... **£6 15 0**
Royalty **£1 5 0**

Or complete with D.E. Valves, Batteries and Loud-speaker
£13 0 0

These two remarkable Receivers have the same circuit. NOTE the remarkable results which have been achieved by a purchase of a Baby-Two—

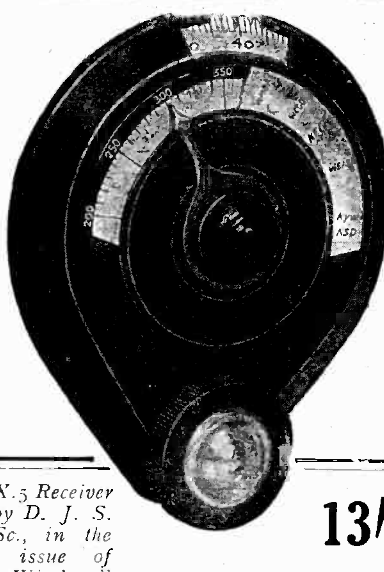
"With reference to the 'Baby-Two' Receiver which you recently supplied to me, you may be interested to hear that I obtained the following stations on the loud-speaker during tests on two consecutive evenings. All the French and German stations given were heard and could be easily distinguished outside the room in which the loud-speaker was placed. This was also the case with London, Bournemouth and Daventry, as well as the following stations :—
Birmingham, Newcastle, Belfast, Manchester ; Toulouse, Paris, Koenigswisterhansen, Madrid, Ecole-Superieure, Stuttgart, Breslau, Berlin."

For full particulars write to :—

GAMBRELL BROS., LTD. 76, VICTORIA STREET, LONDON, S.W.1.

'Phone: Victoria 9 38.

B.T. TUNING CONTROL



For the D.X.5 Receiver described by D. J. S. Hartt, B.Sc., in the December issue of "Modern Wireless."

13/6 each.

The B.T. Tuning Control is simple to mount, gives hair-line control and easy action. There is no side strain or pull on shaft to wear out bearings or destroy alignment of condensers.
Readings are from 0 to 100 to 0. This settles the argument as to clock-wise or anti-clockwise instruments. Registers dial numbers, wavelengths or call letters. Adaptable for 1/4 and 3/16 inch shaft condensers.

LIST PRICE 13/6 EACH.

THE ROTHERMEL RADIO CORPORATION OF GT. BRITAIN, Ltd. 24-26, Maddox Street, Regent Street, London, W.1.
Telephones: Mayfair 578 & 579. Telegrams: "Rothermel, Wesdo, London."

THIS WANDER PLUG TESTS YOUR BATTERY AND SAVES VALVES!

"SAVEIT"

Patent Safety Fuse and Wander Plug

(ORDER FIG. 828).

The fuse operates in the H.T. circuit, taking the place of an ordinary wander plug.

2/- EACH.

When attached to a lead the Safety Fuse operates as an efficient tester of your battery.

From all Dealers, or direct.

Two shillings spent on this wander plug may save you several valves. If the high tension voltage is accidentally connected across the valve filaments, the fuse burns out and the valve or valves remain unscathed. The only cost then is a 6d. replacement bulb instead of pounds for new valves. Is an efficient protection to bright or dull emitter type. Postage 2d. extra.

A. H. HUNT, LTD., (Dept. No. 5). H.A.H. Works, CROYDON, SURREY.

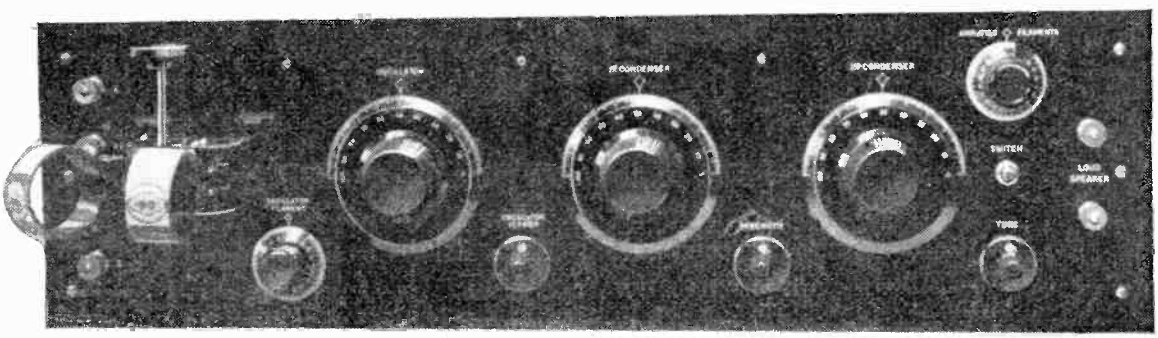
The Igranic Supersonic Heterodyne Receiver.

Test Report from the Radio Press Laboratories.

THE Igranic Electric Co. have submitted a complete Superheterodyne Receiver for test at the Radio Press Laboratories. This particular instrument had been constructed by the firm from the complete outfit of components which they supply.

Makers' Claims

The special oscillator and intermediate frequency coupling units possess an inherent stability which ensures perfect clarity of reception. The outfit is extremely flexible in use, as by employing three separate oscillator units it is possible to cover a range of wavelengths up to above 4,000 metres. By using the Igranic frame aerial, interference from signals transmitted on wavelengths approximating to that of the intermediate frequency amplifier is eliminated.



The Set is of pleasing appearance. Note the two high-frequency tuning condensers.

Description of Complete Set

The external dimensions of the set are, height 8 in., length 28¼ in., and depth 11 in., and the complete receiver is built up with units upon an earthed metal frame. The wiring is kept short and neat and should not be at all difficult for the constructor to carry out. There are two panels, the front one being spaced about 4½ in. from the rear one to allow the condensers to clear the other components, and also to give space for mounting the condensers at some distance away from the panel to avoid hand capacity. With this object in view there is a large earth shield between the oscillator condenser and the panel, and in addition the spindle of the condenser does not project through the panel, but the condenser dial is connected to the spindle by an ebonite sleeve. The combination of these precautions entirely eliminates hand capacity effects.

All the coils are made up in neat units which plug into sockets, while the oscillator unit contains a very small variable condenser operated by a wormscrew which projects from the casing. By means of this adjustment all radiation into the frame has been avoided.

The Frame Aerial

The Igranic frame aerial deserves special attention. Owing to the absence of short-wave high-frequency amplification, any long-wave signals picked up by the frame, especially those in tune with the intermediate frequency, would pass right through the receiver and interfere with the signal. To avoid this the frame is wound in two halves, one half being in opposition to the other.

One half only is tuned to the incoming signals, and since the second half is untuned it does not respond to the short waves, and is spaced sufficiently from the first half to avoid undesirable effects. Thus, owing to the fact that the intermediate frequency is widely different from that of the tuned half of the frame, the voltages produced by the long wave interfering signal across the two halves are equal and opposite. In this way no long-wave interference comes through to the set from the frame.

There is provision made for earth and aerial, which can either be used separately from the frame or in conjunction with it. The uni-directional effects of this combination are extremely useful for preventing interference.

Filter Units

The intermediate filter frequency is about 25 kilocycles (12,000 metres) enabling the set to function effectively as a superheterodyne up to a wavelength of 4,500 metres. There is a neutrodyning arrangement in each of these filter units which renders the intermediate frequency amplifier quite stable, thus obviating the necessity for potentiometer adjustment or any such method for controlling the tendency to oscillate. Long-wave reaction can be obtained, however, by means of a common variable resistance in the grid of the second and fourth valves, but in actual practice this was not found necessary.

Valves

The set is wired for six valves, the first being a D.E.5 acting as a combined oscillator, receiver and rectifier with a long-wave coil in its anode circuit, on the Tropadyne system. The next three valves are long-wave or intermediate frequency valves wired on the reactance-capacity system, D.E.5b valves being employed. The fifth valve, the long-wave rectifier, is also a D.E.5b, while the last, the note magnifier, is an L.S.5.

The one note magnifier valve was found to give quite sufficient strength for all the stations received. The set was noticeably free from distortion even on distant stations. A variable resistance is placed across the secondary of the low-frequency transformer and is called a tone control. This was very useful, as in most cases the strength of the signals was too great to be pleasant.

Controls

In normal use there are two adjustments to make on the set, the oscillator condenser and the frame or aerial condenser according to which is in use. If the frame and an outside aerial are used in combination, then all three adjustments must be made. Two filament controls are provided, one for the oscillator valve, and another for the remaining five valves.

The signals are delivered to the loud speaker through a transformer with an earthed core. This is to reduce the effect of long loud-speaker leads, which varies according to circumstances.

Other Components

One 200 volt battery was employed, tapped at 50 volts for the oscillator valve, 120 volts for the intermediate-frequency valve, and the 200 volts for the last note frequency valve. A 2 μF condenser is connected across the 120 volt section, and the H.T. minus and the L.T. minus are common to earth. There is provision for two grid bias batteries, $1\frac{1}{2}$ volts for the intermediate-frequency valves and about 18 volts or more for the low-frequency valves.

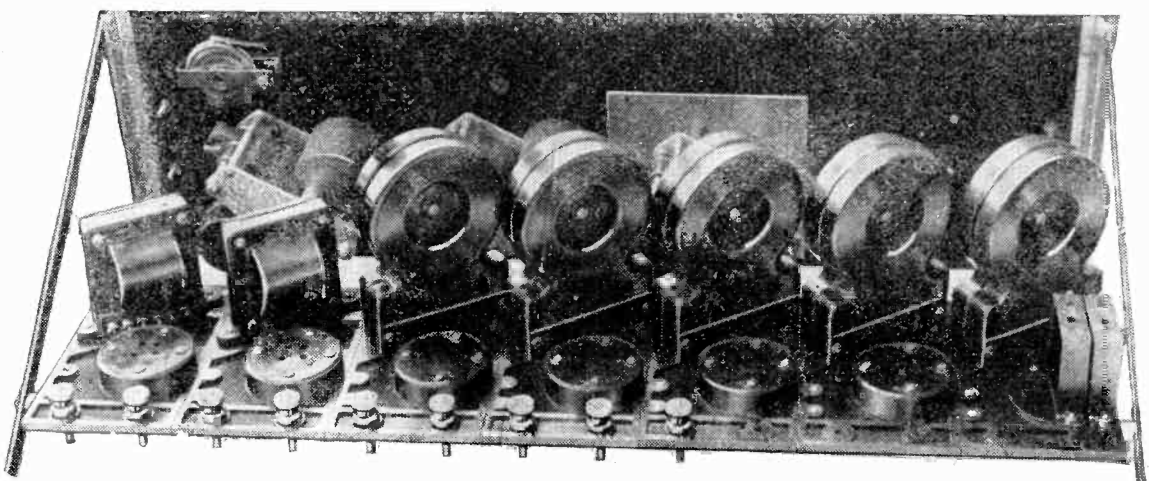
Laboratory Tests

The complete set was tested for general performance at the Radio Press Laboratories, 13 miles from 2LO, and also at a point in Earl's Court, about $2\frac{1}{2}$ miles from the same station. About thirty independent stations were logged in two hours, the only adjustments made during that time being the oscillator condenser and the frame condenser, together with the rotation of the frame. The long wave amplifier was not once made to oscillate, and the general stability was a very pleasing feature.

A good performance of the set was to receive Cardiff at very good loud speaker strength at Earls' Court while the London station was transmitting, without a trace of the signals from the latter station.

The long-wave reaction control did not increase signal strength, any increase in reaction producing a weaker signal until finally a note howl was produced. However, as this control was not needed it did not affect the working of the set.

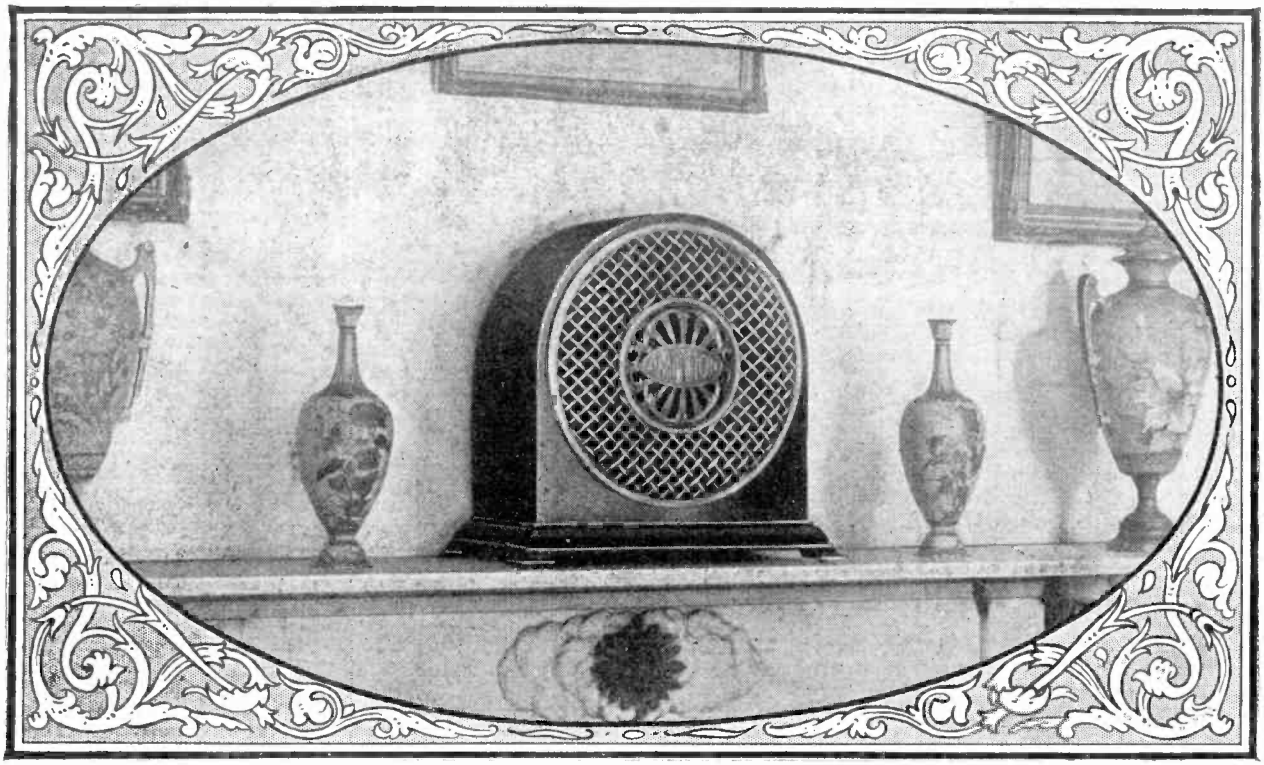
As can be judged from the photographs, the appearance of the finished set is particularly neat when the components are mounted according to instructions.



Special plug-in units are employed for the intermediate-frequency filters.

Catalogue Received.

We have received an interesting catalogue from Messrs. S. A. Cutters, Limited, of 18, Berners St., entitled "Salient Features for the Wireless Enthusiast." It contains useful hints and tips, information on valves, details of components and accessories for the principal Radio Press Sets. The price is 6d., which is refunded on the first purchase. It is proposed to issue the catalogue three times a year.



REDUCING TUNING CONTROLS

By J. H. REYNER, B.Sc.[Hons], A.C.G.I., D.I.C., A.M.I.E.E.

This article describes an ingenious arrangement whereby a two-circuit receiver may be tuned with only one condenser, thereby obtaining the increased selectivity of the two circuits without the additional complication.

IT is now universally recognised that in order to obtain adequate selectivity with a single valve receiver it is essential to employ more than one tuned circuit.

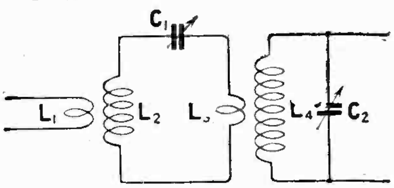


Fig. 1.—In the usual type of coupled circuit the energy is transferred from primary to secondary by means of a magnetic coupling, such as L_3 L_4

Various ways of doing this have been devised from time to time with very good results. Unfortunately, however, the introduction of the additional tune necessitates an extra control, and although in many cases the operation of tuning is not unduly complicated, the simplification of the control of a wireless receiver is always a desirable feature.

Magnetic Coupling

In the receiver to be described, a novel principle has been adopted in which it is possible to employ two tuned circuits with only one tuning control. The ordinary coupled circuit is of the form shown in Figs. 1 and 2. Here we have a primary circuit which is either loosely coupled or auto-tapped to a secondary circuit. The energy is transferred from one circuit to the next through the magnetic or direct coupling, as the case may be. Both these circuits must, of course, be tuned in order to obtain the maximum result, and variable condensers are incorporated for this purpose.

Capacity Coupling

It is possible, however, to transfer the energy between two tuned circuits like this by replacing the magnetic coupling by an electrostatic coupling. Fig. 3 shows an example of this type of coupling. Here we have the inductances and

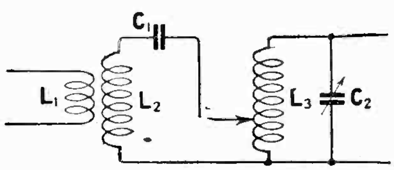


Fig. 2.—Instead of a magnetic coupling, a direct tapping may be used, the circuit then being electrically similar to Fig. 1.

variable condensers as before, but in series with these is a fixed condenser which is common to both circuits. The current flowing in the first circuit produces a variation of voltage across this fixed condenser. Since this fixed condenser is also part of the secondary circuit the voltage variations produce currents in the secondary circuit also, and so transfer the energy from one circuit to the other.

It will be obvious that the extent of the coupling between the two circuits depends upon the value of the fixed coupling condenser. The voltage on a condenser is proportional to the current flowing through it. The larger the condenser, the smaller the voltage produced across it for a given current. Obviously, therefore, for a given current in the primary circuit, the larger the condenser the smaller will be the voltage introduced into the secondary, and so the weaker will be the coupling between the two circuits. In order to obtain good selectivity it is necessary for the coupling between two circuits such as this to be kept weak, and thus the coupling condenser must be fairly large in comparison with the other capacities in the circuit.

A Dual Purpose

This second type of circuit, as it stands, possesses no particular advantages over the ordinary electro-magnetic type of coupling. If we use a condenser, however, to couple the two circuits together, there is no reason why this con-

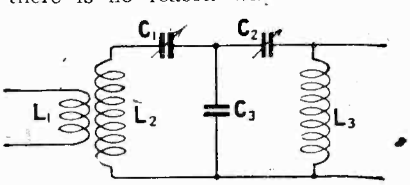


Fig. 3.—Still another form of coupling utilises a common condenser as shown at C_3.

denser should not be made variable in order that it may serve a doubel purpose both of coupling the two circuits together and also of tuning them. This is the principle which has been adopted with the receiver to be described, the circuit of which is shown in Fig. 4. Here the primary circuit consists of the coil L_1, the small fixed condenser C_1, and the coupling condenser C_2, which is made variable. The secondary circuit comprises the coupling condenser C_2 again, the small condenser C_3, and the inductance L_2. The voltage developed across L_2 is applied across the grid and filament of a valve in the usual manner, and the coil L_3 in the anode circuit is coupled to L_2 in order to produce the necessary reaction. The aerial circuit, as will be seen, is connected across a small portion of the coil L_1.

Such a circuit would only work satisfactorily if C_1 and C_3 were equal, and also the effective inductances of L_1 and L_2. Such a condition of affairs is not feasible in practice, and consequently the condenser C_3 has been made variable. This condenser requires adjustment when the set is first constructed, after which it will remain at the same adjustment, all tuning being carried out by means of the coupling condenser C_2. Thus it need not be of an expensive construction, and I have used a Polar Junior for the purpose.

The Components

The components required are as shown in the following list. Provided reliable components are employed the actual make is immaterial, as the working of the set does not depend to any great extent on the components. The actual makes of apparatus employed, however, are shown with each item.

One Radion Panel, 12 in. by 7 in. by $\frac{3}{16}$ in. (American Hard Rubber Co.).

One Cabinet to suit panel with base board 7 in. deep (Carrington Manufacturing Company, Ltd.).

One variable condenser (C_2) .001 μF (Igranic Electric Co., Ltd.).

One variable condenser .0003 μF. (Polar Junior).

One fixed condenser (C_1) .0002 μF. (Watmel).

One fixed condenser (C_4) .0002 μF. with two megohm grid leak. (Watmel).

One two-coil holder with long handle (Lotus).

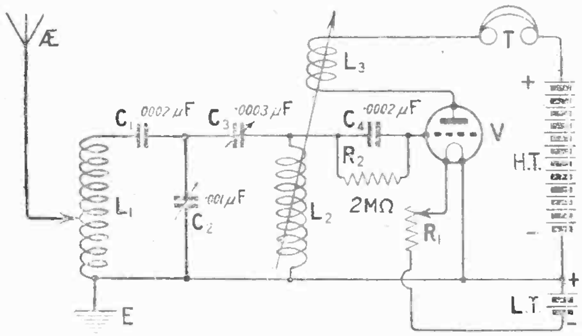


Fig. 4.—In the actual circuit adopted the coupling condenser C_2 serves the double purpose of coupling and tuning the two circuits. C_3 is adjusted once and for all when the set is first made.

One fixed coil holder (Burne-Jones and Co., Ltd.)

One valve holder, vibratory type (Burne-Jones and Co., Ltd.).

One filament rheostat (Polar).

Two terminal strips, each containing four terminals (Peto-Scott Co., Ltd.).

Two panel brackets (Carrington Manufacturing Co.).

Quantity of Glazite wire.

The tuning condenser and reaction control are the only adjustments required in practice.

One packet Radio Press panel transfers.

Mounting the Components

The panel should first be drilled in accordance with the diagram given in Fig. 5, after which the two variable condensers and the filament resistance may be mounted in position on the panel. The two-coil holder may then be mounted in the appropriate position on the base board, but it is desirable to leave the final fixing until the panel has been screwed to the base board, as will be seen later. The valve-holder, grid condenser and leak, and the fixed condenser C_1 may be screwed in their appropriate positions and the two terminal panels screwed to the back of the base board. The panel may now be fixed in an appropriate position to the base board, after which the two-coil holder may be finally adjusted so that the spindle runs comfortably through the hole drilled in the panel.

It will be necessary at this stage of the proceedings to remove the knob from the end of the spindle. This knob is usually screwed on fairly tight, and it is advisable to hold the spindle with a pair of pliers, when it will be found that the knob can be unscrewed quite easily. If this is not done, there is a danger of damaging the coil holder's mechanism.

Wiring Up

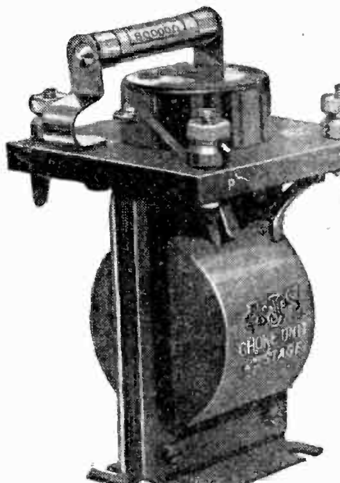
After the components have been assembled in position, there will be little difficulty in wiring up in accordance with the diagram given in Fig. 6. As the components are fitted into the minimum of space care should be taken, during the wiring up, that no wires run in a position where they will be fouled by any subsequent coils or valves which may be inserted in position. The actual wiring shown in the diagram is such as to clear every moving part comfortably, and if this wiring is followed there will be no difficulty.

Operation of the Set

When the wiring of the set has been completed, it may be tested out in the usual manner by con-

Conscientious Constructors are Considering Chokes

Given a Choke and a Transformer costing the same, the Choke will be almost certain to give much more faithful reproduction. Like all A.J.S. Receivers, the one chosen by Sir Oliver Lodge was choke coupled.



CHOKE coupling on the L.F. side has not generally received the attention it deserves. Perhaps it is by reason of the fact that if a choke is used without due care in the choice of valves, necessary condensers and grid leaks, considerably less volume will result. If, however, valves of correct design are employed, there should be no falling off in signal strength.

Although this may not be obvious to all at first, it can easily be explained. Owing to the comparatively low impedance of the primary winding of the average transformer selling at a reasonable figure, low impedance valves must be used if good quality reproduction is desired. Now low impedance valves generally have a low amplification factor. The average good choke, and the one illustrated in particular, has a high impedance at all audio frequencies, therefore high impedance valves, valves whose amplification factor is generally high, should be used on the L.F. side, so that any loss of volume due to absence of the step-up effect of a transformer is compensated for by the high amplification obtained from the valves. The only position in a choke coupled receiver in which a low impedance valve should be used is the last position.

There is another great advantage in the use of chokes for L.F. coupling, and that is, a set so constructed is not so liable to develop audio or L.F. "howls." Even if three stages of amplification are used, while admitting that a correctly designed set should not "howl," many constructors may at one time or another have experienced much difficulty in this direction. The fact that a choke has only one winding, and a transformer two windings, makes a good choke a much more reliable piece of apparatus, and one less likely to break down.

The use of valves having a high amplification factor means that less drain is put on the H.T. Battery, whose life is consequently longer, and this means a direct saving, to say nothing of the saving in valve costs due to having to use a low impedance or power valve in the last position only.

The chief thing to remember is, that the valve with the loud-speaker in its plate circuit should be a low impedance power valve; any previous note magnifiers can be high amplification factor valves with considerable advantage.

If these instructions are adhered to, it will be found that the amplification with choke coupling is normally quite equal to transformer amplification, with considerable increase in purity.

Three types of Chokes are supplied :—

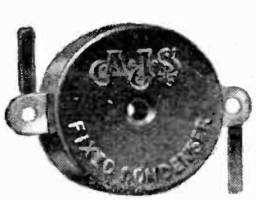
(1) The Choke only.

(2) A Choke Unit for the first stage of intervalve coupling. This Unit comprises the Choke by-pass and coupling condensers, and grid leak.

(3) A Choke Unit for the second and subsequent stages of intervalve coupling, with coupling condenser and grid leak. These units only require the addition of a Valve-holder Resister, and the necessary connections to complete a low frequency amplifier.

Choke only	15/-
Choke Unit, both stages	20/-

Publication No. 115 tells you all about chokes and the valves to use.



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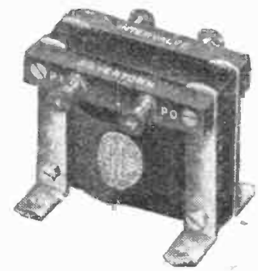
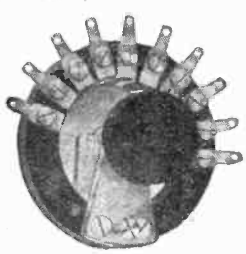
Ensure Perfect Reception



B.500.
INTERVALVE TRANSFORMER.
Guaranteed for 12 months.
Price **21/-** each.

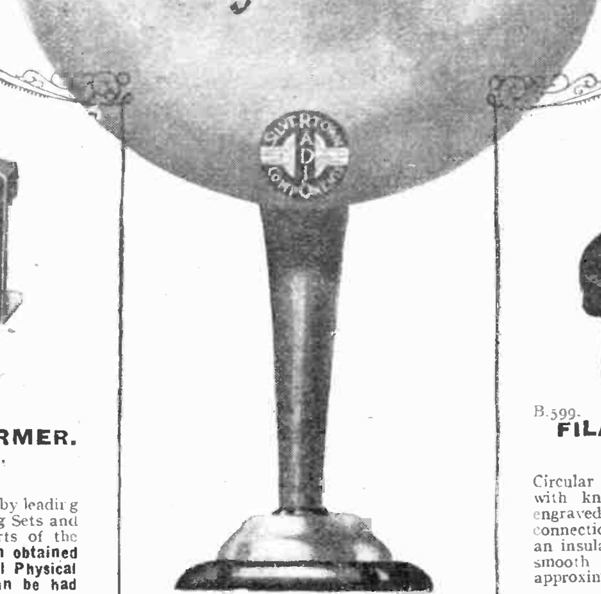
This Transformer has been adopted by leading Manufacturers of Wireless Receiving Sets and discriminating amateurs in all parts of the world. **Excellent results have been obtained on tests carried out by the National Physical Laboratory. Copy of the curve can be had on application.**



B.570.
10-WAY INDUCTANCE OR CAPACITY SWITCH.

(Patent 226245). This switch is of the under panel mounting type, and is fitted to the panel by means of the two countersunk head screws supplied. It enables the experimenter to build up large capacities, and is an invaluable addition to any set.

Price **5/6** each.



THE SILVERVOX.

The "Silvervox" Loud Speaker will reproduce both speech and music without the loss of its original tone and quality. Coils wound to either 120 or 2,000 ohms. The tone arm is a heavy aluminium casting. Total height 20 inches. Size of trumpet 12½ inches diameter.

Price **£3 10s.** each.

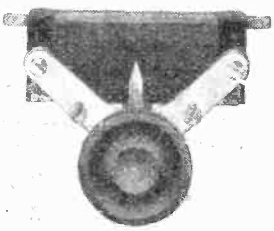
AN AID TO ENTHUSIASTS.
We have prepared a logging chart for recording wavelengths, condenser settings, etc., of those stations which require careful calibration to tune in. A copy of this chart, printed on stiff card, with hanger, can be obtained free of charge at any of our Branches or from any high-class dealer.

B.599.
FILAMENT RHEOSTAT.
One Hole Fixing.

Circular pattern, on ebonite former, complete with knob, pointer, black celluloid scale engraved in white, and two terminals for connections. The resistance wire is wound on an insulating rod, thereby giving a perfectly smooth adjustment. B.599—Wound to approximately 5 ohms resistance.

Price **3/-** each.

B.600—Wound to approximately 30 ohms resistance. Price **3/6** each.



SILVERTOWN POTENTIOMETERS

On rectangular ebonite former, complete with knob and pointer. Former mounted on cast brass frame. Resistance approximately 400 ohms.

New Reduced Prices.

B.529. For panel mounting, **5/-** (old price 7/6)
B.564. Mounted ... **15/6** (" " 18/-)

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CARDIFF: Pier Head Chambers, Bute Docks.
DUBLIN: 70, Middle Abbey Street.
GLASGOW: 15, Royal Exchange Square.
LEEDS: 1, New York Road.
LIVERPOOL: 54, Castle Street.
LONDON: 100 and 102, Cannon Street.
MANCHESTER: 16, John Dalton Street.
NEWCASTLE-ON-TYNE: 59, Westgate Road.
SHEFFIELD: 88-90, Queen Street.
PORTSMOUTH: 49, High Street.

necting up the low-tension circuit, and ensuring that the valve lights correctly, after which the high tension may be connected and the telephones inserted in circuit.

The operation of the set will be found to be comparatively simple

Balancing the Circuits

The Polar Junior condenser should then be set at about the middle of the scale, and the aerial connected to one of the tapping points on the X coil. The valve is then turned on and the tuning

be made on the compensating condenser (Polar), and it will be found that there is a definite point on this condenser at which the signals are a maximum. This, of course, corresponds to the condition when the two circuits are in

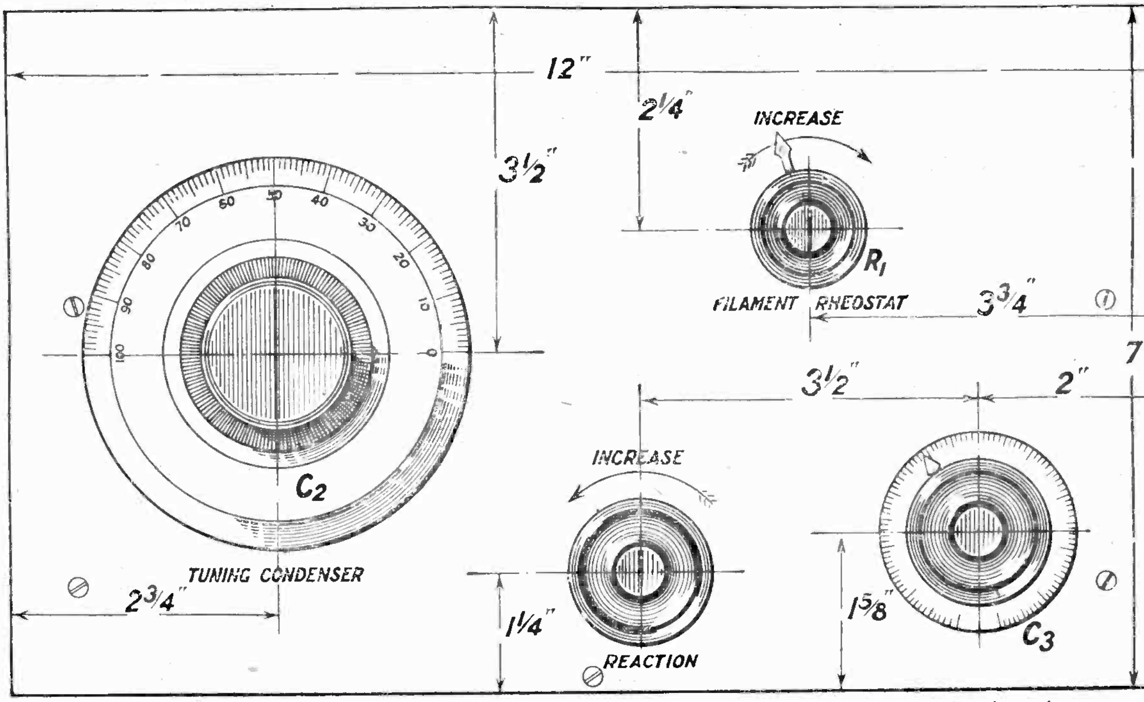


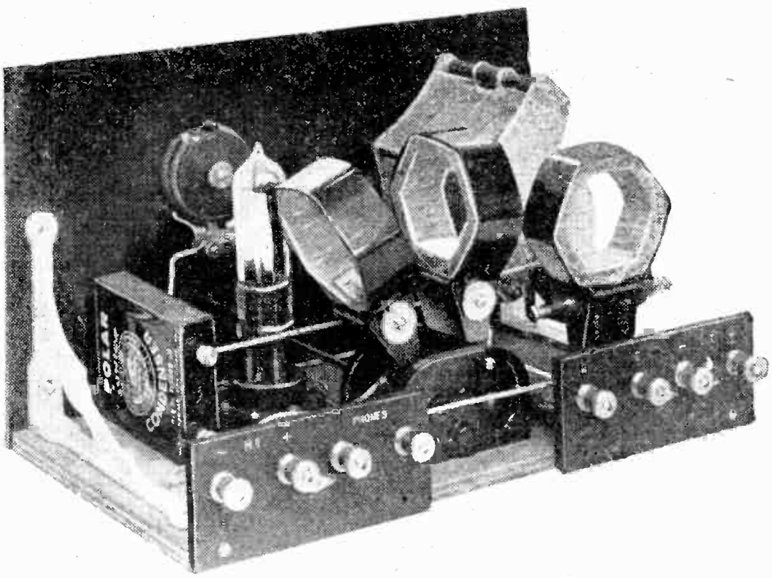
Fig. 5.—The arrangement of the panel may easily be seen from this drawing.

after the first principles have been grasped. In order to receive the higher frequency broadcasting a 75X coil should be inserted in the fixed coil holder, a 75 in the fixed holder of the two-coil holder and a reaction coil of about 50 in the moving holder. It is advisable to use the coils specified because in order to obtain best results a tight-coupled aerial arrangement should be employed, an X coil being used here; and in order that the two tuned circuits may be as similar as possible a 75 coil of the same make should be inserted in the fixed holder of the two coil holders. The reaction coil, of course, is of less importance provided that it is sufficient in size to produce the necessary reaction.

condenser is adjusted to the local station, which should be heard without any difficulty. The tuning will be found reasonably sharp, but in the majority of cases not particularly so. Having tuned the local station approximately on the main condenser a fine tune should

tune, and when this adjustment has been made it will be found to remain approximately constant under working conditions.

If the local station is comparatively close, say within 10 miles or so, the adjustment on the compensating condenser will not be very sharply defined, and a final adjustment may be made later when tuning into the more distant stations. As a matter-of-fact, however, in practice I have found that this compensating condenser serves admirably as a vernier to the main tuning condenser, and that having obtained the correct position for the local station, an adjustment which can usually be found within 10° either side the other stations can be given their final tune-in by means of a slight



The lay-out of the receiver is extremely compact, but adequate space is provided for satisfactory operation.

readjustment of the compensating condenser.

Once set, therefore, the operation of the receiver is perfecly straightforward. In order to tune in to any other station the reaction coil should be brought up towards the oscillation point and the tuning condenser rotated until the required station is heard. At this point a final adjustment may be made on the compensating condenser, and it will be found that the strength will possibly be slightly improved by this adjustment. I do not wish to imply, however, that an alteration of the compensating condenser is essential. Once the correct position has been found no further adjustment is necessary, and all tuning can be done if desired on the main tuning condenser.

One Tune Sufficient

It will be seen, therefore, that the number of tuning controls has actually been reduced, and we are obtaining the benefit of 2 or possibly 2½ tuned circuits, allowing for the fact that the aerial is tightly coupled, with only one actual tuning control. The selectivity of the arrangement is good when the correct adjustment has been found.

Test Report

I have received the usual British and Foreign Continental Stations without any trouble, while 2LO, a distance of 11 miles was sufficient to operate a small loud speaker.

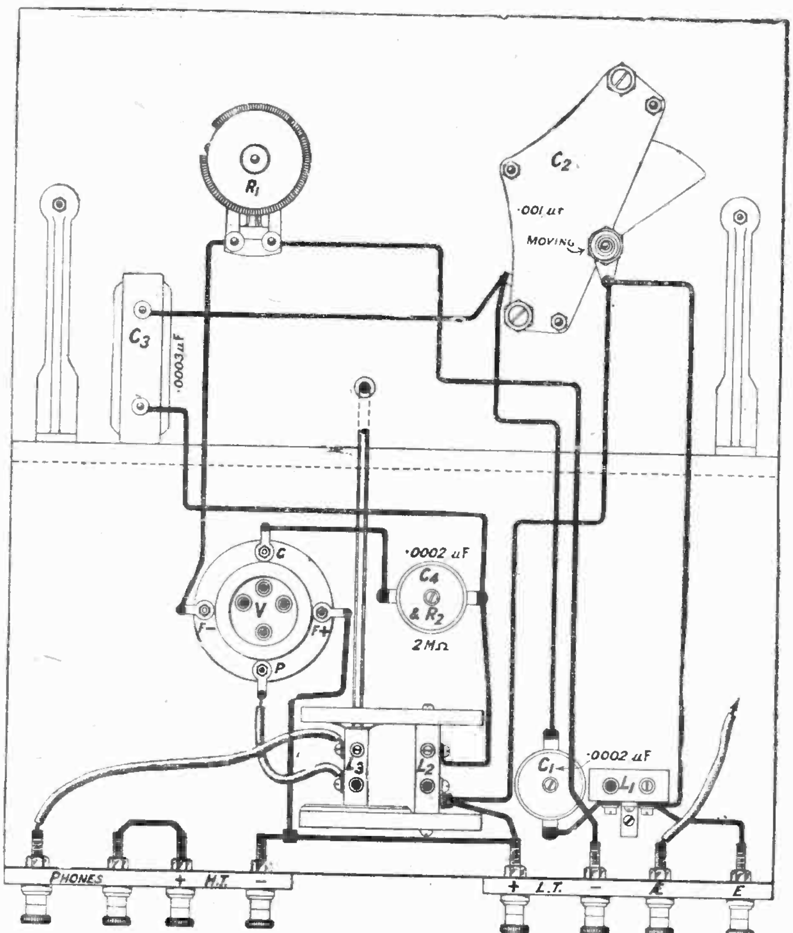
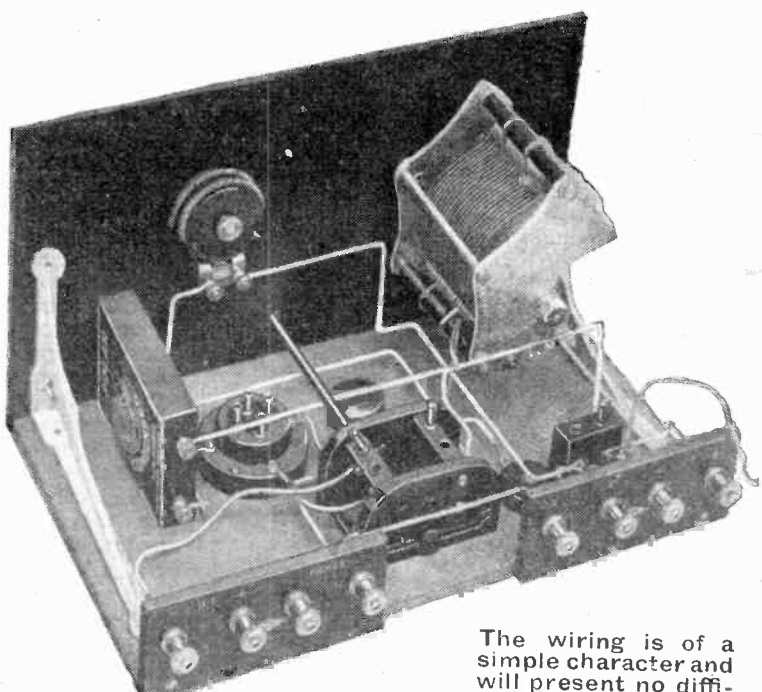


Fig. 6.—The back of panel lay-out and wiring may be obtained from this diagram. As the whole arrangement is very compact care should be taken to follow the diagram carefully.



The wiring is of a simple character and will present no difficulty.

A general purpose valve or special rectifying valve is suitable. The DE5B gives very good results. The most interesting point, however, is that at the stated distance it was possible to receive the Bournemouth programme entirely free from interference from 2LO. This was not an isolated accomplishment, but could be repeated again and again when the correct adjustment had been found. As I stated earlier, until this correct adjustment is discovered the set may appear somewhat unselective. It is simply a matter of finding the correct value of the compensating condenser in order that the two circuits may actually be in tune. The variation of coupling condenser C_3, then, at the same time tunes both the circuits.

The setting of the compensating condenser will vary if the aerial tap is changed from one point to another. It is desirable to decide which tap is better, and then to adjust the compensating condenser once and for all.

Radio in Other Lands

THE nearest Radio Station to the South Pole is one belonging to the Argentine Government, and is to be found in the South Orkney Islands. Any enthusiast, therefore, who picks up the call sign LRT will be in communication with the world's most Southern Radio Station. There is also a Meteorological Station attached to the Radio Station, and much valuable data is to be expected from this source.

Broadcasting was started a few months ago in Peru, the equipment of the station being very similar to that of 2LO. The apparatus, in fact, is more or less a duplicate of that installed at the London Station. The Peru station is situated at Lima, and operates on a transmitting wavelength of 360 metres. Look out for the call sign OAB!

In Syria the Government authorities will not yet allow the importation of transmitting apparatus of any description, although there is no ban on receiving gear. Listeners in this district therefore have to rely on foreign programmes for their entertainment, but with the increasing number of stations in Germany Austria and Italy they will probably have a fair choice of programmes.

Cutting the cake at the second birthday of KFKX, the world's pioneer repeating station at Hastings, Nebraska.

Radio apparatus in Holland is included amongst the list of luxury taxes, and it is now being considered by the Dutch Government in a new bill. It is proposed that it be collected in the form of a sales tax of five per cent.

A huge Radio Station is being constructed in the Philippines by the Radio Corporation of America, and when ready will be capable of communication with all parts of the globe. It appears that the use of high frequencies with small powers has not yet proved its commercial worth, and for solid 24-hour working the giant station is still to be employed.

Although it is illegal to import radio apparatus into China, a correspondent of the American Relay League states in a report that China has twenty privately owned broadcasting stations, and somewhere in the neighbourhood of 5,000 listeners. The public interest seems to be increasing and the majority of the sets are constructed by the dealers themselves. Presumably the parts are imported as electrical apparatus, then assembled, and sent to the customers. Magazines and newspapers print a large number of diagrams and instructions for building sets.

Static does not trouble listeners very much in California, states the *San Francisco Daily News*, and they do not experience the interference which is more prevalent in other countries. California is located on the western side of America, and has a clear, dry climate.

In Germany all transmitting stations are considered the property of the Imperial Post Office, but they are operated by private companies. This arrangement maintains the competitive spirit while retaining the advantages of Government control. The programmes from some of the German stations are admittedly of a very high standard.

At the Arlington Station, which is situated in the United States, two of the masts recently erected have a height of 459 ft., and a third has a height of 600 ft. This is one of the most up-to-date equipped stations in the United States, the power room being built underground so as to minimise any possible interference. The station will be used mainly for broadcasting weather and market reports.

Broadcasting is proving of great advantage to farmers in Canada, the market reports being of extreme importance. Previously farmers had to depend upon telegraphic market reports, and those who bought on the last quotation very often discovered a few hours later that the market was well below the price they originally bought at.

During the planting and growing season meteorological reports are of great value, and will very often enable a grower to take the necessary precautions against unseasonable frosts, and in harvest time against bad weather.

Some Further Notes on the DX FIVE

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

A few further practical details on the DX Five, together with operating data. The Test Report by our Elstree Laboratories shows it to attain a high standard.

IN last month's issue I gave some necessarily brief notes on the operation of the "DX Five," but there are perhaps a few points on which some further information is desirable.

Improved Coupling Units

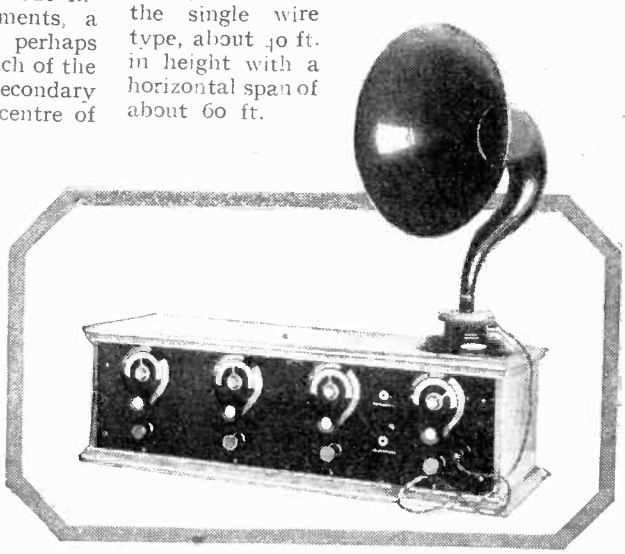
It will be remembered that the coupling units shown in the photographs of the receiver were of an experimental type. These were subsequently replaced by others made to the same specification but incorporating minor refinements, a description of which will perhaps not be out of place. In each of the first two units the 40-turn secondary winding is placed in the centre of the 2 in. length of 3 in. diameter ebonite tube, and small soldering tags are provided for connection to the ends of this winding. In the third unit the 40-turn secondary winding is commenced at about ¼ in. from one end of the 2½ in. length of the same diameter ebonite tube, and the reaction winding of 30 turns, tapped at the fifteenth turn, is spaced ⅜ in. (that is, between the end of the 40-turn winding and the beginning of the reaction coil). Five small soldering tags are provided on the tube for connection purposes, two for the 40-turn winding, and three for the reaction winding, so that either 15 or 30 turns may be used, according to requirements.

Tapping Points

A refinement in the manner of making connection to the tappings on the primary coils, which are wound on the familiar X type of former introduced by Mr. Percy W. Harris, consists in soldering the bared and twisted loops and the bared wires from the beginning and ends of the coils to short lengths of 6 B.A. screwed rod tapped into the arms of the formers. For each of these primary coils there are six such pieces of screwed rod, suitably arranged in pairs on three of the arms of the X former. Connection to suitable tappings is then conveniently made by gripping the screwed rod between the jaws of the small spring clips.

Operating Conditions

Perhaps I can best give an idea as to the conditions for operating the set by indicating a few examples which have been found to give the best results in practice on my own aerial, which is of the single wire type, about 40 ft. in height with a horizontal span of about 60 ft.



The DX Five, described in our last issue.

One set of conditions is as follows: two ordinary bright emitter R type valves for V_1 and V_2, a C.T. 25B (resistance-capacity type) for V_3, and a D.E.8 L.F. and D.E.5 for V_4 and V_5 respectively, with 90 volts on H.T. + 1, 48 volts on H.T. + 2, and 120 volts on H.T. + 3, with the first primary (L_1) at the grid end of the secondary winding (L_2), the second and third primaries (L_3 and L_5 respectively) just inside the tubes of the coupling units, *i.e.*, a short distance away from the grid ends of their respective secondaries, L_4 and L_6. Also using the full 35 turns for L_3 and L_5, and the 15 turn reaction coil; 1½ volts negative bias on the grids of V_1 and V_2.

Excellent Results

Under these conditions, with 20 turns for L_1, both Manchester and Cardiff can be received at full loud-speaker strength under favourable conditions, without any or at the most only an inappreciable back-ground of 2LO's transmissions. On frequencies more remote from that of 2LO, up to about 700 kc. (about 425m.) 35 turns for L_1 may be used to advantage, while on frequencies corresponding to the upper part of the broadcast band the full 45 turns of L_1 give the best strength. The circuit, under these conditions, is perfectly stable and reaction control on C_4 is smooth and gradual.

Another Combination

Two D.E.5 type valves for V_1 and V_2, 60 volts on H.T. + 1, 10 turns for L_3 and L_5, and the remainder of the conditions as above, also gave another very good combination. If the D.E.5 type valves were removed and the resistance capacity type substituted in the H.F. stages, a slight improvement in selectivity was noticeable.

Thus, having adjusted the primaries L_3 and L_5 to suit the conditions under which you are working, the main adjustment, apart from the actual tuning on the condensers and the reaction control, consists in varying the turn numbers of the first primary L_1 to secure the best results on the particular station to which you are listening.

Oscillation Control

As far as the choice of these various arrangements is concerned, I personally prefer the first set of conditions with R valves for V_1 and V_2. When using the D.E.5 type of valve in the H.F. stages you may get a tendency to H.F. oscillation in certain cases, but if this does occur the circuit can

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Complete with base (as illustrated)	12/6
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Condenser only	3/-
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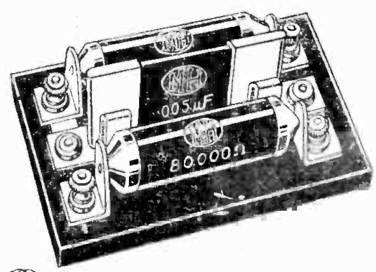

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be made completely stable by reducing the number of turns in the primaries L_3 and L_5.

With valves of the resistance-capacity or special H.F. types as detectors, the 15-turn reaction coil should be adequate, but if this is found to be too small with a detector valve which oscillates less readily the whole of the reaction coil should be tried.

H.T. Battery

If a set of this type, where the total anode current may be about 15 milliamperes or more (a measurement when using four .25 ampere type and one R type valves gave 16 ma.) is worked consistently from H.T. dry batteries it is desirable to use those having the large size cells unless, say, the first three valves are supplied from one battery and the last two from separate batteries, so that the load on any particular battery is within safe limits.

Stations heard

It is of little use giving a long list of stations received, but some indication of the selectivity obtainable has already been given, and it will be sufficient to say that on my aerial many of the British main stations and the Continental stations between 250 and 550 metres are usually unpleasantly loud on the loud-speaker when using five valves; others come in at varying strengths, depending on conditions. Although I have not made a point of listening definitely for American stations, WGY was received on one occasion before 12.30 a.m. at moderate loud-speaker strength, and, in spite of a bad background of "mush," speech and announcements were quite intelligible.

Radio Press Laboratories' Test Report.

THE wiring and layout of this set is very good. On the front panel the only controls are four variable condensers and four variable rheostats.

Performance

The performance of this receiver was exceptionally good, Cardiff and Manchester both being obtained on a loud-speaker, whilst London was broadcasting, without a trace of London. Once the three tuning condensers are in adjustment the picking up of stations is quite an easy matter. The set was perfectly stable, the reaction control bringing signal strength up until finally there was a gentle oscillation.

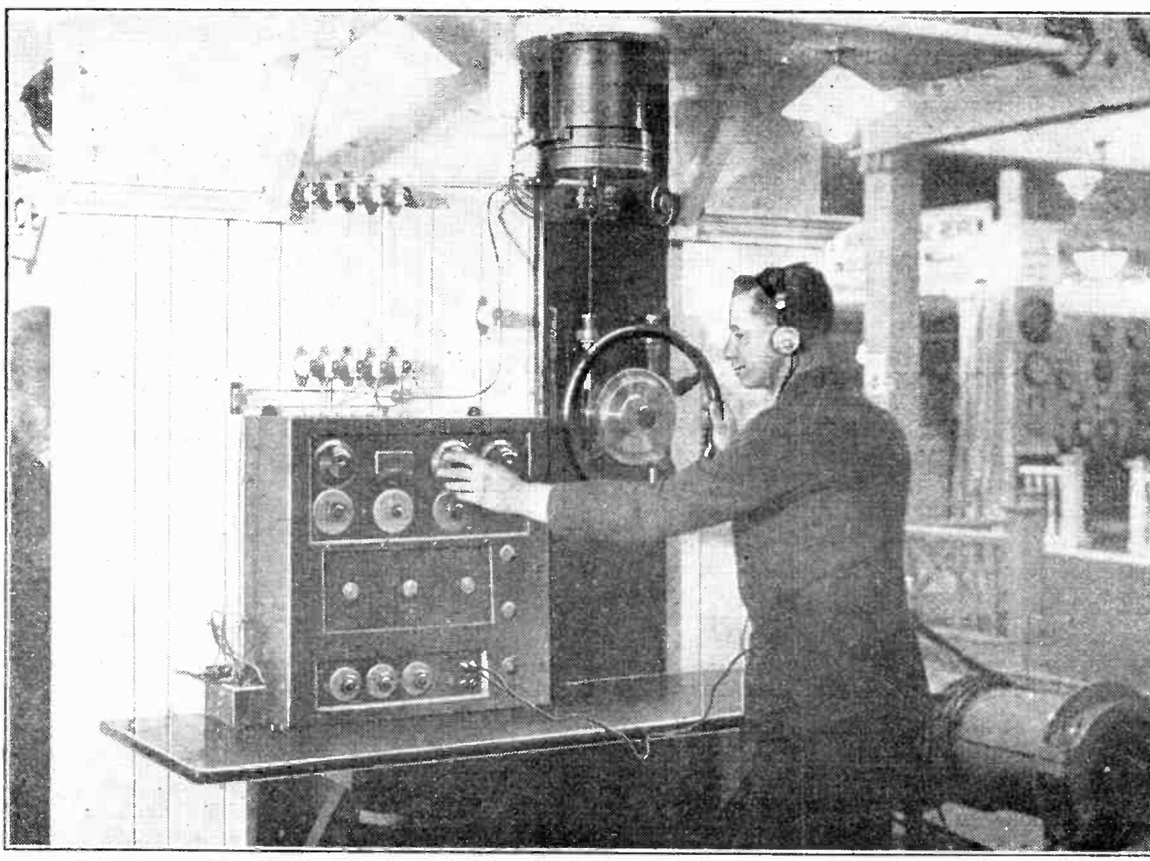
Preliminary Adjustment

The adjustment of the various transformers and grid battery for any particular set of valves would no doubt take considerable time and careful work, but once adjusted they are absolutely constant, and the only variables that need be touched are the three tuning condensers on the outside of the panel, and also the reaction condenser.

There is little doubt that the special transformers in themselves do not entirely account for the extra selectivity obtained.

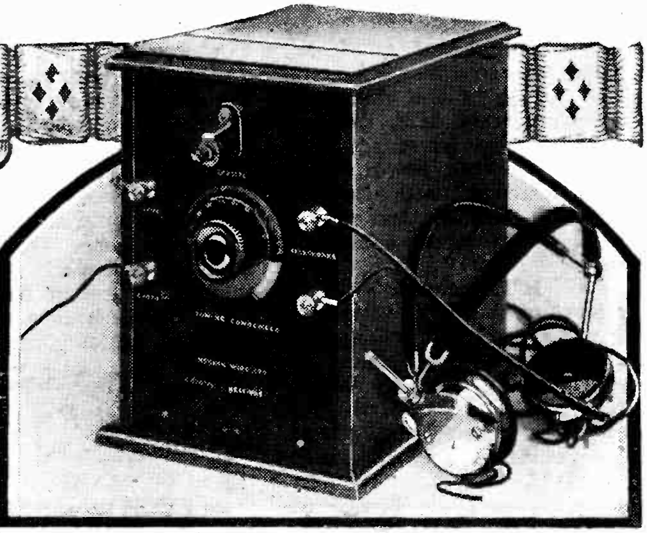
Good Design

The high tension is supplied to the high-frequency valves through chokes. The high-frequency circuit being fed from the plate through a condenser, and then through the primary of the transformer and returned to earth, each valve has an entirely separate high-frequency path to the filament, thus avoiding a great deal of reaction which takes place through the high-frequency currents going through a common H.T. battery.



Messrs. Siemens Bros. have recently produced a new type of Direction Finder which contains several novel features. The operator is here seen handling the apparaus.

Sharp Tuning in Crystal Receivers



By E.H.BERRY

A simple arrangement employing two tuned circuits, one of which is semi-permanently tuned.

THE enjoyment of the local station or of the Daventry transmission is frequently marred for many listeners who are unfortunate in living in coastal areas by the interference due to the morse transmission between ships and ships and shore stations.

Because of its usually flat tuning and comparatively weak signal strength, the crystal receiver is more affected by such interference.

The problem is to increase selectivity without materially decreasing the signal strength.

Loose Coupling

One solution of this problem, and probably the most satisfactory, is to employ loose, or auto-coupling.

This usually necessitates the multiplication of controls, but the receiver to be described has been so designed that once the correct tappings have been determined, there is only the one control.

Secondary Tuning

The circuit, which is illustrated in Fig. 1, consists of a tuned primary circuit, L_1C_1, auto-coupled to a low-loss secondary circuit, L_2.

To increase still further the selectivity, the tuned primary circuit is tapped across a portion only of the secondary.

The secondary, of course, requires to be tuned to the frequency of the incoming signal. Instead of a variable condenser, however, a fixed condenser is employed, and the number of turns in the secondary circuit is made variable.

Straightforward Arrangement

Since a crystal receiver is essentially a one-station receiver, the only alteration of tuning required is to allow for small variations at the local station. Consequently, it is possible to find the optimum tapping on the secondary once and for all.

There is no serious disadvantage in employing a tapped secondary, for the number of tappings are sufficient to cover a fairly wide frequency range.

Should the selective arrangement only be required on occasion, it is quite possible by means of the clips to change over to the conventional straightforward arrangement by taking point H to point G in Fig. 1, and point F to point B.

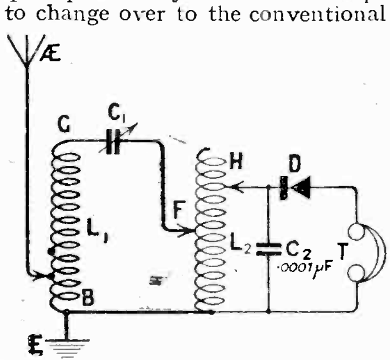


Fig. 1.—The circuit consists of a tuned primary circuit loosely coupled to a low-loss secondary circuit.

The reception of Daventry will necessitate a 200 or 250 Lissen X coil for L_1. As interference is not received on this wavelength to the same extent the circuit arrangement used to receive this station does not include L_2.

Components

The following is a list of the components which are required in the construction of the receiver. The manufacturers' names are given in each case for the convenience of those who wish to use the same components.

One ebonite panel (9 in. by 6 in. by ¼ in.) (Paragon).

One mahogany cabinet complete with baseboard to take this panel (Carrington Mfg. Co.).

One Lissen X coil, No. 50 or 60.

One Lissen X coil, No. 250 (for Daventry).

Four terminals (Burne-Jones & Co., Ltd.).

One board-mounting coil socket (Burne-Jones & Co., Ltd.).

One ·0003 μF variable square law condenser, low-loss type (Ormond).

One crystal detector, K type (Wates Bros.).

One low-loss coil former, 7 in. long (Collinson).

Three spring clips (Peto-Scott).

One ·0001 μF fixed condenser (Watmel).

Half-pound No. 22 enamelled or D.C.C. copper wire.

Flexible rubber covered wire.

Glazite for wiring.

Screws.

Radio Press panel transfers.

The Low-loss Coil

Our first step is the construction of the low-loss coil.

Secure the wire through the two holes provided at one end, leaving about six inches for connection later, and begin winding.

Wind on as many turns as can be accommodated, which will be found to be about 90 turns.

Taking Tappings

If cotton-covered wire is used, the covering may easily be removed for the purpose of taking tappings by running a hot soldering iron up and down between two of the rods of

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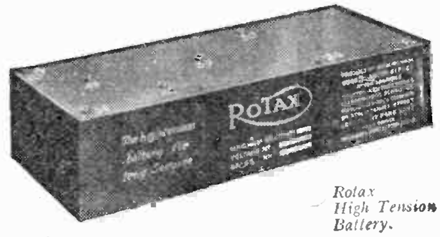

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H.G. 3	45	30	14/6	15/-
H.G. 4	60	40	19/-	19/6
H.G. 5	90	60	28/5	29/6
H.G. 6	105	70	33/6	34/6
G.B. 3	4½	3	Price 1/6 each	

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E.W.146	4	80	40	30/-	6/6
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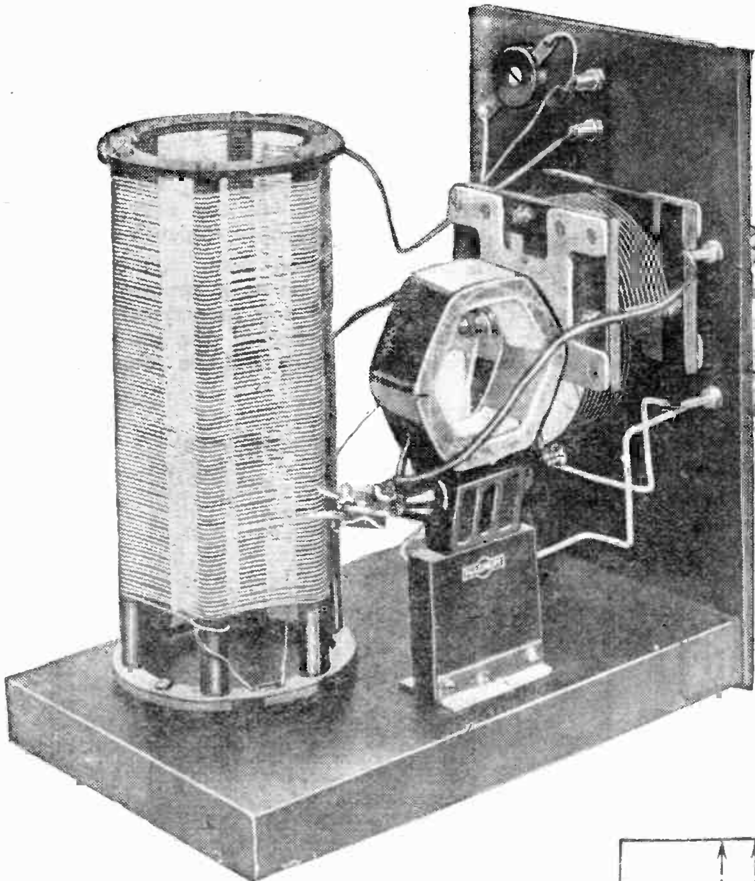


The low-loss secondary with the appropriate tapping arrangements can be seen in this figure.

the skeleton former. The same may be done with enamelled wire or such portions as are required to be bared may be scraped with a penknife.

The process of making the tapping points is greatly facilitated by raising with a match stalk the bared portion of those turns to which the short tapping wires are to be attached. The match-stalk should then be laid under these turns, but over the adjacent turns, so raising the required turns clear.

Small pieces of square wire may then be soldered to the tapping points; as little solder as possible should be used because of the close spacing of the wire, or the adjacent turns may be shorted.

Primary Tappings

Tappings should be taken every two turns between 20 and 40 turns, counting from the end where the six-inch length was left for future use. Beginning now at the other end, tappings should be taken at 5, 10, 15, 20, 25 and 30 turns.

This completes the construction of the coil.

Drilling the Panel

Mark out the panel according to the drilling diagram shown in Fig. 2. Now take the panel and temporarily fix to the baseboard while in the cabinet. This ensures a good fit.

Laying out of Components

Withdraw the panel and baseboard and proceed to mark on the baseboard the position for the coil socket and low-loss former.

Insert a coil in the coil-holder to ensure adequate space being provided.

Mark the position for the fixing screws and affix the coil socket and former.

Remove panel from the baseboard and mount the condenser, terminals, and crystal detector sockets.

Wiring up

The wiring-up may readily be followed from the diagram given in Fig. 3, the only special point being that a piece of square wire of sufficient length to take two clips should be attached to the moving plates of the condenser. This is for the direct-coupled circuit to receive Daventry.

The components on the panel should be wired first, after which we may attach the panel to the baseboard and complete the wiring.

By the aid of Fig. 3 the complete wiring may be accomplished, and should present no difficulties.

Testing the Set

Attach the aerial, earth and 'phones. The aerial clip should be attached to the strip of wire on the condenser, and also the crystal tapping taken to the same position. The clip from the condenser should be clipped on to the earth terminal.

This utilises the conventional straightforward circuit, and is the best means of testing for correct wiring and coil value. Owing to the selective nature of the set it is quite possible to miss the local

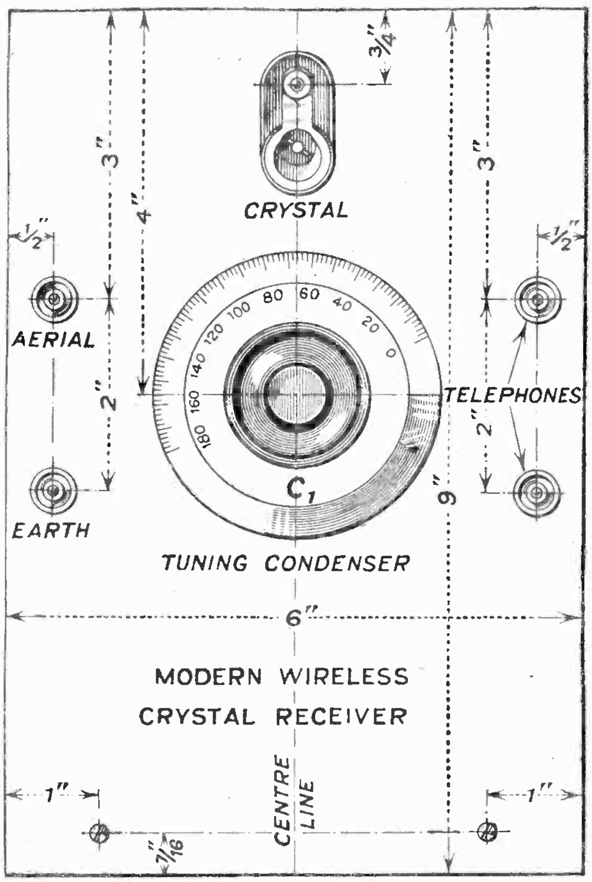


Fig. 2.—The drilling of the panel may be carried out with the aid of this diagram.

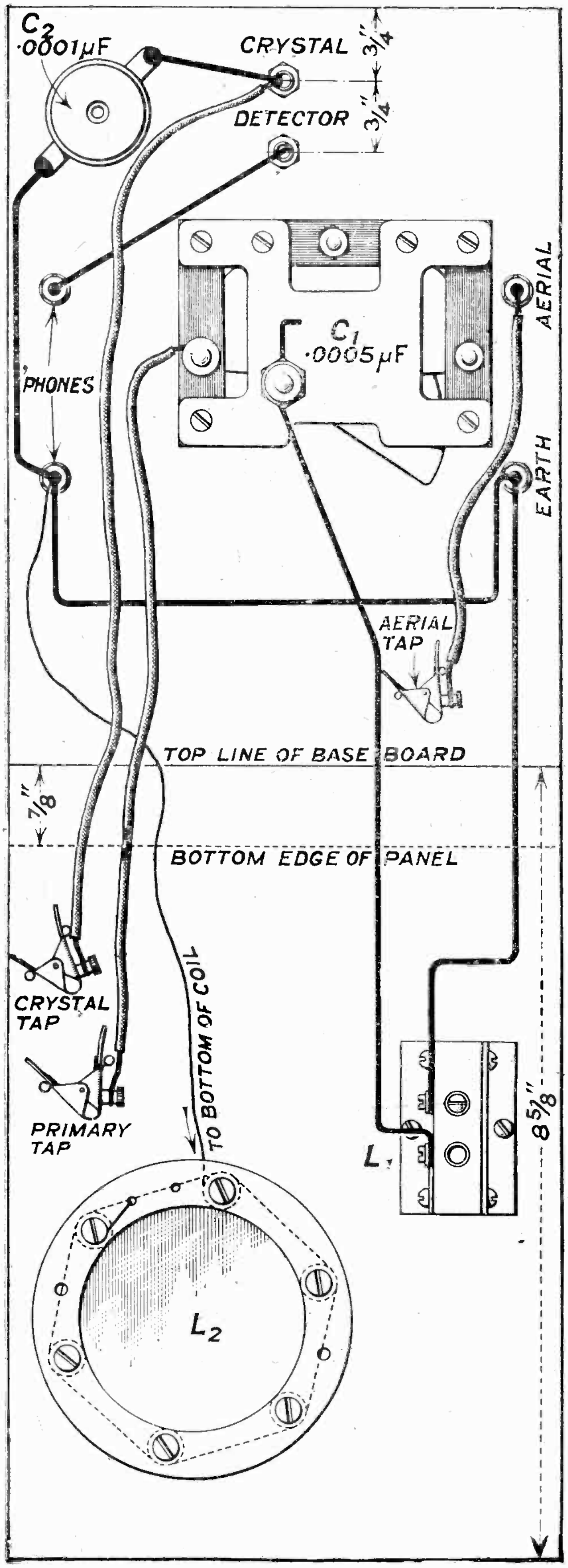


Fig. 3.—The wiring of the receiver is simple.

station at first, when using the loose-coupled arrangement. On rotating the condenser the local station should be heard. When the loudest signals possible have been obtained with this arrangement, the loose-coupling may be tried. If a Lissen X coil is used, attach the aerial clip to one of the side terminals and retune by means of the condenser. Try which of the side tappings gives the loudest signals, retuning each time.

The flexible connection from the condenser should now be clipped on to a tapping (one of the close-spaced ones) and the crystal tapping taken to the top tapping of the low-loss coil. On retuning, the tuning will be found much sharper.

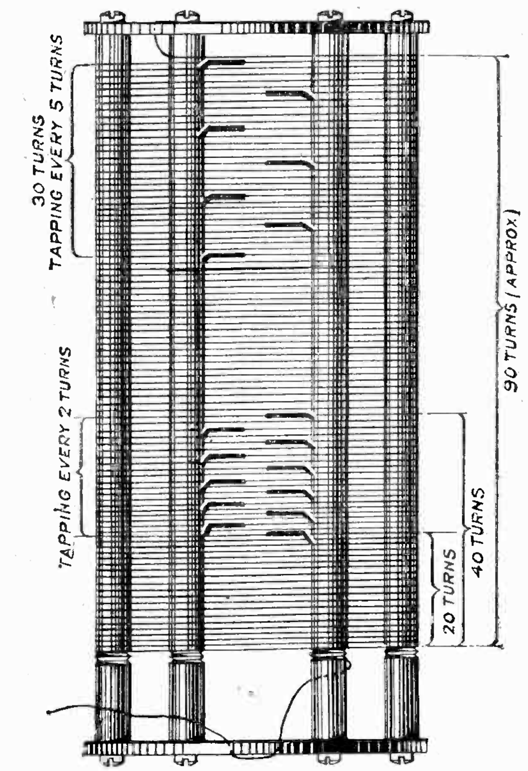


Fig. 4.—Details of the tappings on the low-loss coil.

The effect of varying the condenser tappings should now be tried, taking care to retune each time. A position of greatest signal strength will be found.

When this has been done the variation of the position of the crystal tapping may be tried.

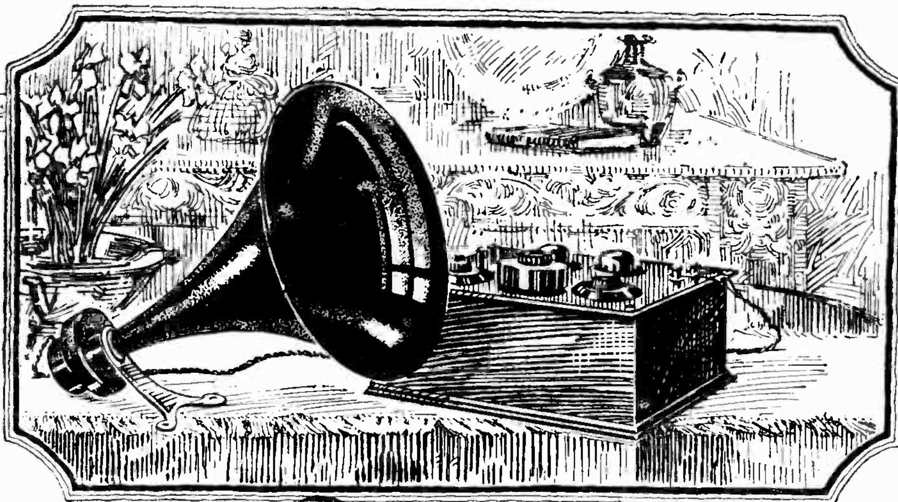
Test Report

The .0001 μF fixed condenser is suitable for the higher frequencies, but for the reception of the lower frequency stations such as Birmingham or Aberdeen a .0002 μF condenser should be used.

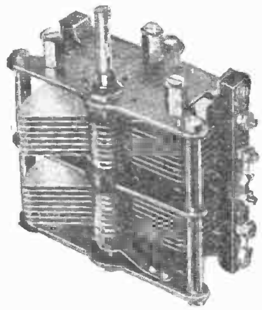
On test this receiver was found to function excellently with very marked sharpness of tuning.

When the correct tapping had been found for tapping F in Fig. 1, there was little decrease in signal strength as compared with a straightforward arrangement.

Daventry was also received at good strength, the straightforward circuit being adopted as previously stated.



KING IN RADIO



King-Cardwell Condensers manufactured under licence from the A. D. Cardwell Manufacturing Corporation.

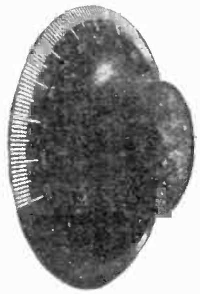
King Components are carefully made

K 1,200 King Neutrodyne Kit.

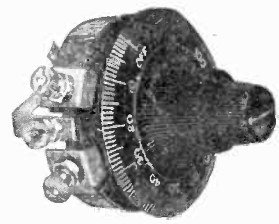
THE success of Radio reception depends largely upon the quality of the components—if one is faulty, the whole receiver is at fault.

"King in Radio" components are made with the utmost care from the very best materials obtainable. The designs are the best—when the best is made by some other manufacturer, as in the case of Cardwell condensers, we manufacture it under licence from the original manufacturer.

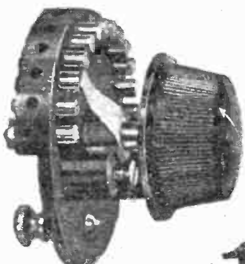
All the facilities of an eight-acre plant equipped with the most modern machines for the making of radio components helps to maintain the "King in Radio" high quality standards. Each component goes through a thorough system of inspection before it leaves the plant.



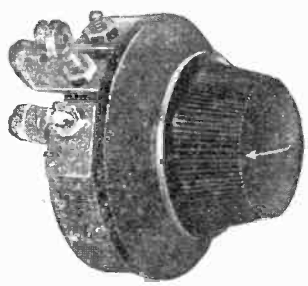
Dials in black bakelite.



Single hole mounting Rheoswitch.



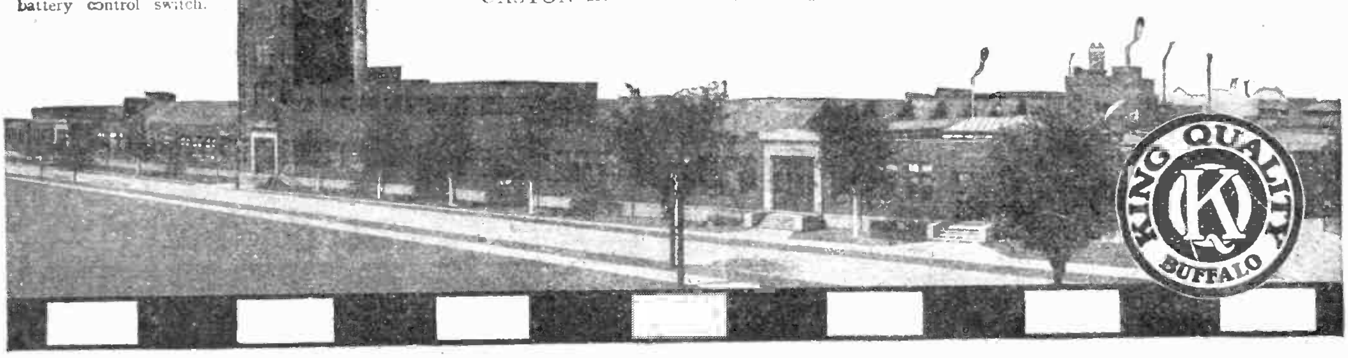
Inductance and "H.T." battery control switch.

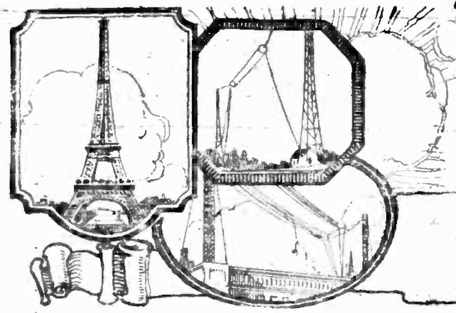


Single hole mounting Potentiometer.

KING QUALITY PRODUCTS, INC.

European Branch :
27-28, ANNING STREET, LONDON, E.C.2, ENGLAND.
CASTON E. MARBAIX, *Manager.*





Regular Programmes from Continental Broadcast Stations

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

Corrected up to December 19th, 1925.

Ref. No.	G. M. T.	Name of Station.	Call Sign and Wavelength.	Situation.	Nature of Transmission.	Closing Time or Approx. Duration.	Approx. Power used.
					WEEK DAYS.		
	a.m.						
1	5.55	Hamburg ..	HA 395 m. and 460 m.	Germany ..	Time Signal, Weather Report ..	15 mins.	1.5 Kw. and 4 Kw.
2	6.40	Eiffel Tower ..	FL 2650 m.	Paris ..	Weather Forecast	5 mins.	5 Kw.
9	7.55	Vaz Diaz ..	PCFF 1950 m	Amsterdam	Stocks, Shares and News ..	10 mins.	2 Kw.
211	8.0	Radio-Wien ..	—— 530 m.	Austria ..	Market Prices	10 mins.	1.4 Kw.
8	9.23	Eiffel Tower ..	FL 2650 m.	Paris	Time Signal in G.M.T. (Spark)	3 mins.	60 Kw.
238	9.55	Vaz Diaz ..	PCFF 1950 m	Amsterdam	Time Signal	3 mins.	2 Kw.
303	10.0	Radio-Wien ..	—— 530 m.	Vienna ..	Morning Concert .. .. .. (Mon., Tues. and Thurs.)	1½ hrs.	1.4 Kw.
10	10.0	Eiffel Tower ..	FL 2650 m.	Paris ..	Time Signal in Greenwich Sidereal Time (Spark)	5 mins.	60 Kw.
180	10.15	Breslau ..	—— 418 m.	Silesia ..	Weather Report—Exchange ..	10 mins.	1.5 Kw.
13	10.44	Eiffel Tower ..	FL 2650 m.	Paris ..	Time Signal in G.M.T. (Spark)	3 mins.	60 Kw.
14	10.55	Eiffel Tower ..	FL 2650 m.	Paris ..	Fish Market Quotations, Cotton Exchange (Monday excepted)	10 mins.	5 Kw.
15	11.0	Frankfurt ..	—— 470 m.	Frankfurt	Time Signal in C.E.T. (Spoken), followed by News	5 mins.	1.5 Kw.
182	11.0	Leipzig ..	—— 452 m.	Germany ..	Concert	11.50 p.m.	1.5 Kw.
184	11.0	Zurich ..	—— 515 m.	Switzerland	Weather Report	5 mins.	500 Watts.
20	11.20	Voxhaus ..	B 505 m.	Berlin ..	Exchange Opening Prices ..	5 mins.	4.5 Kw.
30	11.30	Stockholm ..	SASA 427 m.	Sweden ..	Weather Forecast, followed by Exchange and Time Signal from Nauen	Noon.	1 Kw.
249	11.30	Breslau ..	—— 418 m.	Silesia ..	Morning Concert	12.25 p.m.	1.5 Kw.
260	11.40	Hilversum ..	NSF 1050 m.	Holland ..	News Bulletin	10 mins.	3 Kw.
23	11.57	Nauen ..	POZ 3000 m.	Berlin ..	Midday Time Signal in G.M.T. (Spark). This Signal is relayed by Zurich and all German stations, except Munich and Stuttgart	8 mins.	50 Kw.
	Noon						
157	12.0	Zurich ..	—— 515 m.	Switzerland	Weather Forecast, Shares & News	5 mins.	500 Watts.
261	12.0	Helsingfors ..	—— 318 m.	Finland ..	Time Signal, Weather Report ..	5 mins.	1 Kw.
	p.m.						
202	12.15	Munster ..	MS 410 m.	Westphalia	Concert or Lecture	1.30 p.m.	3 Kw.
32	12.30	Radio-Paris ..	SFR 1750 m.	Clichy ..	Concert, followed by News ..	2 p.m.	4 Kw.
239	12.35	Royal Dutch Meteorological Inst.	—— 1100 m.	Utrecht (De Bilt)	Night Frost Reports	10 mins.	2 Kw.
324	12.40	Agen ..	—— 318 m.	France ..	Weather Report, Market Prices	10 mins.	250 Watts.
31	12.45	Vaz Diaz ..	PCFF 1950 m	Amsterdam	Stocks and Shares	10 mins.	2 Kw.
34	12.55	Munich ..	—— 485 m.	Bavaria ..	Time Signal, News, and Weather Report	10 mins.	1.5 Kw.
37	1.20	Voxhaus ..	B 505 m. and 576 m.	Berlin ..	Stock Exchange News	5 mins.	4.5 Kw.
35	1.30	Komarow ..	—— 1800 m	Czecho-Slovakia	Stock Exchange and Late News News and Exchange Quotations	10 mins.	1 Kw.
181	2.0	Breslau ..	—— 418 m.	Silesia ..		10 mins.	1.5 Kw.
40	2.15	Munster ..	MS 410 m.	Westphalia	Stocks, Shares and News ..	10 mins.	3 Kw.
39	2.45	Eiffel Tower ..	FL 2650 m.	Paris ..	Exchange Opening Prices (Saturday excepted)	8 mins.	5 Kw.
159	3.0	Radio-Wien ..	—— 530 m.	Vienna ..	News, followed by Concert ..	5 p.m.	1.4 Kw.
226	3.0	Stuttgart ..	—— 446 m.	Wurtemberg	Concert	5 p.m.	1.5 Kw.
325	3.15	Hamburg ..	HA 395 m. and 460 m.	Germany ..	Music	4 p.m.	1.5 Kw. and 4 Kw.
43	3.15	Konigsberg ..	—— 463 m.	East Prussia	Light Orchestra (Wed. and Sat., Children's Hour)	5.30 p.m.	1 Kw.

Ref. No.	G. M. T.	Name of Station.	Call Sign and Wavelength.	Situation.	Nature of Transmission.	Closing Time or Approx. Duration.	Approx. Power used.
				WEEK DAYS (Contd.)			
250	3.30	Munich ..	—— 485 m.	Bavaria ..	Concert	5 p.m.	1.5 Kw.
47	3.30	Eiffel Tower ..	FL 2650 m.	Paris ..	Exchange Quotations (Saturday excepted)	5 mins.	5 Kw.
41	3.30	Voxhaus ..	B 505 m. and 576 m.	Berlin ..	Concert, followed by News ..	5 p.m.	4.5 Kw.
42	3.30	Frankfurt ..	—— 470 m.	Germany ..	Light Orchestra	5 p.m.	1.5 Kw.
46	3.30	Leipzig ..	—— 452 m.	Germany ..	Concert	4.30 p.m.	1.5 Kw.
306	3.30	Union-Radio ..	EAJ7 408 m.	Madrid ..	Concert	1 hr.	1.5 Kw.
158	4.0	Zurich ..	—— 515 m.	Switzerland	Concert by Hotel Baur-au-Lac, relayed	5 p.m.	500 Watts.
160	4.0	Breslau ..	—— 418 m.	Silesia ..	Light Orchestra	5 p.m.	1.5 Kw.
326	4.0	Munster ..	MS 410 m.	Westphalia	Concert	5.0 p.m.	3 Kw.
240	4.10	Vaz Diaz ..	PCFF 1950 m	Amsterdam	Time Signal, Stocks and Shares	3 mins.	2 Kw.
52	4.30	Eiffel Tower ..	FL 2650 m.	Paris ..	Exchange Closing Prices (except Saturday)	8 mins.	5 Kw.
308	4.45	Radio-Paris ..	SFR 1750 m.	Clichy ..	Concert	1 hr.	4 Kw.
54	5.0	Radio-Belge ..	SBR 262 m.	Brussels ..	Concert, followed by News ..	6 p.m.	2.5 Kw.
186	5.0	Frankfurt ..	—— 470 m.	Germany ..	Lectures	5.30 p.m.	1.5 Kw.
187	5.0	Hamburg ..	HA 395 m. and 460 m.	Germany ..	Music or Lecture	6 p.m.	1.5 Kw. and 4 Kw.
241	5.0	Warsaw ..	PTR 385 m.	Poland ..	Concert	7 p.m.	——
309	5.10	Unione Radio-fonica Italiana	IRO 425 m.	Rome ..	Concert relayed from Hotel de Russie, Rome	6.30 p.m.	1.5 Kw.
60	5.15	Radio-Wien ..	—— 530 m.	Vienna ..	Evening Programme (Wed. and Sat. till 9 p.m.)	8 p.m.	1.5 Kw.
305	5.15	Strassnice ..	—— 546 m.	Prague ..	Lecture	¾ hr.	1 Kw.
161	5.30	Munich ..	—— 485 m.	Bavaria ..	Lectures, Talks, etc.	7 p.m.	1.5 Kw.
263	5.40	Hilversum ..	NSF 1050 m.	Holland ..	Concert, followed by News (Mon. excepted)	7.15 p.m.	3 Kw.
162	6.0	Eiffel Tower ..	FL 2650 m.	Paris ..	Concert, concluded by News Bulletin	7 p.m.	5 Kw.
298	6.0	Radio-Barcelona	EAJ1 325 m.	Spain ..	Concert, followed by News ..	7 p.m.	1 Kw.
299	6.30	Komarov ..	—— 1800 m.	Brunn ..	Concert	8.30 p.m.	1 Kw.
63	6.30	Stuttgart ..	—— 446 m.	Wurtemburg	Lecture, followed by Evening Programme	10 p.m.	1.5 Kw.
204	7.0	Oslo	—— 382 m.	Norway ..	Time Signal and Concert ..	9 p.m.	1 Kw.
58	7.0	Eiffel Tower ..	FL 2650 m.	Paris ..	General Weather Forecast ..	8 mins.	5 Kw.
188	7.0	Frankfurt ..	—— 470 m.	Germany ..	Lecture	7.30 p.m.	1.5 Kw.
61	7.0	Konigsberg ..	—— 463 m.	East Prussia	Concert and Late News ..	9 p.m.	1 Kw.
62	7.0	Hamburg ..	HA 395 m. and 460 m.	Germany ..	Concert, Late News and Dance Music	10 p.m.	1.5 Kw.
66	7.0	Lausanne ..	HB2 850 m.	Switzerland	Time Signal, Concert (Wednesdays excepted)	8.30 p.m.	300 Watts.
73	7.0	Munich ..	—— 485 m.	Bavaria ..	Concert and News	10 p.m.	1.5 Kw.
234	7.0	Strassnice ..	—— 561 m.	Prague ..	Concert, followed by News ..	10 p.m.	1 Kw.
310	7.0	Union-Radio ..	EAJ7 408 m.	Madrid ..	Concert (3 alternate days a week)	9 p.m.	1.5 Kw.
69	7.15	Breslau ..	—— 418 m.	Silesia ..	Lecture or Talk, followed by Concert	10 p.m.	1.5 Kw.
64	7.15	Zurich ..	—— 515 m.	Switzerland	Lecture and Concert, followed by Late News	9 p.m.	500 Watts.
65	7.15	Leipzig ..	—— 452 m.	Germany ..	Concert and News (3 days a week until 10.30 p.m.)	9 p.m.	1.5 Kw.
300	7.15	Radio-Catalana	EAJ13 460 m.	Barcelona	Concert	10 p.m.	1 Kw.
323	7.30	Geneva ..	—— 1100 m.	Switzerland	Concert relayed from Hotel Metropole	9 p.m.	600 Watts.
67	7.30	Frankfurt ..	—— 470 m.	Germany ..	Concert and News	10 p.m.	1.5 k.w.
59	7.30	Munster ..	MS 410 m.	Westphalia	Concert, followed by News ..	9.45 p.m.	3 Kw.
72	7.30	Voxhaus ..	B 505 m. and 516 m.	Berlin ..	Concert, followed by News and Weather Report	9.30 p.m.	4.5 Kw.
317	7.30	Konigswusterhausen	LP 1300 m.	Berlin ..	Evening Programme relayed from Voxhaus on High Power	11 p.m.	10 Kw.
320	7.30	Eiffel Tower ..	FL 2200 m.	Paris ..	Concert	9 p.m.	2.5 Kw.
228	7.50	Hilversum ..	NSF 1050 m.	Holland ..	Concert on Monday, 6.40-8.40 p.m.	9.10 p.m.	3 Kw.
253	8.0	Agen	—— 318 m.	France ..	Exchange Quotations and News Bulletin (Concert Friday 8.30 p.m.)	9 p.m.	250 Watts.
245	8.0	Lyngby ..	—— 2400 m.	Denmark ..	Press News	8.15 p.m.	1.5 Kw.
311	8.15	Lyons ..	—— 280 m.	France ..	News	10 mins.	500 Watts.
74	8.15	Radio-Belge ..	SBR 265 m.	Brussels ..	Concert, preceded and followed by News	10.10 p.m.	2.5 Kw.
316	8.15	Geneva ..	—— 1100 m.	Switzerland	Concert relayed from Hotel Metropole, Geneva	10 p.m.	600 Watts.
76	8.15	Radio-Paris ..	SFR 1750 m.	Clichy ..	Detailed News Bulletin.. ..	8.30 p.m.	4 Kw.

Ref. No.	G. M. T.	Name of Station.	Call Sign and Wavelength.	Situation.	Nature of Transmission.	Closing Time or Approx. Duration.	Approx. Power used.

WEEK DAYS (Contd.)

Ref. No.	G. M. T.	Name of Station.	Call Sign and Wavelength.	Situation.	Nature of Transmission.	Closing Time or Approx. Duration.	Approx. Power used.
242	8.25	Royal Dutch Meteorological Inst.	KNML 1100 m.	Utrecht	Night Frost Report	5 mins.	2 Kw.
164	8.30	Unione Radio-fonica Italiana	IRO 425 m.	Rome	Concert, followed by News and Dance Music	11 p.m.	4 Kw.
254	8.30	Radio Toulouse	—— 441 m.	France	News, followed by Concert	10 p.m.	2 Kw.
252	8.30	Lyons	—— 280 m.	France	Concert	10 p.m.	500 Watts.
75	8.30	Ecole Sup. des Postes	FPTT 458 m.	Paris	Concert, sometimes preceded by Lecture	10 p.m.	500 Watts.
77	8.30	Radio-Paris	SFR 1750 m.	Clichy	News, followed by Concert	10 p.m.	4 Kw.
177	9.0	Radio-Barcelona	EAJ1 325 m.	Barcelona	Concert	11 p.m.	650 Watts.
312	9.0	Radio Club, Sevillano	EAJ5 357 m.	Seville	Concert	11 p.m.	1.5 Kw.
327	9.30	Voxhaus	B 505 m. and 576 m.	Berlin	Cabaret Dance Music Thurs. & Sat.	11 p.m.	45 Kw.
301	10.0	Bilbao	EAJ11 383 m.	Spain	Concert	12 midnight	1 Kw.
78	10.0	Radio-Iberica	RI 392 m.	Madrid	Concert	2 hrs. (Time varies to 4 p.m. and 6 p.m. on every alternate day of month)	3 Kw.
79	10.0	Eiffel Tower	FL 2650 m.	Paris	Time Signal in Greenwich Side-real Time (Spark)	5 mins.	60 Kw.
80	10.10	Eiffel Tower	FL 2650 m.	Paris	Weather Forecast	5 mins.	5 Kw.
81	10.44	Eiffel Tower	FL 2650 m.	Paris	Time Signal in G.M.T. (Spark)	3 mins.	60 Kw.
313	11.0	Radio-Catalana	EAJ13 460 m.	Barcelona	Concert	12 midnight	1 Kw.
82	11.57	Nauen	POZ 3000 m.	Berlin	Time Signal in G.M.T. (Spark)	8 mins.	50 Kw.

SUNDAYS.

Ref. No.	G. M. T.	Name of Station.	Call Sign and Wavelength.	Situation.	Nature of Transmission.	Closing Time or Approx. Duration.	Approx. Power used.
	a.m.						
83	7.30	Frankfurt	—— 470 m.	Germany	Morning Prayer	1 hour	1.5 Kw.
85	7.30	Leipzig	—— 452 m.	Germany	Morning Prayer	9 a.m.	1.5 Kw.
165	8.0	Konigsberg	—— 463 m.	E. Prussia	Morning Prayer	8.45 a.m.	1 Kw.
212	8.0	Voxhaus	B505m. & 576m.	Berlin	Morning Prayer	9 a.m.	4.5 Kw.
328	8.0	Dortmund	—— 283 m.	Germany	Morning Prayer	9.0 a.m.	1.5 Kw.
214	8.0	Munster	—— 410 m.	Westphalia	Morning Prayer	9.0 a.m.	3 Kw.
329	8.15	Hamburg	HA 395 m. & 460 m.	Germany	Morning Prayer	9.15 a.m.	1.5 Kw. and 4 Kw.
265	9.0	Helsingfors	—— 318 m.	Finland	Divine Service	9.30 a.m.	750 Watts.
86	9.0	Komarow	—— 1800 m.	Czecho-Slovakia	Sacred Concert	1 hour	1 Kw.
346	9.0	Ryvang	—— 1150 m.	Sweden	Divine Service	10.0 a.m.	800 Watts.
256	9.0	Copenhagen	—— 775 m.	Denmark	Divine Service	10.15 a.m.	1.5 Kw.
87	9.23	Eiffel Tower	FL 2650 m.	Paris	Time Signal in G.M.T. (Spark)	3 mins.	60 Kw.
207	9.30	Oslo	—— 382 m.	Norway	Divine Service	10.30 a.m.	1 Kw.
213	9.40	Bloemendaal	—— 315 m.	Holland	Divine Service	2 hours	40 Watts.
330	9.40	Hilversum	NSF 1050 m.	Holland	Divine Service	11.10 a.m.	10 Kw.
90	10.0	Strasnice	—— 546 m.	Prague	Classical Music	1 hour	1 Kw.
92	10.0	Radio-Wien	—— 530 m.	Vienna	Concert	11.50 a.m.	1.4 Kw.
89	10.0	Eiffel Tower	FL 2650 m.	Paris	Time Signal in Greenwich Side-real Time (Spark)	5 mins.	60 Kw.
64	10.30	Stuttgart	—— 446 m.	Wurtemberg	Classical Concert	1 hour	1.5 Kw.
192	10.30	Munich	—— 485 m.	Bavaria	Sacred Concert	no n	1.5 Kw.
96	10.30	Konigswus-terhausen	LP 1300 m.	Berlin	Concert	11.50 p.m.	10 Kw.
95	10.44	Eiffel Tower	FL 2650 m.	Paris	Time Signal in G.M.T. (Spark)	3 mins.	60 Kw.
98	11.0	Stockholm	SASA 440 m.	Sweden	Divine Service	12.15 p.m.	1 Kw.
97	11.20	Eiffel Tower	FL 2650 m.	Paris	Fish Market Quotations	4 mins.	5 Kw.
101	11.57	Nauen	POZ 3000 m.	Berlin	Mid-day Time Signal in G.M.T. (Spark)	3 mins.	50 Kw.
	p.m.						
273	12.10	Breslau	—— 418 m.	Silesia	Sacred Concert	11.55 p.m.	1.5 Kw.
102	12.45	Radio-Paris	SFR 1750 m.	Clichy	Concert, followed by News	1.45 p.m.	4 Kw.
331	2.30	Radio-Iberica	RI 392 m.	Spain	Concert	5.30 p.m.	1.5 Kw.
215	3.0	Munster	—— 410 m.	Westphalia	Concert	5.30 p.m.	
216	3.0	Lyngby	—— 2400 m.	Denmark	News	10 mins.	
332	3.0	Radio Sala-manca	EAJ 22 290 m.	Spain	Concert	4 p.m.	1.5 Kw.

SUNDAYS (Contd.)

Ref. No.	G. M. T.	Name of Station.	Call Sign and Wavelength.	Situation.	Nature of Transmission.	Closing Time or Approx. Duration.	Approx Power used.
168	3.0	Konigsberg	— 463 m.	East Prussia	Light Orchestra	5.0 p.m.	1 Kw.
107	3.0	Frankfurt	— 470 m.	Germany	Children's Corner	4.0 p.m.	1.5 Kw.
106	3.0	Radio-Wien	— 530 m.	Vienna	Afternoon Concert	5.0 p.m.	1.5 Kw.
105	3.0	Stuttgart	— 446 m.	Wurtemberg	Light Orchestra	5.0 p.m.	1.5 Kw.
108	3.30	Munich	— 485 m.	Bavaria	Concert	5.0 p.m.	1.5 Kw.
169	3.30	Voxhaus	B 505 m. and 576 m.	Berlin	Light Orchestra	5.0 p.m.	4.5 Kw.
170	3.30	Leipzig	— 452 m.	Germany	Light Orchestra	5.0 p.m.	1.5 Kw.
167	4.0	Zurich	— 515 m.	Switzerland	Hotel Baur-au-lac, Concert relayed	6.0 p.m.	500 Watts.
171	4.0	Frankfurt	— 470 m.	Germany	Light Orchestra	5.0 p.m.	1.5 Kw.
217	4.40	Bloemendaal	— 315 m.	Holland	Divine Service	6.40 p.m.	40 Watts.
111	5.0	Radio-Belge	SBR 265 m.	Brussels	Concert	1 hour	2.5 Kw.
219	5.0	Malmo	SASC 270 m.	Sweden	Concert	7.0 p.m.	1 Kw.
257	5.30	Hamburg	HA 395 m. and 460 m.	Germany	Concert	7.0 p.m.	1.5 Kw. and 4 Kw.
333	5.30	RadioBarcelona	EAJ1 325 m.	Spain	Concert	9.0 p.m.	1.5 Kw.
112	6.0	Eiffel Tower	FL 2650 m.	Paris	Concert, followed by News	1 hour	5 Kw.
334	6.0	Helsingfors	— 318 m.	Finland	Concert	8.30 p.m.	750 Watts.
220	6.30	Voxhaus	B 505 m. and 576 m.	Berlin	Evening Programme followed by Dance Music	11.0 p.m.	4.5 Kw.
335	6.30	Dortmund	— 283 m.	Germany	Concert	8.30 p.m.	1.5 Kw.
174	6.30	Munich	— 485 m.	Bavaria	Concert	9.30 p.m.	1 Kw.
269	7.0	Oslo	— 382 m.	Norway	Concert, followed by Dance Music	11.0 p.m.	1 Kw.
336	7.0	Radio Cartagena	EAJ16 335 m.	Spain	Concert	8.0 p.m.	1.5 Kw.
337	7.0	Radio-Cadiz	EAJ3 350 m.	Spain	Concert	9.0 p.m.	1.5 Kw.
338	7.0	Berne	— 302 m.	Switzerland	Concert	9.30 p.m.	.5 Kw.
237	7.0	Strassnice	— 546 m.	Czecho-Slovakia	Concert	8.0 p.m.	1 Kw.
176	7.0	Copenhagen	— 775 m.	Denmark	Concert, followed by News	8.30 p.m.	1 Kw.
114	7.0	Radio-Wien	— 530 m.	Vienna	Concert	9.30 p.m.	1.5 Kw.
173	7.0	Frankfurt	— 470 m.	Germany	Lecture, followed by Evening Programme	10.0 p.m.	1.5 Kw.
119	7.0	Hamburg	HA 395 m. and 460 m	Germany	Concert, followed by News	9.0 p.m.	1.5 Kw. and 4 W.
120	7.0	Eiffel Tower	FL 2650 m.	Paris	General Weather Forecast	8 mins.	5 Kw.
125	7.0	Stuttgart	— 446 m.	Wurtemberg	Concert	10.0 p.m.	1.5 Kw.
124	7.0	Breslau	— 418 m.	Silesia	Light Orchestra, Dance Music from 9.0 p.m.	10.0 p.m.	1.5 Kw.
116	7.0	Munster	— 410 m.	Westphalia	Classical Concert	9.0 p.m.	3 Kw.
122	7.15	Zurich	— 515 m.	Switzerland	Concert, followed by News	10.0 p.m.	500 Watts.
123	7.15	Leipzig	— 452 m.	Germany	Symphony Concert	10.0 p.m.	1.5 Kw.
118	7.20	Konigsberg	— 463 m.	E. Prussia	Concert	9.0 p.m.	1 Kw.
270	7.40	Hilversum	NSF 1050 m.	Holland	Concert	9.10 p.m.	10 Kw.
175	7.40	Radiofonica-Italiana	IRO 425 m.	Rome	Concert, followed by late News	10.0 p.m.	3 Kw.
121	8.0	Lausanne	HB2 850 m.	Switzerland	Concert or Talk	9.30 p.m.	300 Watts.
339	8.0	Radio Agen	— 318 m.	France	Weather Forecast	10 mins.	250 Watts.
340	8.0	Radio-Catalana	EAJ13 460 m.	Spain	Concert	11.0 p.m.	1.5 Kw.
128	8.15	Radio-Paris	SFR 1750 m.	Clichy	Detailed News Bulletin	9.0 p.m.	4 Kw.
127	8.30	Radio-Belge	SBR 265 m.	Brussels	Concert, followed by News	10.10 p.m.	2.5 Kw.
341	8.30	Radio-Toulouse	— 441 m.	France	Concert	10.30 p.m.	1.5 Kw.
129	8.30	Ecole Superieure	FPTT 458 m.	Paris	Concert or Lecture (May begin 15 mins. earlier or later)	10.30 p.m.	500 Watts.
130	8.45	Radio Paris	SFR 1750 m.	Clichy	"Radio Ball" Programme of Dance Music	10.30 p.m.	4 Kw.
342	9.0	Radio Salamanca	EAJ22 290 m.	Spain	Concert	11.0 p.m.	1.5 Kw.
343	9.0	Radio-Sevillano	EAJ5 350 m.	Spain	Concert	10.0 p.m.	1.5 Kw.
131	9.15	Petit-Parisien	— 345 m.	Paris	Concert (items announced in English as well as French)	11.0 p.m.	500 Watts.
133	10.0	Eiffel Tower	FL 2650 m.	Paris	Time Signal in Greenwich Sidereal Time (Spark)	3 mins.	60 Kw.
344	10.0	Radio-Vizcaya Bilbao	EAJ11 383 m.	Spain	Concert	12 midnight	1.5 Kw.
134	10.44	Eiffel Tower	FL 2650 m.	Paris	Time Signal in Greenwich Mean Time (Spark)	3 mins.	60 Kw.
345	11.0	Radio-Sevilla	EAJ17 300 m.	Spain	Concert	1.0 a.m.	1.5 Kw.
135	11.57	Nauen	POZ 3000 m.	Berlin	Time Signal in G.M.T. (Spark)	8 mins.	50 Kw.

Ref. No.	G. M. T.	Name of Station.	Call Sign and Wavelength.	Situation.	Nature of Transmission.	Closing Time or Approx. Duration.	Approx. Power used.

SPECIAL DAYS.

Ref. No.	G. M. T.	Name of Station.	Call Sign and Wavelength.	Situation.	Nature of Transmission.	Closing Time or Approx. Duration.	Approx. Power used.
	a.m.						
156	11.0	Radio-Wien ..	—— 530 m.	Austria ..	Tues., Thurs., Sat. Concert ..	12.50 p.m.	1.5 Kw.
	p.m.						
224	3.20	Munich ..	—— 485 m.	Bavaria ..	Wed., Children's Corner ..	½ hour	1.5 Kw.
203	5.0	Gotenborg ..	SMZX 460 m.	Sweden ..	Tues., Concert	8.0 p.m.	300 Watts.
180	5.30	Belgrade ..	HFF 1650 m.	Serbia ..	Tues., Thurs. and Sat., Concert..	1 hour	500 Watts.
142	5.40	Hilversum ..	NSF 1050 m.	Holland	Mon., Children's Hour	6.40 p.m.	2 Kw.
271	6.0	Helsingfors ..	—— 370 m.	Finland ..	Tues., Thurs. and Sat., Concert..	8.0 p.m.	1 Kw.
147	6.0	Stockholm ..	—— 440 m.	Sweden ..	Wed., Thurs., Fri., Sat., Concert	7.0 p.m.	——
137	6.15	Lausanne ..	HB2 850 m.	Switzerland	Wed., Children's Corner ..	1 hour	300 Watts.
221	7.0	Copenhagen ..	—— 775 m.	Denmark ..	Thurs. and Sat., Concert ..	8.30 p.m.	1.5 Kw.
258	7.30	Ryvang ..	—— 1150 m.	Denmark ..	Tues., Wed. and Sat., Concert	8.30 p.m.	800 Watts.
223	8.0	Malmo ..	SASC 270 m.	Sweden ..	Thurs. and Sat., Dance Music..	10.0 p.m.	500 Watts.
225	8.30	Le Matin ..	SFR 1750 m.	Paris ..	Sat., Special Gala Concert ..	11.0 p.m.	4 Kw.
232	9.0	Voxhaus ..	B 505 m. and 576 m.	Berlin ..	Thurs. and Sat., Dance Music	11.0 p.m.	4.5 Kw.
210	9.0	Radio-Wien ..	—— 530 m.	Vienna ..	Wed. and Sat., Dance Music ..	11.30 p.m.	1.5 Kw.
154	9.15	Petit-Parisien..	—— 345 m.	Paris ..	Tues., Thurs. and Sat., Concert (Items announced in English as well as French)	11.0 p.m.	500 Watts.
155	10.0	Radio-Paris ..	SFR 1750 m.	Clichy ..	Two evenings per week, Dance Music	10.45 p.m.	4 Kw.
272	10.0	Munich ..	—— 485 m.	Bavaria ..	Wed. and Sat., Dance Music ..	11.0 p.m.	1.5 Kw.

The following are Relay Stations :—

Kassel, 288 m., 1 kw.; relays Frankfurt.
Dresden, 292 m.; mostly relays Leipzig.
Eberfeld, 259 m and Dortmund 283 m, relay Munster.
Nuremberg, 340 m, 1 kw.; relays Munich.
Graz, 404 m.; relays Radio-Wien 3 days a week.
Hjorring Radiofonistation, 1250 m.; relays Copenhagen. Odense Radiotelefonistation, 950 m.; relays Ryvang
Lyons La Doua, 480 m., Marseilles, 350 m., and Toulouse, 310 m.; relay Ecole Superieure, Paris.
Bremen, 279 m., 1 kw; and Hanover, 296 m., 1 kw.; relay Hamburg.

The Future of the B.B.C.

As most readers know, the licence of the British Broadcasting Company terminates at the end of this year, and a committee is now sitting to decide what shall be the future of broadcasting in this country.

Preliminary meetings of the committee were held at the House of Lords on December 3rd and 4th, 1925, at which evidence was taken from the three principal parties.

The evidence of the Post Office was first heard, but this hearing was *in camera*, so that no details are available.

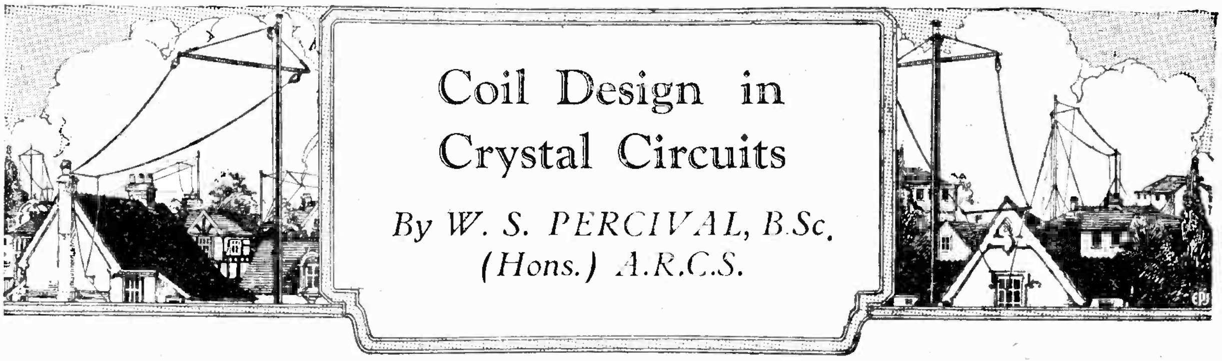
The B.B.C., in outlining their position and plans for the future, had a very able exponent in Mr. J. C. W. Reith, the Managing Director.

He stated that, whatever the future of broadcasting might be, it would be necessary to have unified control. They (the B.B.C.) had been criticised, of course, as a private concern enjoying the privileges of a monopoly, but they had always tried to do their duty to the public.

Future schemes proposed included the reduction of the number of stations from twenty-two to fifteen, the smaller number being compensated for by larger powers. The problem of providing alternative high- and low-brow programmes was receiving their consideration at the present time, and it was hoped that a solution of the difficulty would be found by providing two transmissions on different frequencies, from the same station.

The evidence of the third party—the Wireless League—was intended to represent the point of view of the listeners. The chairman, Sir A. Stanley, proposed a British Broadcasting Commission on the lines of the National Gallery Trustees. The suggested constitution, however, approximates very closely to the existing board, so that the necessity for change was not apparent.

A complete report of the proceedings appeared in *Wireless Weekly* for December 16, and also *Wireless* for December 19. Full reports of the further meetings on the subject now being held will also appear in these journals.



Coil Design in Crystal Circuits

By W. S. PERCIVAL, B.Sc. (Hons.) A.R.C.S.

It is well known that improved results are obtainable on a crystal set by tapping the detector circuit across part of the coil only. This article explains why and where to tap for the best signals.

ONE of the most desirable tendencies in present day wireless is the introduction of exact measurements of high-frequency losses in wireless circuits.

In this article an attempt has been made to elucidate a very general principle involving damping in wireless circuits, and to indicate the best sizes for coils in crystal sets.

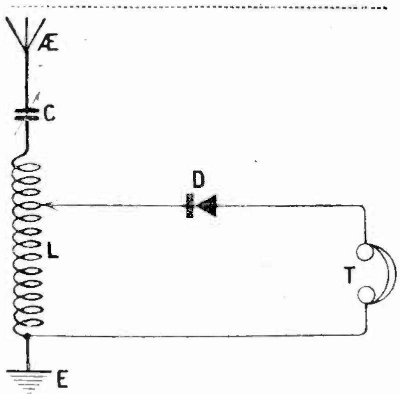


Fig. 1.—For best results the crystal is only tapped across part of the coil L.

Fig. 1 shows a very common crystal receiver in which series tuning is employed. Now theory indicates that in such circuits series tuning is more efficient than parallel tuning, although the difference is often not very great. A receiver tuned with a series capacity is also somewhat simpler to deal with theoretically, and so will be used as the basis of the discussion to follow.

An Equivalent Circuit

Fig. 2 represents the previous circuit, but expressed in what is, for our purpose, a more convenient form. C represents the series tuning capacity, combined with that of the aerial, by means of a simple formula which need not, however, concern us here. Actually some of the aerial capacity should be combined with the self capacity of the coil, and be placed in parallel with the latter. Since this capacity is not generally large, and it does not appreciably affect the theory, it will be neglected in the subsequent remarks. L_1 represents the inductance of the aerial, and that part of the tuning inductance across which the crystal is not tapped. The remainder of the inductance is denoted by L_2, while r represents the resistance of the crystal and telephones. Finally R is the series resistance of the aerial, coil and earth connection.

Further Simplification

Now it can be shown that when R is much smaller than r the resistance r in parallel with L_2 is approximately equivalent to a series resistance of $\frac{\omega^2 L_2^2}{r}$, where ω is 2π times the frequency of the incoming oscillations. This must be added to the resistance R already present, to obtain the apparent total resistance of the circuit which is therefore $R+\frac{\omega^2 L_2^2}{r}$.

We are thus enabled to draw the circuit in a still more simplified form as in Fig. 3, where E is the E.M.F. applied to the aerial, E_1 is the E.M.F. across the whole of the coil, and e is the potential difference across the crystal. It will be noted that the new series resistance is all placed outside the inductance across which the crystal is tapped. This is justified if the effective series resistance $R+\frac{\omega^2 L_2^2}{r}$ is small compared to the impedance of the coil, which is almost always the case.

Now the input voltage E is constant, and it is our object to adjust the crystal tapping-point until $\frac{e}{E}$ is a maximum. We may consider this as being made up of the product of two other ratios, $\frac{e}{E_1}$ and $\frac{E_1}{E}$.

Now $\frac{E_1}{E}$ is equal to the ratio of the impedance of the coil to that of the whole circuit, *i.e.*, $\frac{\omega(L_1+L_2)}{R+\frac{\omega_2 L_2^2}{r}}$ since the impedance of the latter when it is tuned is purely resistive, and equal to $R+\frac{\omega^2 L_2^2}{r}$. This ratio is thus greatest when L_2 is least, which means that to make the P.D. across the whole coil a maximum, the crystal should be tapped across as few turns as possible.

On the other hand, in order to make $\frac{e}{E_1}$ as large as possible we should tap across all the turns in circuit. In this case $e=E_1$ and

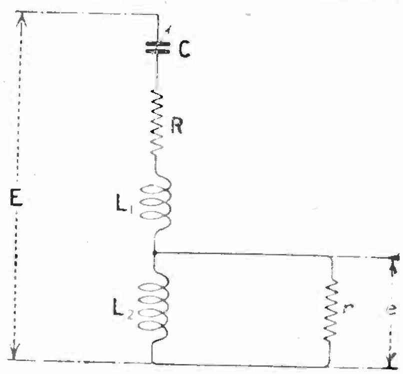


Fig. 2.—This circuit is equivalent to that of Fig. 1.

the ratio has its maximum value of unity.

We have thus to effect a compromise between two contradictory conditions. If we start by tapping across zero turns, and gradually increase the inductance L_2 across which we tap the crystal, we shall gradually increase the ratio $\frac{e}{E_1}$ and decrease $\frac{E_1}{E}$. At a certain point which is known as the optimum tapping the product attains its maximum value. Thereafter it decreases owing to the decrease in E_1/E outweighing the increase in e/E_1.

It can be shown math matically that this occurs when $R = \frac{\omega_2 L_2^2}{r}$ or in other words, when the damping due to the series resistance R is equal to that due to the parallel load r. The above formula can also be expressed in the form $L_2 = \frac{\sqrt{Rr}}{\omega}$.

Practical Deductions

Several deductions can be drawn from this expression which are of general interest to designers of crystal sets. Thus in a low-loss aerial and earth system, used in conjunction with a well-designed coil, we should expect R to be small; and, therefore, to get the best results the crystal should be tapped across only a few turns, in other words, L_2 should be small. With a poor aerial, *i.e.*, one with a large high-frequency resistance, we should find on the other hand that the crystal must be tapped across almost the whole of the inductance. This is the reason why a tapped coil is of little advantage on a poor aerial system.

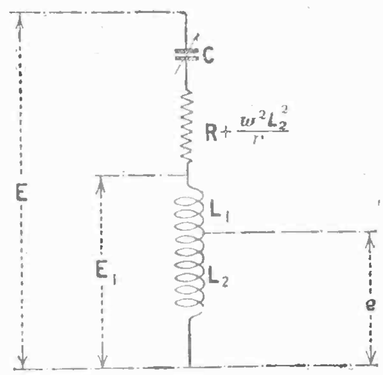


Fig. 3.—The damping of the crystal may be represented by an additional series resistance.

We may now consider the effect of L_1, *i.e.*, that portion of the inductance across which the crystal is not tapped. This portion of the inductance has quite an appreciable resistance of its own, and it is therefore desirable to cut it down as much as possible. In other words, our coil should be as small as is consistent with there being sufficient inductance on which to obtain an optimum tapping-point and to tune the circuit.

It is well known to those who use tapped coils that the best tapping-point varies to some extent according to the crystal contact. This is owing to the differences in the resistances of the contact, and is to be expected theoretically. If a perikon combination is used instead of the more usual galena, a considerably larger inductance will be required. This is due to the larger resistance and therefore smaller damping of the perikon.

Selectivity

Before concluding we may draw attention to one other question which is of importance in connection with tapping, and that is selectivity. This is discussed elsewhere in this issue by Dr. Robinson.

If a condenser in parallel with the coil is used for tuning, the theory must be somewhat modified, but the general conclusions are not greatly affected.

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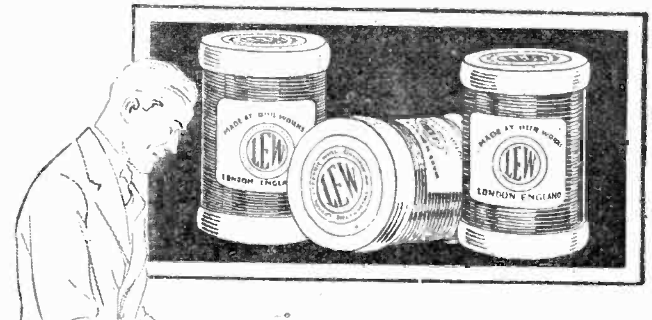

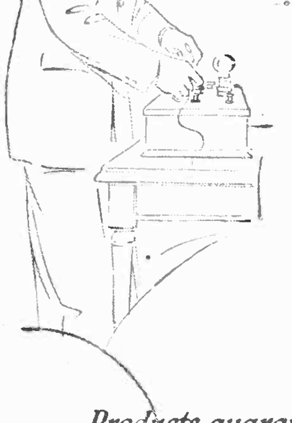

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JUDD

The Transatlantic Tests

Details of the important experiments which are to take place in the latter part of January

FOR the past two years International Broadcast tests have been arranged in the middle of the winter, when the conditions are the most favourable, in order to try and establish records of long-distance reception. To facilitate such reception arrangements are made on both sides of the Atlantic for broadcasting stations to transmit definite and suitable programmes at certain stated times only, after which all transmission ceases as far as possible. Thus at the time when the American stations are transmitting every endeavour will be made to restrict transmission on this side of the Atlantic so that the listeners may have the greatest possible opportunity for receiving the American programme.

Careful Organisation

The arrangements naturally require considerable preparation beforehand, and the organisation for this third International test is now well advanced. In America our contemporary, *Radio Broadcast*, is making the necessary arrangements, the organisation on this side being carried out by Radio Press, Ltd. Detailed information will be given immediately prior to the event in our weekly publications, *Wireless Weekly* and *Wireless*. We are able to give preliminary information, however, as follows :—

The last week in January has been fixed for the test. Experience indicates that it is the most satisfactory time from all points of view. The American, Canadian, Mexican and Cuban Broadcasting Stations will transmit from 10 to 11 p.m., Eastern standard time, beginning on the evening of Sunday, January 24th, and continuing throughout the week. Owing to the difference in time between America and Europe, these times will be 3 a.m. to 4 a.m., G.M.T. The English and Continental stations will then take the air from 4 a.m. to 5 a.m. G.M.T.

Progressive Transmissions

Some interesting arrangements are being made in America to group the stations on one or more of the nights, e.g., during the first 15 minutes of the hour the Eastern Group will transmit, the second period being given to Central zone, the third to the Western Mountain Group and the last 15 minute period to the stations in the Pacific zone.

It is possible that similar arrangements will be made among the European stations on the last night of the test, Saturday, January 30th. As at present arranged, transmission of programmes will take place from several British stations including 5XX, and from leading stations on the Continent.

Arrangements are also in hand for a test of the effect of latitude on the reception. Thus for one quarter of an hour, say, the Canadian stations would transmit, followed in quarter of an hour periods by the Northern and the Southern United States stations, and finally the stations south of the United States. Similar arrangements may be made on this side of the Atlantic.

CALIBRATE YOUR OWN RECEIVER.

On Wednesday January 13th the frequencies on the main B.B.C. stations will be accurately measured by the Radio Press Laboratories at the following times :—

Station.	Time (p.m.).
Aberdeen	7.45
Birmingham	7.55
Belfast	8.5
Glasgow	8.15
Newcastle	8.25
Bournemouth	8.35
Manchester	8.45
London	8.55
Cardiff	9.5

The results will be published in "Wireless Weekly" the following Wednesday, so enabling readers to calibrate their own receivers.

Good Conditions

The times, of course, are somewhat awkward. They have to be chosen because it is only during this period that complete darkness stretches over the Atlantic and reception is satisfactory. We trust that all who can will participate in the test, which should be particularly interesting in view of the almost complete absence of interference which is expected owing to the fact that all the regular broadcasting stations on this side will have closed down.

Readers who are interested should make a particular point of following our weekly publications during the next few weeks in order that they may keep informed of the arrangements which are being made. In America the actual programme transmitted any one night is being published the next morning in the daily press.

Calibration of Receivers

In order to take fullest advantage of this test it is necessary for the receiver to be accurately calibrated. We would particularly refer our readers, therefore, to the calibration scheme organised by our Elstree Laboratories, which is now in full swing.

On certain evenings the frequencies of the main stations of the B.B.C. are accurately measured at stated times. These results are published in the following issue of *Wireless Weekly.*

The amateur, therefore, simply tunes into as carefully as possible to each broadcasting station at the appropriate time and notes the dial reading. Reference to the published figures the following week will give the exact frequencies (or wavelengths) at these points, so that a calibration curve may be drawn from the receiver.

WIRELESS TIME SIGNALS.

Changes in French Issue.

The following information is reproduced through the courtesy of the Royal Observatory, Edinburgh.

FOLLOWING a series of resolutions adopted at the meeting of the International Time Commission at Cambridge in July last, certain changes will be made in the issue of Time Signals from radio stations in France, commencing on January 1st, 1926.

The present series of signals from the Eiffel Tower (FL), Lyons (Doua, YN) and Bordeaux (Lafayette, LY) will be withdrawn and will be replaced by the series shown in table at foot of page.

This series will be put into operation in the first instance for a period of four months, after which it is contemplated that No. 3 may be withdrawn and No. 5 replaced by an issue of the International and Rhythmic Signal from FL, simultaneously with that from LY at 20h. By that time it is expected that the issue on spark from FL will be replaced by an issue on modulated CW.

In the meantime the issues Nos. 3 and 5 will take the same form as hitherto, and for ordinary users the only service which is withdrawn is the issue of the Old Semi-automatic Series from FL at 10h. 45m.

The form taken by the issue No. 1 is the following :—

(*a*) Preliminary signal.

(*b*) Times of issue of rhythmic signal of the *previous day* as determined by the *Bureau International de l'Heure*, Paris.

(*c*) Commencing at 7h. 57m. 55s., the International Signal, as hitherto, except that the three dashes which have constituted the Time Signal are to be replaced by dots, commencing at the seconds 55.0, 56.0, 57.0, 58.0, 59.0, 60.0 and lasting each about 0.2 sec.

(*d*) Commencing at 8h. 1m. 0s., a new rhythmic issue of 306 signals, falling as follows :—

1m. 0s.	1st dash	followed	by	60	dots
2m. 0s.	62nd	,,	,,	,,	,,
3m. 0s.	123rd	,,	,,	,,	,,
4m. 0s.	184th	,,	,,	,,	,,
5m. 0s.	245th	,,	,,	,,	,,
6m. 0s.	306th				

The *commencements* of all these signals are to be evenly spaced ; the commencements of the dashes are intended to fall precisely at the commencements of the seconds of mean time and they will be each about one-half second in duration ; the dots will be about one-fifth of a second in duration.

Besides these issues upon the wavelengths hitherto employed by FL and LY respectively, issues Nos. 6 and 7 will be made at 8h. and at 20h, simultaneously by both stations on *short wavelengths*—namely, 32 metres and 75 metres, on the same pattern as the issues Nos. 1, 2 and 4 below, during the probationary period of four months. After that, it is contemplated that one or other of these wavelengths may be suppressed and the other retained permanently in addition to the series (1)—(5) below.

A period of probation of four months has been adopted in order to ascertain how far the new issues meet both general and scientific requirements.

Any comments which are the result of experience on the working of the new issues, or upon the abolition of the old issues, should be addressed either to *M. le Directeur, Bureau International de l'Heure, Observatoire National, Paris, XIVe*, or to the undersigned. They should arrive not later than the beginning of March.

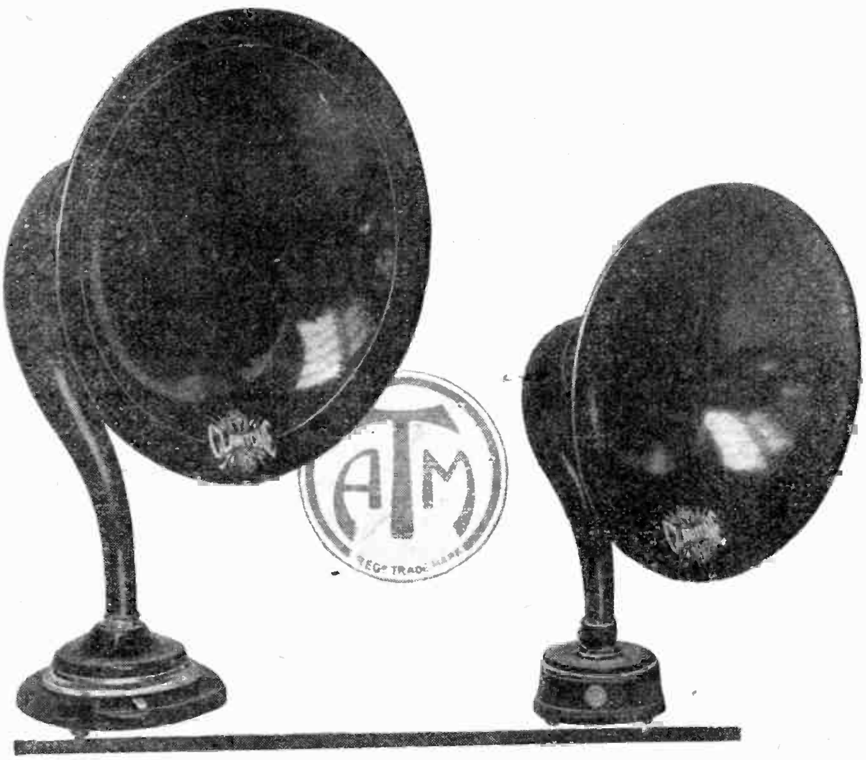
R. A. SAMPSON,

President, International Time Commission.

Royal Observatory, Edinburgh

9th December, 1925.

No.	G.M.T.	Signal.	Station.	Wavelength.	
1	8.0	International and Rhythmic Signals	FL	2,600	Spark
2	8.0	Do Do	LY	23,400	CW
3	9.30	International	FL	2,600	Spark
4	20.0	International and Rhythmic Signals	LY	23,400	CW
5	22.45	Old Semi-automatic Signal	FL	2,600	Spark
6, 7		Short Wave Emissions—*see text.*			



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35 (B.B.C.)	5/6
50	5/6
75	5/6
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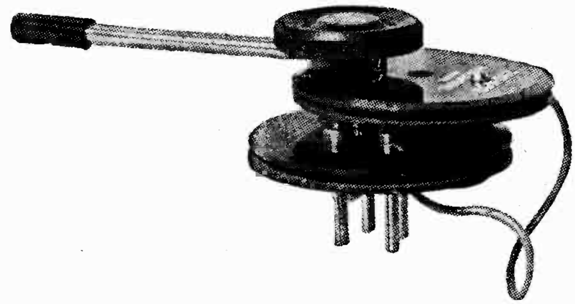

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NEW TYPE—LARGE CAPACITY.

Type R.B. 3 (72 volts) with lid removed.

THE EMBODIMENT OF ALL THAT IS ASSOCIATED WITH THE NAME.

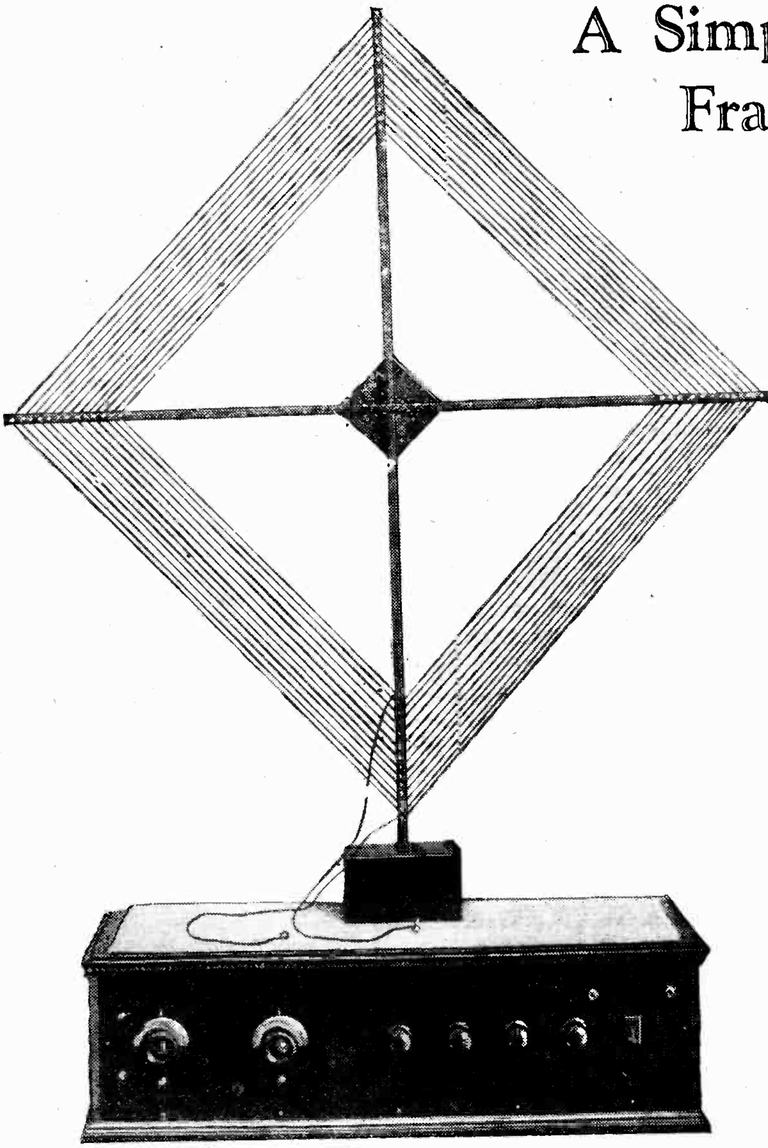
Why risk poor reception and uncertain results when ample supplies of these exceptionally reliable H.T. Batteries are now available?

Obtainable from all leading wireless dealers.

SIEMENS BROTHERS & CO., LTD., WOOLWICH, S.E.13.

A Simply Constructed Frame Aerial for the Broadcast Frequencies

by
JOHN UNDERDOWN



WITH the increasing popularity of the Supersonic Heterodyne receiver frame aerials are coming into greater prominence, and although a large number may be purchased there are many constructors who prefer to make their own. Little skill is required to make quite an efficient frame which will be equal to many a bought article, and even better than some, whilst costing but a fraction of the price asked for the latter.

Tuning Range

By far the greater number of broadcasting stations work on frequencies between 500 and 1,500 kilocycles, and the frame about to be described is designed to tune over this range with a .0005 μF variable air condenser in parallel. On actual measurement, with a J.B. low-loss condenser of the above capacity this range was more than covered, the combination tuning to 1,500 k.c. with the condenser all out, so that the minimum capacity is taken into account

Material Required

In constructing the frame the following material will be necessary:—

- One piece of thoroughly well-seasoned oak 4 ft. by 1 in. by $\frac{1}{2}$ in. and one piece 3 ft. 6 in. long of same cross-section.
- One heavy wooden block of suitable dimensions to act as a base.
- One square piece of oak or any hard wood of $4\frac{1}{2}$ in. side and $\frac{1}{4}$ in. thick.
- Four $\frac{3}{4}$ in. No. 4 wood-screws.
- Fifty-three tacks ($\frac{1}{2}$ in. or $\frac{5}{8}$ in. long.)
- Half pound 20 or 18 gauge enamelled copper wire.

Constructional Work

Since a "diamond" type frame is easier to make than a "box" type and is also somewhat more suitable, this method of construction was chosen The two pieces of 1 in. by $\frac{1}{2}$ in. cross-section oak, which should be of well-seasoned material, are used for the diagonals, and after the surfaces have been planed (if necessary) the shorter piece is half-notched in the centre and the latter at 21 in. from one end. This operation should be carried out with some care to obtain a good fit. (Fig. 1.)

Provision for Orientation

In order that the frame may be easily rotated the end of the longer cross-piece opposite to that from which the previous 21 in. measurement was made should be reduced to $\frac{1}{2}$ in. circular section to fit into the base on which the frame will eventually stand, and square shoulders should be left (Fig. 2). The circular section may conveniently be made 2 in. in length.

Simplified Winding

Having previously measured, by means of a megger, the insulation resistance between two tacks driven into well-seasoned oak at a distance of $\frac{1}{2}$ in. apart and obtained readings of infinity, it was considered unnecessary to insulate the frame turns by notched ebonite strips, and the simple method of winding seen in the photograph was adopted. At $14\frac{3}{4}$ in. from the centres of the notches on the diagonals, rows of tacks, separated by $\frac{1}{2}$ in. spacing, are driven in. Over these tacks the final winding is placed. To prevent splitting the wood it is best to drill small holes for the tacks with a suitably small drill. Thirteen tacks are required on the three upper ends of the cross-pieces and 14 for the lower end where the winding starts and finishes.

The Base

A fairly heavy wooden base is desirable for the frame, and a 6 in. square block, 2¼ in. thick, serves admirably. This should be drilled in the centre to take the ½ in. diameter circular end of the longer cross-piece. The latter should be made to rotate easily before the two cross-pieces are finally joined together.

Before the winding is commenced the 4½ in. square piece of oak should be screwed into position as seen in the photographs to give added rigidity to the framework, and is best affixed on the opposite side of the latter to that on which the turns will be wound later.

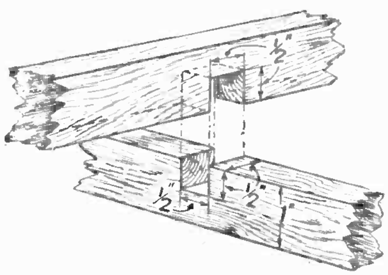


Fig. 1.—The two cross-pieces should be half-notched as shown.

The Winding

Winding the frame is not a single-handed job unless the framework is clamped to the top of a table, and it is best to obtain assistance if possible. Bare one end of the 20 or 18 gauge enamelled copper wire specified and twist several times round one of the

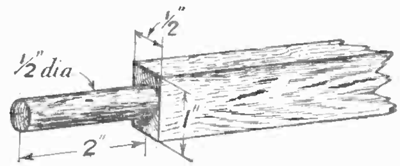


Fig. 2.—The end of the longer cross-piece should be rounded as shown.

inside tacks. The winding is thus commenced with the inner turns and wound outwards. Keep an even tension on the wire and little difficulty should be experienced in obtaining a neat appearance. I actually used 20 gauge wire and employed about six ounces thereof.

The thirteenth turn should be finished off in a similar manner to that employed at commencing. To the beginning and end of the winding solder suitable lengths of rubber covered wire to go to the frame terminal of the set. Finally the wood of the frame should receive a coating of varnish or shellac, when a useful and efficient frame results.

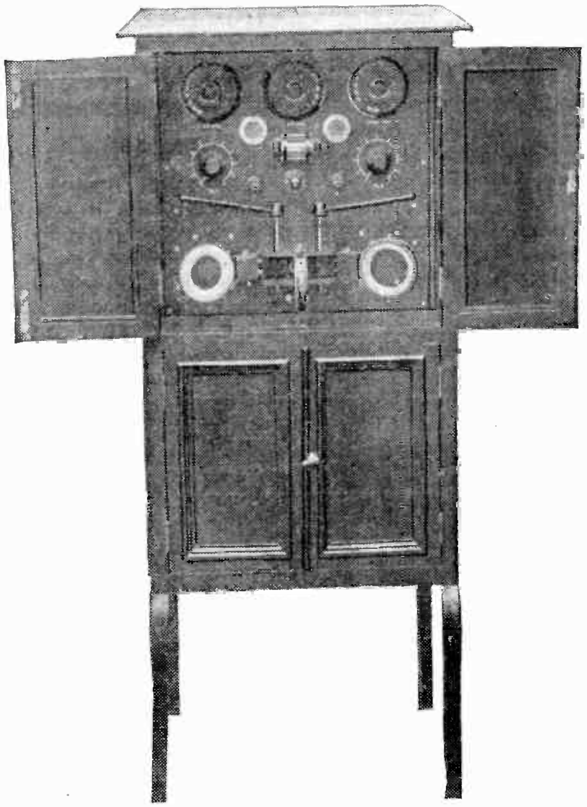
A SIMPLE CRYSTAL SET.

SIR,—I am sure you will be interested to hear what good results I get from the Crystal Set by D. J. S. Hartt, in MODERN WIRELESS, September, 1924. My house is in Dorchester, on the south-west coast, and lays in a valley. Bournemouth we get very well with a No. 25 coil, and by using a No. 150 coil Daventry comes through much louder than Bournemouth. All who have listened to it say it is the best crystal set they have heard and *I* think so too. I have made several sets with the same circuit for friends.—Yours truly, H. A. TOWNSEND.

London, S.W.7.

The Proof of the Pudding is in the Eating

What "Modern Wireless" Readers think of Radio Press Designs.



This handsome and compact loose-coupled ST100 was built by Mr. H. Rumble.

The All-Concert Receiver in New Zealand.

SIR,—I was recently fortunate enough to pick up an old copy of MODERN WIRELESS, dated September, 1923, and a perusal of its pages led to my being interested in the "All-Concert Receiver," described by Mr. Percy W. Harris. I had previously been using a simple 3-coil single valve regenerative set (home-made) and was getting excellent results from all New Zealand stations on 'phones up to 680 miles. The reading of the above-mentioned article fired me with ambition to get further afield, which to us in these islands is a very far cry, the nearest foreign station being approximately 1,260 miles. I decided to adapt my old receiver, and although I could not follow Mr. Harris's instructions as to lay-out rigidly, I must say that the ultimate results exceeded all expectations. The only variation I used in the general idea was to use separate H.T. for each valve and potentiometer control on the H.F. valve. With this set I now get all New Zealand stations on the loudspeaker with sufficient strength to fill the house. The distances of our New Zealand stations from here are Auckland, IYA and IYB, 300 miles; Wellington, 2YK and 2YB, 340 miles; Christchurch, 3AC, about 500 miles; Dunedin, 4YA, 700 miles, I have to detune slightly. These are our main stations, but there are numerous small stations of very low power which I hear on 'phones. Outside our own land I regularly each night, between 9.30 p.m. and 11.30 p.m., hear Australian stations, and I have no difficulty in receiving at comfortable loudspeaker strength either 2BL, Sydney, or 2FC, Sydney, a distance of 1,260 miles from here. I have at various times when conditions were very favourable picked up KGO, California, and KHJ, in the same American State, these stations being approximately 6,800 miles, and on one occasion, only for a brief period of about 35 minutes, I heard KDKA experimenting, reception being faint but clear. These latter stations received on 'phones of course, needless to state. The possibilities of this type of receiver are indeed great, and I have no hesitation in recommending it to those in need of a simply operated yet effective means of hearing broadcast music. I forgot to mention that, except for loud-speaker work, I use a 2-ft. frame aerial, made up with 72 ft. of No. 18 s.w.g. copper, for New Zealand stations. My outside aerial is stranded copper, 35 ft. high and 95 ft. long, earth and lead-in included, the earth being 3 ft. of heavy copper strip about 1 in. by $\frac{1}{8}$ in., soldered to a water-pipe. With reference to the coils I use in my All-Concert Receiver, the following may be of use to other wireless enthusiasts. For broadcasting wavelengths I use cardboard cylinders $4\frac{1}{8}$ in. in diameter, 1 in. in width. The primary or aerial coil has a winding of 18 turns 20-gauge copper d.c.c., the anode 25 turns of 28 gauge d.c.c. copper, and the reaction 23 turns 28 gauge d.c.c., and I find them very effective, using series or parallel condenser as needed.—Yours truly,

SAM. J. PEARSON.

Gisborne, New Zealand.

A Single-Valve Receiver for KDKA.

SIR,—May I add my congratulations to those of the many readers of MODERN WIRELESS who have built the "Single-Valve Receiver for KDKA" described by Mr. Stanley G. Rattee in the March, 1925, issue of MODERN WIRELESS.

This circuit really has solved the problem of long-distance reception on short waves. The dream of the wireless enthusiast has come true at last, namely, to be able to invite friends in any evening and get KDKA as easily as one would tune in any other station. Using a note magnifier, music can be heard comfortably loud on the loudspeaker, with remarkable purity of tone, while the absence of self-oscillation is a delight.

The fact that I followed Mr. Rattee's lay-out to the letter no doubt accounts for the pleasing results obtained.—Yours faithfully,

ROBERT J. NICHOLS.

Eltham, S.E.9.

(*Continued from page* 480.)

in the usual manner. If with the type of lamp-holders used the connections have to be taken through the baseboard, and brought through outside the holder, care should be taken to make grooves in the underside of the baseboard for the wires to run in. When the wires are in position these should be filled with paraffin wax or some similar material.

Testing out the Unit

When the construction is completed the unit can be connected up and tested, not forgetting to include the condenser in the earth lead of the set, as mentioned above and shown in Fig. 4.

The flex connected to the input of unit is joined to any convenient

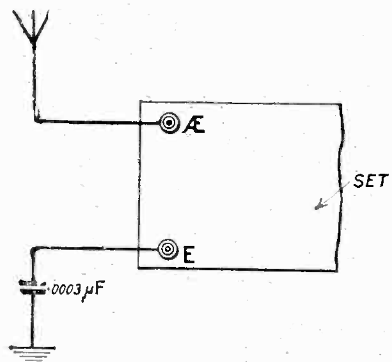


Fig. 4.—A 0.C0)3μF condenser should be inserted in the earth lead.

form of main plug, which should be plugged into the house mains, and the terminals marked output + and — are connected respectively to the H.T. + and — of the set. After ascertaining that the valve and lamps are alight the set should be switched on and tuned as usual. If no signals are heard, the main plug should be reversed in its socket.

The unit was tested at our Elstree laboratories on a three-valve set of the detector and 2 L.F. type, and also a Harmony Four Receiver, which embodies two H.F. valves. It was found to give extremely satisfactory results, no difference, indeed, being noticed to the performance with large H.T. accumulators which are normally employed.

VALVES IN SERIES

In the last issue a circuit was given on page 281 in which several valves were employed with their filaments in series. It has been found inadvisable to use this circuit with more than three valves if the 60 milliampere type is employed.

Super-Heterodyne Reception in South Africa

SIR,—Please find enclosed two photos of a Supersonic Heterodyne Wireless Set.

This was taken from the article by Mr. John Scott-Taggart in MODERN WIRELESS for May, 1924, only I have designed an oscillator of my own. The set is capable of receiving any wave-length by means of plug-in coils.

American Reception

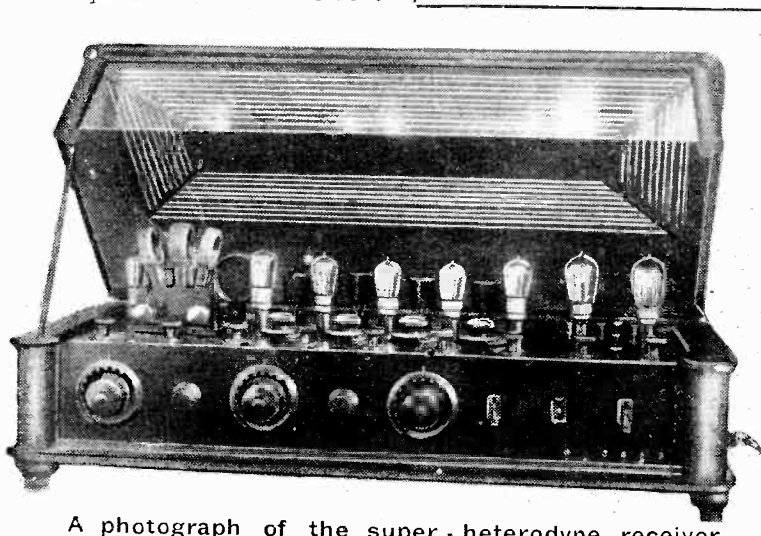
This set can be used with outside or frame aerials, and switches are provided for cutting out any high or low-frequency valves, which may be necessary. For instance, Johannesburg, 600 miles, Durban 500 mil s, and Cape Town 500 miles, c n be heard at loud-speaker strength on outside aerial with detector, oscillator, one intermediate stage, second det ctor, and one stage of power amplification, which is equivalent to any good five-valve neutrodyne set made, and is free from distortion. On short wave work this set is wonderful. KDKA up to a week or two ago could be received at loud-speaker strength any morning I wished to get up, and was free from distortion, and as clear as if it were only a few miles away. There is no doubt the supersonic is the set for short waves.

The wire wound frame aerial in the lid of the cabinet works very well, or alternatively we use an external frame of our own design. It is equivalent to an excellent outside aerial, with the addition of one or more valve, which shows that the design of our aerial is right. On the base of the frame will be seen two copper rails insulated on ebonite rods $1\frac{1}{2}$ in. apart, on which two wipes of brass spring are attached to two terminals which lead to the set. This can be rotated in any direction and any number of complete turns can be made without interference to the leads to the set.

This frame was picked out after making about six different patterns; the wire spacing was also got at by first starting at $\frac{3}{8}$ in. apart and so going up to 1 in. apart, but we found that $\frac{3}{4}$ in. was the right thing. The wire used is Danish, 240 strands 40 S.W.G. enamelled and double silk covered, making it look like a single wire 14 DSC.

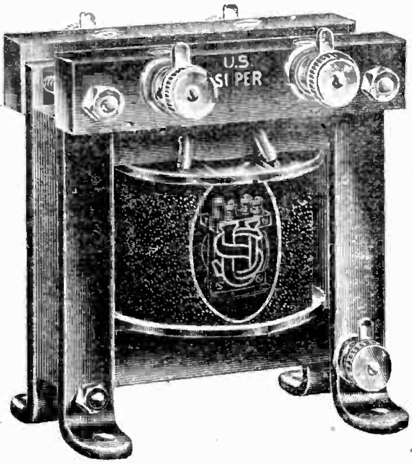
A comprehensive switching system has been adopted. Three switches are employed by means of which the number of valves in circuit is varied. One switch controls the power valves, and either a 120 or 2,000 ohm loud-speaker is used.—Yours truly, WALTER WILSON.

Port Elizabeth.



A photograph of the super-heterodyne receiver constructed by Mr. Wilson.

U.S. Transformers give Unequalled Service



All British

SUPER TRANSFORMER

"Modern Wireless" says of the U.S. Super Transformer:

"The present instrument, if the high quality of the specimen submitted is an indication, can be heartily recommended, and indicates the vast strides that have been made recently in the design of really effective transformers for L.F. amplification."

Fidelity

JUST as the master musician interprets with absolute fidelity the creation of a composer, so does the U.S. Super Transformer interpret radio transmissions. Every shade of musical tone colour, stirring overtures, whispering lullabys, is reproduced faithfully and without distortion. U.S. Super reproduction is, in fact, a revelation of what a good transformer is really capable of. It gives unusually high amplification over the whole band of audio frequencies which is consistently maintained throughout the entire range. Know the joy of perfect audio amplification and faithful radio reproduction—Incorporate the U.S. Transformer in your set.

The U.S. Transformer's success lies in the excellence of its design. The core, with no bolts through it, is packed with finest stalloy iron, allowing fullest amplification without hint of distortion; winding is done by experts; terminals are large and comfortable, with ebonite strips at top and soldering tags. **Ratios guaranteed 5-1 and 3-1.**

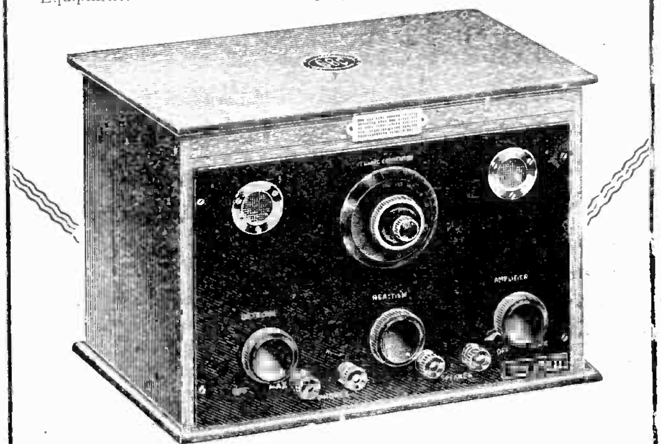
PRICE **18/6** From all dealers or direct from the manufacturers.

BRITISH MADE.

TWO VALVE CABINET SET

Complete Outfit including— Set (Two Valve, cabinet as below), High Tension Battery 60 v. Low Tension Battery. Coils (for 300-500 metres). Valves (two Dull Emitter). Standard Loud-speaker. Aerial Equipment. Flex for connecting up.

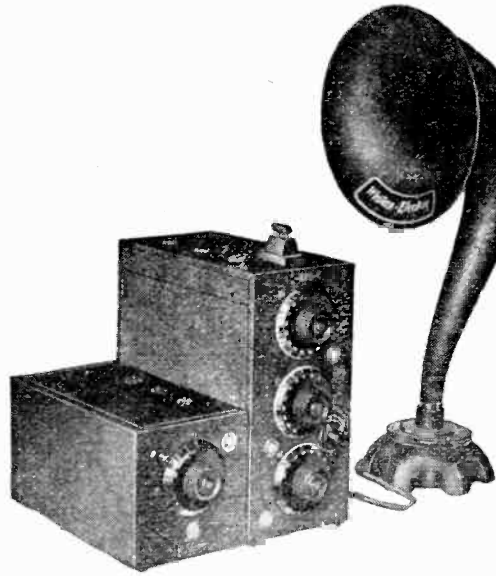
PRICE: **£8 : 10 : 0** *Including Marconi Royalties* **Nothing else required. Nothing else to pay. Absolutely Complete.**



THE U.S. RADIO CO., LTD.
Radio Works, Tyrwhitt Road, Brockley, S.E. 4.
'Phone: Lee Green 2404. Wires: Supertran, Lewis, London.

Loud Speaking Equipment

Standard
FORMERLY
Western Electric



WE are offering a complete Western Electric 5-valve Receiving Set complete with Loud Speaker for £27 - 17 - 0. This set will meet the most critical demands and gives excellent loud-speaker results from both home and foreign stations. Units may be purchased separately if desired.

Write for our booklet No. W546 for details of Western Electric Valves, Receiving Sets, Amplifiers, Loud Speakers, and Igranic accessories.

Standard Telephones and Cables Limited
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Works:—NORTH WOOLWICH, NEW SOUTHGATE and HENDON.

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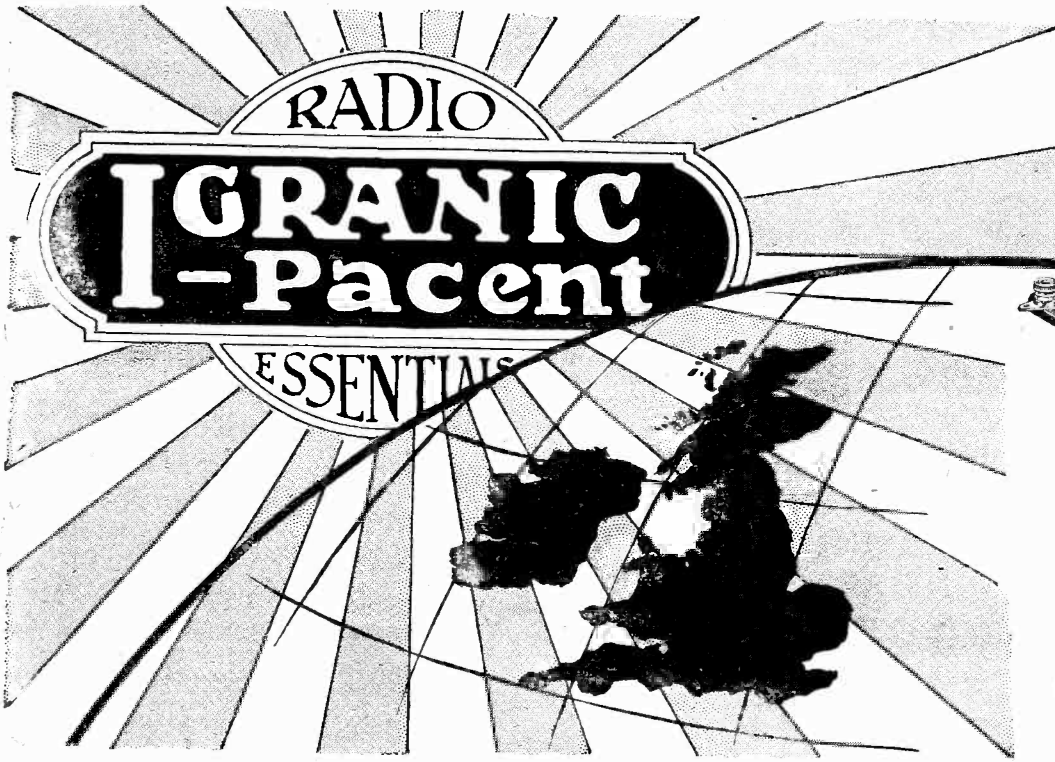
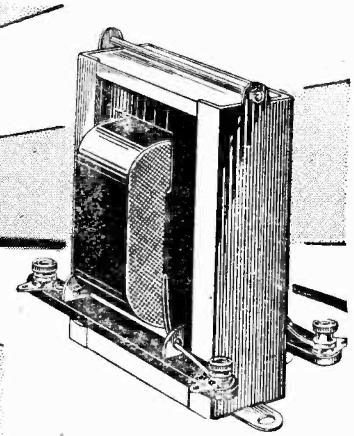
Complete for £27-17-0

And now the IGRANIC for all British Wireless





The Igranic-Pacent Super-Audioformer

A low frequency transformer remarkable for its unique amplification curve. The special construction of the core and coils gives a uniform amplification of frequencies as low as 100 and as high as 8,000, resulting in perfect, distortionless amplification of speech and music.
It is eminently suitable for use with general purpose valves and particularly for power amplification up to plate voltages of 500 volts.
Robust construction and careful manufacture eliminate breakdowns or other troubles.
Soldering tags and terminals are provided to the clearly marked primary and secondary. Price **27/-**

Thus another step in the elimination of guesswork is taken. Wireless Constructors seeking highest attainable efficiency in their sets may select from the Igranic-Pacent range of components secure in the knowledge that all of these represent the most recent developments of radio engineering research.
By the addition of the Pacent Radio Essentials Igranic have welded the experience of two great radio engineering organisations.

This is good news for those constructors and experimenters who have learned by experience that the brand Igranic signifies the super-component—for now new components augment the already comprehensive Igranic range.
The Pacent Radio Essentials have won such renown in America as to be made standard equipment in forty nationally-distributed radio receiving sets.

Write to-day for our new Igranic-Pacent booklet P8, which gives full details regarding these new devices.

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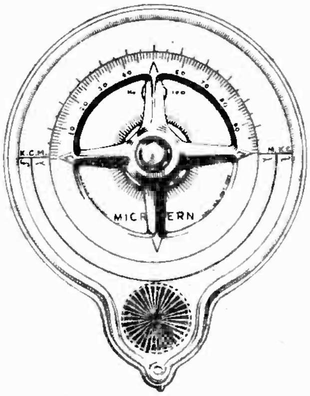
-PACENT *era* dawns Constructors



THE IGRANIC-PACENT MICROVERN.

A combined operating knob and vernier control which can be fitted to any variable condenser, variometer, variocoupler or other tuning device, Fitted with a slow motion mechanism with a reduction ratio of 5 to 1, possessing unique features. No gears are used and there is no backlash or alteration to tuning when the hand is removed from the knob.
The outside diameter is 4¼ in. and the dial acts effectively as an electrostatic shield, preventing hand capacity effects.
Stations can be recorded with pencil by name, wavelength or frequencies and the records easily and cleanly erased with a damp cloth.
Quickly mounted on a spindle by tightening one set screw, and a small brass bolt secures it in place on the panel. Suitable for 3/16 in. or ¼ in. diam. Spindles.

Prices :

Silver Finish	8/6
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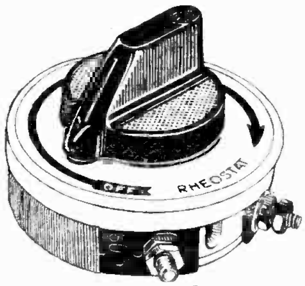
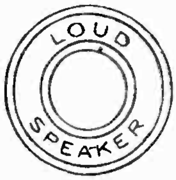


THE IGRANIC-PACENT PORCELAIN RHEOSTATS AND POTENTIOMETERS.

A porcelain base is used on these Igranic-Pacent Rheostats and Potentiometers. Fitted with moulded knob and gold or silver finished dial. Two unit construction; winding spaced to give maximum cooling effect. A 3/16 in. shaft with flat sides to facilitate mounting. Elongated holes to accommodate varying spaced mounting holes on panel.

Rheostats :—

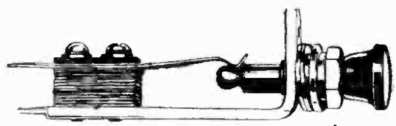
Resistance.	Current carrying capacity.	Price
6 ohms ...	... 1.5 amps.	2/6
10 ,, ...	... 1.0 ,, ...	2/6
20 ,, ...	... .6 ,, ...	2/6
30 ,, ...	... .5 ,, ...	2/6
50 ,, ...	... .3 ,, ...	2/6
Potentiometer :—		
400 ohms	... .25 amps.	2/6



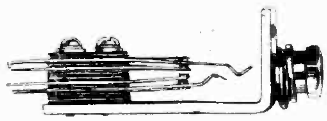
THE IGRANIC-PACENT JACK NAMEPLATE.

The Igranic-Pacent Jack Nameplate can be mounted behind the hexagon nut of a jack to indicate its purpose. Made of brass with silver or gold finish and black lettering, it is useful and attractive.
Thirteen titles are available :—
Detector Jack, First Stage Jack, Second Stage Jack, Third Stage Jack, External Jack, Input Jack, Output Jack, Loud-Speaker, Phones, Frame Aerial, Aerial-Earth, Volt-Meter and "On and Off."

Silver Finish, Price **3d.**
Gold Finish, Price **3d.**



Jack Switch and Jack Switch Attachment.



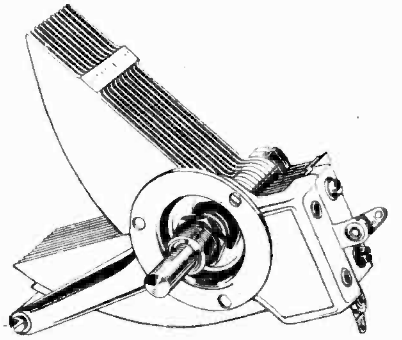
Double Circuit Jack.

THE IGRANIC-PACENT JACKS AND PLUGS.

Igranic-Pacent Jacks and Plugs provide a simple, efficient and very convenient means of carrying out many operations which are difficult with switches. In America, practically all phones and loud-speaker leads are fitted on the panel so that the mere fact of slipping the plug in the appropriate jack determines the number of valves used. The springs are of German Silver with silver contacts riveted in. Nickel-plated brass is used for the frames so as to render them non-magnetic, and the special insulating material used is far superior to the fibre insulation in so many jacks. The lugs are fan-tailed and tinned to facilitate soldering and the nipples can be adjusted to fit on any panel from ⅛ in. to ⅜ in. thickness.
The range is so extensive we advise you to write for list.

THE IGRANIC-PACENT BALCON.

An efficient and inexpensive balancing or neutralising condenser, which can be fitted in a small space on panel or baseboard. Once adjusted there is very little risk of the setting being accidentally altered.
It consists of two nickel-plated electrodes enclosed in a glass tube, over which is fitted a nickel-plated brass sleeve. The glass tube forms the dielectric and the balancing is obtained by sliding the brass sleeve along the glass tube. Price **2/-**

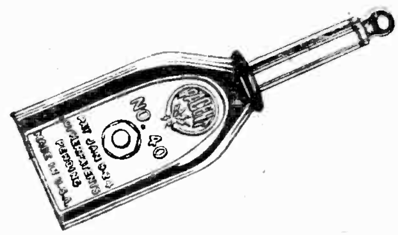


THE IGRANIC-PACENT TRUE STRAIGHT LINE FREQUENCY VARIABLE CONDENSER.

A high grade variable condenser with low-loss characteristics, a true straight line frequency curve and negligible minimum capacity. Fixed and moving plates are of brass, riveted together and soldered, ensuring permanent alignment and sound electrical connection.
Rigid channel shaped framework in continuous electrical connection with moving plates, prevents hand capacity effects.
Only two small pieces of highest quality insulating material are used, so arranged that the absorption losses are negligible.
Dust-proof bearings result in smooth, silky movement. Positive stops at minimum and maximum are contained within the bearing.
Single or three hole fixing is provided for.
Two condensers can be mounted to form a dual with single dial control.

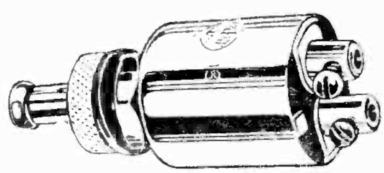
Prices :

.00035 mfd.	**14/6**
.0005 ,, ...	**18/6**



IGRANIC-PACENT UNIVERSAL PLUG.

This is one of the most popular in use to-day Standard equipment on many well-known makes of loud-speakers. To connect—insert cord tips in connector springs and clamp shells together. Polarity stamped on connector springs.
Obtainable in black. Price **1/6.**



THE IGRANIC-PACENT BATTERY SWITCH.

A neat and well finished "On and Off" Switch generally used for battery switching.
Substantial and reliable contact is assured, and there is nothing to get out of order. Special type terminals are fitted to facilitate connecting up. One hole mounting. Price **1/9.**

Radio Press News

THE preliminary announcements which appeared in the last issue of MODERN WIRELESS concerning the *Radio Press Year Book* for 1926, have aroused so much interest that some further details will no doubt be appreciated.

A special feature which was not disclosed in the previous announcement will be found in an exceedingly complete and accurate list of call signs of experimental transmitting stations.

A special effort has been made to bring this list up to date and to make it thoroughly dependable, and it will prove invaluable to everyone who listens on other wavelengths than the broadcast band.

The valve data section will make a strong appeal to the serious experimenter, providing as it does an almost unrivalled collection of easily accessible information. Just the things the practical man wants to know about a valve are presented in handy tabulated forms for scores of different types.

For the more advanced worker, again, actual characteristic curves of a very large number are also given.

For the non-technical reader the general section will be found to provide a fund of interesting and helpful matter by well-known authorities, which covers a remarkably wide field.

Articles appear from the pens of Major James Robinson, D.Sc., Ph.D., F.Inst.P., Captain H. L. Crowther, M.Sc., and many other distinguished contributors.

The articles and condensed information in the workshop section include such items as instructions on marking out and drilling panels, matting ebonite, general hints on wiring and soldering, tables of sizes of drills and taps, tables of weights per pound of ebonite, and so on. This part of the book has received special attention, and the home constructor will find that the expectations aroused by these hints will be fully borne out by the book itself when he receives his copy.

The majority of home constructors do not as a rule feel that wireless calculations come within their field, but this is probably due in large part to a feeling that the formulæ involved in such operations as the calculation of the number and size of plates required in making a fixed condenser of a certain capacity are difficult to use. The section of the *Year Book* which deals with simplified calculations will be found to remove such ideas with singular completeness, and to prove that everyone may carry out such elementary design work for himself with the aid of the simplest arithmetic.

This section has been prepared by an author well known for his capacity to present mathematics in simple form, and covers all the important calculations met with in every-day wireless work.

INCREASING EFFICIENCY IN RADIO RECEPTION.

SELECTIVITY is one of the essentials nowadays for efficient long distance reception, and in this connection might be mentioned a small and compact two-valve receiver which is described in the current issue of *The Wireless Constructor* by A. V. D. Hort, B.A. The set is specially designed for sensitivity combined with selectivity.

Selectivity

Whilst speaking of selectivity, an article by which every experimenter can benefit is that which G. P. Kendall, B.Sc., contributed to the December 26 issue of *Wireless*, entitled "What is Flat Tuning?"

The issue of *Wireless Weekly* dated December 9 also contained an interesting article on the subject by J. H. Reyner, B.Sc. (Hons.), A.M.I.E.E., which gave some most interesting and helpful information regarding the design of tuning circuits, showing just how much resistance was necessary in a circuit in order to obtain satisfactory reproduction.

Economy of Construction

The two-valve receiver, using variometer reaction control, which was described in *Wireless* dated December 26, by C. P. Allinson, makes use of a somewhat neglected method of oscillation control, and here all the necessary tuning coils are incorporated in the receiver.

Similarly, no external coils are necessary in the "Single Coil Two-Valve Receiver," described by E. J. Marriott in the current issue of *The Wireless Constructor*.

Every enthusiast will find some very material information in the article by P. W. Harris, M.I.R.E., which appeared in *Wireless* dated December 26. This was entitled "False Economy in Set Construction," and should be read by all constructors of wireless sets.

Neutrodyning Methods

In the construction of sensitive receiving equipment the neutrodyning of the H.F. valves employed is a practice which has been proved extremely efficient, and it is now extensively used. Mr. P. W. Harris, M.I.R.E., has had a wide experience in this field, so that his discussion in *Wireless Weekly*, dated December 23, of the various neutrodyning methods possible, will be found of considerable practical help to experimenters.

The possibility of distortion developing in the L.F. stages of a wireless receiver, apart from the grid bias question, is one against which adequate precaution must be taken if pure reproduction is to be obtained. Mr. J. H. Reyner has written an article dealing with this subject in a most interesting manner, and those who desire faithful reproduction of broadcast would do well to read it.

Super-Sets

Multi-valve receivers are very popular in certain circles, but it should be borne in mind, when purchasing a receiver which comes under this category, that several points must be reckoned with.

Advice to the prospective purchaser of a super-set was given in *Wireless* dated December 19 by Capt. H. J. Round, M.C., M.I.E.E., and some useful hints are given therein.

Regular Programmes from American Broadcasting Stations

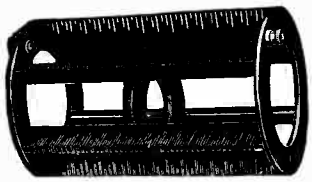
Hours of transmission given in Greenwich mean time and in local time prevailing.

Telephony only. Corrected up to December 19th, 1925.

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

No.	G.M.T.	Local Time prevailing.	Station.	Call Sign and Wave-length.	Town.	Nature of Transmission.	Approx. Duration
WEEK-DAYS.							
A. 97	10.30 p.m.	4.30 p.m. C.S.T.	Fort Worth Star Telegram	WBAP 475.9 m.	Fort Worth, Texas	Police News	¼ hr.
A. 1	11.0 p.m.	6.0 p.m. E.S.T.	Willard Storage Battery	WTAM 389.4 m.	Cleveland, Ohio	Dinner Concert	1 hr.
A. 65	11.0 p.m.	6.0 p.m. E.S.T.	American Tel. & Tel. Co.	WEAF 492 m.	New York	Musical Programme	5 hrs.
A. 61	11.0 p.m.	6.0 p.m. E.S.T.	"The Detroit News"	WWJ 352.7 m.	Detroit, Mich.	Dinner Concert (except Sat.)	1 hr.
A. 4	11.15 p.m.	6.15 p.m. E.S.T.	Westinghouse Elec. & Mfg. Co.	KDKA 309 and 64 m.	Pittsburg, Pa.	Dinner Concert	¾ hr.
A. 98	11.15 p.m.	6.15 p.m. E.S.T.	L. Bamberger & Co.	WOR 405 m.	Newark, N.J.	Talk, Sports, News	15 min.
A. 99	11.30 p.m.	6.30 p.m. E.S.T.	L. Bamberger & Co.	WOR 405 m.	Newark, N.J.	Dinner Music (Tues. and Fri., 11.55)	1 hr.
A. 2	11.30 p.m.	6.30 p.m. E.S.T.	Westinghouse Elec. & Mfg. Co.	WBZ 333.1 m.	Springfield, Mass.	Dinner Concert (except Sat.)	30 min.
A. 15	11.30 p.m.	6.30 p.m. E.S.T.	General Electric Co.	WGY 379.5 m.	Schenectady, N.Y.	Music and/or Talks (except Fri. and Sat.)	30 min.
A. 100	11.30 p.m.	6.30 p.m. E.S.T.	Pittsburg Press, Kaufmann & Baer Co.	WCAE 461.3 m.	Pittsburg, Pa.	Dinner Concert	1 hr.
A. 5	11.50 p.m.	5.50 p.m. C.S.T.	"Kansas City Star"	WDAF 365.6 m.	Kansas City, Mo.	Market, Weather, Time and Road Report	10 min.
A. 80	Midnight	7.0 p.m. E.S.T.	Gimble Bros.	WIP 508.2 m.	Philadelphia, Pa.	Children's Corner	1 hr.
A. 6	Midnight	6.0 p.m. C.S.T.	"Kansas City Star"	WDAF 365.6 m.	Kansas City, Mo.	Talks, Stories, Music	1 hr.
A. 8	Midnight	6.0 p.m. C.S.T.	Westinghouse Elec. & Mfg. Co.	KYW 536. m.	Chicago, Ill.	News, Market Report	10 min.
A. 66	Midnight	6.0 p.m. C.S.T.	Chicago Tribune Broadcasting Co.	WGN 370 m.	Chicago, Ill.	Dinner Concert	—
A. 9	Midnight	7.0 p.m. E.S.T.	Goodyear Tyre & Rubber Co.	WEAR 389.4 m.	Cleveland, Ohio	Orchestra (except Saturday)	1 hr.
A. 12	Midnight	6.0 p.m. C.S.T.	Woodmen of the World	WOAW 526 m.	Omaha, Nebraska	Talk or Concert	1 hr.
A. 89	Midnight	7.0 p.m. E.S.T.	Henry Field Seed Co.	KFNF 266 m.	Shenandoah, Iowa	Concert (except Sat.)	2 hrs.
A. 101	Midnight	6.0 p.m. C.S.T.	Fort Worth Star Telegram	WBAP 475.9 m.	Forth Worth, Texas	Dinner Music	½ hr.
A. 102	Midnight	7.0 p.m. E.S.T.	Jewett Radio & Phonograph Co.	WJR 517 m.	Detroit, Mich.	Orchestra	2 hrs.
A. 103	Midnight	7.0 p.m. E.S.T.	Chesapeake Tel. Co.	WCAP 469 m.	Washington	Market News followed by Concert (Mon., Wed. and Fri.)	3 hrs.
A. 13	12.10 a.m.	7.10 p.m. E.S.T.	Westinghouse Elec. & Mfg. Co.	KDKA 309 and 64 m.	Pittsburg, Pa.	News, Talk, Market Reports	15 min.
A. 17	12.15 a.m.	6.15 p.m. C.S.T.	Sears-Roebuck & Co.	WLS 345 m.	Chicago, Ill.	Music and Concert	2 hrs.
A. 10	12.30 a.m.	7.30 p.m. E.S.T.	Westinghouse Elec. & Mfg. Co.	KDKA 309 and 64 m.	Pittsburg, Pa.	Children's Hour	¼ hr.
A. 104	12.30 a.m.	7.30 p.m. E.S.T.	John Wanamaker	WOO 508.2 m.	Philadelphia, Pa.	Dinner Concert	1 hr.

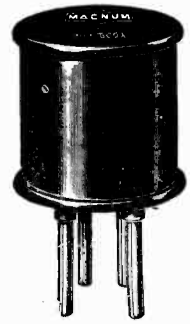
MAGNUM
COMPONENTS



THE 3-STEP LOW-LOSS COIL FORMER,

designed by Mr. G. P. Kendall and described in *Wireless*
Price **10/-**.
Or ready Wound **12/6**.

Send stamps for Latest Lists dealing with 15 Radio Press Sets, also the Magnadyne and new Illustrated Catalogue.
NOTE.—Where a complete set of components, together, with a drilled panel, is purchased together. Royalties at the rate of 12/6 per valve holder are payable.



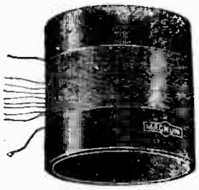
MAGNUM H.F. TRANSFORMERS.
An entirely new Design with Protected Windings.
Wavelength Range.
With .0003 Condenser.

No. 0	150—300
*No. 0A	250—525

*Special Neutrodyne Unit for Broadcast Range.

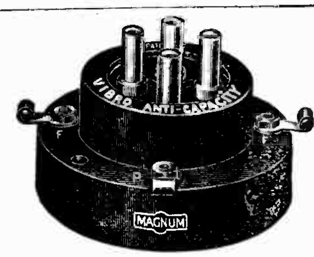
No. 1	300—600
No. 2	550—1200
No. 3	1100—3000
No. 4	2500—7000

Price **7/-** each.



TAPPED ANODE COIL.

For the SIMPLICITY 3 (Radio Press Envelope No. 3). Also the T.A.T. CIRCUIT designed by Mr. J. Scott-Taggart.
Price **8/-** each.



MAGNUM "VIBRO" ANTI-CAPACITY VALVE-HOLDER.

Price **5/-** each.

All components supplied for "An All-Enclosed Drawing-Room Set," as described in this issue by Mr. G. P. Kendall. Prices on application.

SPECIAL H.F. TRANSFORMERS.

As used in the D.X.5 described in MODERN WIRELESS (Dec. issue). Price per set of 3 including mounting brackets, **£1 17s. 6d.**

MAGNUM ANGLE BRACKETS.

As fitted to several Radio Press Sets.
Price per pair **3/-**.

MAGNUM TERMINAL PANELS.

As used on several Radio Press Sets.

Drilled and engraved, fitted with 7 terminals	4/6
Drilled and engraved, fitted with 4 terminals	2/6
Drilled and engraved, fitted with 3 terminals	2/6

MAGNUM SINGLE COIL HOLDER.

For Baseboard Mounting, as used in several Radio Press Sets.
Price **1/9**.

PURCHASE OUT OF INCOME.

To meet those cases where it is not convenient to purchase outright, we have arranged to supply the undernoted Complete Sets on the Instalment system.

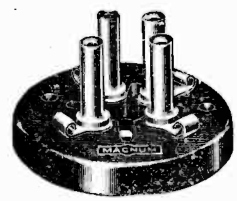
Magnadyne Super-Het ...	£35	0	0
Magnum De Luxe Receiver	£40	0	0
Anglo-American Six ...	£22	0	0

(Royalties Extra.)

CONSTRUCT THE 3-VALVE "PRINCE" RECEIVER.

As described in this issue by Mr. A. S. Clark.

1	Polished Cabinet, as described...	£1	5	0
1	Radion Panel, 14 by 7 by 3/16, Drilled	0	10	6
1	Baseboard, 14 in. by 6½ in. ...	0	2	0
1	Igranic Sq. Law Condenser, .0005	1	4	0
1	Magnum Terminal Panel, as described, fitted with 13 Terminals	0	5	6
1	G.R.C. Push-Pull Switch ...	0	3	0
3	Magnum Vibro Valve Holders...	0	15	0
1	Magnum Single Coil Holder ...	0	1	9
3	Effesca Dual Rheostats ...	0	18	0
1	Effesca L.F. Transformer. Type "C"	1	5	0
1	Potentiometer, M.H.	0	7	6
1	G.R.C. Single Circuit Telephone Jack	0	2	6
1	G.R.C. Double Circuit Telephone Jack	0	4	0
2	Dekko Dial Indicators ...	0	0	9
1	Leak, .5, on Base	0	3	0
1	A.J.S. Fixed Resistance. D. ...	0	1	6
1	A.J.S. Fixed Resistance. D.E,	0	1	6
1	T.C.C. Condenser, .005... ...	0	2	0
2	Sets R.P. Transfers	0	1	0
8	Lengths Glazite	0	2	0
		£7	15	6



MAGNUM ANTI-CAPACITY VALVE-HOLDER.

As used on several Radio Press Sets.
Price **2/6**.

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THE ONLY TRUE
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The Service Battery

GUARANTEED 12 MONTHS
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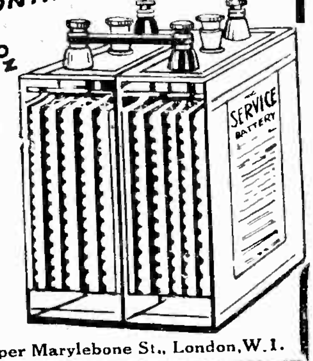

SPECIAL ev. 66 A. for D.E. valves fully charged **12/-** post free.

	AMPERES. 44	66	88	110
2-VOLT	[illegible]	[illegible]	12/-	15/-
4-VOLT	16/	20/-	24/-	30/-
6-VOLT	24/-	30/-	36/-	5/

All Batteries despatched 1st charged.
CARR. PAID within 24 Hours to your door on money back terms.
Single Cells. 2 Non-Corrosive Terminals per cell. Ebonite Separators, Non-Frothing and Practically Unspillable.
H.T. 60 volt. Every Cell separately sealed and removable. Tapped every 6 volts, with Wander Plugs. Post Free. **7/6**
Efficient Repairs 6 Months Guarantee. 3 Days' Delivery.
SERVICE BATTERY CO., 44½, Upper Marylebone St., London, W.1.

"But I can't afford to scrap my 2-valve Set,"

said Dick Rogers.

Leslie Hillman was building the latest "Modern Wireless" Harmony Four and his friend Dick Rogers had just dropped in to see what progress he had made.

"YES," said Dick, "I should certainly like to build up this Set. A fellow at the office has been telling me of the wonderful results he has had from it. But I can't afford to scrap my 2-valve Reflex." "No need to," answered Leslie, "why not use the parts as far as they go and buy the remainder? Just a minute while I get my Pilot Manual*. . . Here you are! Page 33 gives the full list of parts you need for a Harmony Four. Now let's make a list of all the parts you already have." So they wrote down the list and Dick found to his satisfaction that he already had a great number of the components. "According to this Pilot Manual," he said, "I don't think I shall need to spend more than about £4 or so on new parts." "Don't forget the cabinet," put in Leslie. "Oh! I shan't trouble about that at first," replied Dick. "I see that it is a baseboard type of Set. If I keep the dust from it I can manage without a cabinet for a few weeks." "But . . . . what about Peto-Scott's? Will they supply me with a wiring diagram and instructions if I don't buy all my parts from them?" You needn't worry about that," said Leslie, with a smile, "the Set I'm building now was originally a 3-valve 'All Concert de Luxe' which I built up under the Pilot System. That shows the wisdom of buying good components in the beginning," he added. "Well, I think I'll send for the parts tomorrow, and perhaps you'll come along next Saturday and give me a hand." "To be sure I will," answered Leslie.

** A copy of this large 56-page book will be sent to all who send 3d. in stamps to cover postage, etc.*

SOME PILOT SETS:

New S.T. 100

	£	s.	d.
Complete kit of components	£6	4	2
Drilled and engraved panel		11	6
Cabinet to fit	1	0	0

All Concert de Luxe

	£	s.	d.
Complete kit of components	£4	11	11
Drilled and engraved panel		16	6
Cabinet to fit		17	0

3-Valve Dual

	£	s.	d.
Complete kit of components	£5	11	3
Drilled and engraved panel		14	0
Cabinet to fit	1	7	6

D.X. Four

	£	s.	d.
Complete kit of components	£9	4	9
Drilled and engraved panel		15	6
Cabinet to fit	1	15	0

Coastal Three

	£	s.	d.
Complete kit of components	£6	5	0
Drilled and engraved panel		13	6
Cabinet to fit	1	7	6

Harmony Four

	£	s.	d.
Complete kit of components	£6	19	6
Drilled and engraved panel		17	0
Cabinet to fit	1	15	0

4-Valve Family

	£	s.	d.
Complete kit of components	£5	17	2
Drilled and engraved panel	1	2	6
Cabinet to fit		15	0

Transatlantic V.

	£	s.	d.
Complete kit of components	£5	0	6
Drilled and engraved panel		18	6
Cabinet to fit		17	0

Special Five

	£	s.	d.
Complete kit of components	£8	19	0
Drilled and engraved panel	1	10	0
Cabinet to fit	3	3	0

Anglo-American 6

	£	s.	d.
Complete kit of components	£9	8	6
Drilled and engraved panel	1	10	0
Cabinet to fit	3	4	6

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Pilot Sets

for home Constructors

Please send me a copy of the Pilot Manual, giving detailed working instructions and illustrations for building many of the well-known Radio Press Sets. I enclose 3d. to cover cost of postage, etc.

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Address ....

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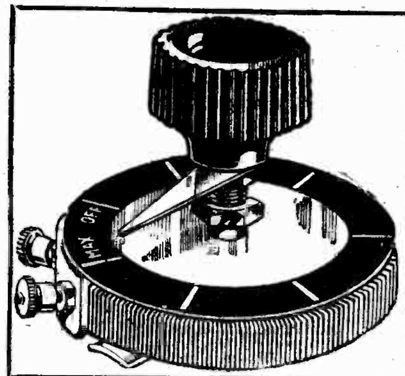

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FILAMENT RESISTANCES

ON BAKELITE MOULDINGS

7 ohms - -	2/3
15 ohms - -	2/6
30 ohms - -	2/6

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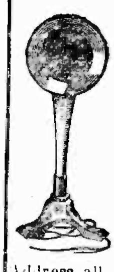
Have opened a large City Showroom at 218, UPPER THAMES STREET, E.C.4, and are selling an enormous stock of Radio and Electrical Goods of the highest grade—Marconi, Siemens, Sullivan, Brown, Western Electric, at bargain prices. Send 4d. for illustrated catalogue and price list. The Stores at 9, Colonial Avenue, Minories, contain tons of goods at sacrifice prices to save removal. Callers only. Telephone: Avenue 4166.

NEW WESTERN ELECTRIC LOUD SPEAKERS.

Complete with Cord in Makers' Sealed Carton, 4,000 ohms .. 22/6; 2,000 ohms .. 20/-; 70 ohms .. 17/6.



"THE CATALOGUE THAT SAVES YOU POUNDS."

Its scope ranges from a 5s. pair of British Headphones or a 12s. 6d. Milliammeter to a 30,000 volt Generator, and covers all requirements.

If you cannot call and inspect goods in our showrooms between 9 a.m. and 6 p.m. it will pay you to send 4d. for our Catalogue at once. Goods promptly despatched all over the world.

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REPAIRS

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Rewound to any Resistance and made equal to new. Price quoted on receipt of instruments.

Prompt Delivery.

THE VARLEY MAGNET CO.

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Established 26 years.

'Phone: Woolwich 888.

No.	G.M.T.	Local Time prevailing.	Station.	Call Sign and Wave-length.	Town.	Nature of Transmission.	Approx. duration.

WEEK DAYS (Contd.).

No.	G.M.T.	Local Time prevailing.	Station.	Call Sign and Wave-length.	Town.	Nature of Transmission.	Approx. duration.
A. 105	12.30 a.m.	7.30 p.m. E.S.T.	Pittsburg Press. Kaufmann & Baer Co.	WCAE 461.3 m.	Pittsburg, Pa.	Children's Hour (Tues., 7.15 E.S.T.)	15 min.
A. 16	12.35 a.m.	6.35 p.m. C.S.T.	Westinghouse Elec. & Mfg. Co.	KYW 536 m.	Chicago, Ill.	Children's Hour	25 min.
A. 106	12.45 a.m.	7.45 p.m. E.S.T.	Westinghouse Elec. & Mfg. Co.	KDKA 309 m. and 64 m.	Pittsburg, Pa.	Address from University (except Sat.)	¾ hr.
A. 70	1.0 a.m.	7.0 p.m. C.S.T.	St. Louis Post Dispatch	KSD 545.1 m.	St. Louis	Concert (Thurs., Silent)	2 hrs.
A. 64	1.0 a.m.	8.0 p.m. E.S.T.	The Shepherd Stores	WNAC 280.3 m.	Boston, Mass.	Concert	1½ hrs.
A. 107	1.0 a.m.	7.0 p.m. C.S.T.	Westinghouse Elec. & Mfg. Co.	KYW 536 m.	Chicago, Ill.	Dinner Concert	½hr.
A. 108	1.0 a.m.	8.0 p.m. E.S.T.	Watch Tower	WBBR 272.6 m.	Staten I., N.Y.	Concert and News (Mon., Thur. and Sat.)	1 hr.
A. 85	1.0 a.m.	8.0 p.m. E.S.T.	"The Detroit News"	WWJ 352.7 m.	Detroit, Mich.	News and Music (Mon., Wed., Fri.)	1 hr.
A. 11	1.0 a.m.	8.0 p.m. E.S.T.	Westinghouse Elec. & Mfg. Co.	WBZ 333.1 m.	Springfield, Mass.	Concert or Musical Programme (except Sat.)	30 min.
A. 63	1.15 a.m.	8.15 p.m. E.S.T.	Radio Lighthouse	WEMC 286 m.	Berrion Springs, Mich.	Concert	1¼ hr.
A. 19	1.30 a.m.	7.30 p.m. C.S.T.	Fort Worth Star Telegram	WBAP 475.9 m.	Fort Worth, Texas	Musical Programme (except Sat.)	1 hr.
A. 28	2.0 a.m.	8.0 p.m. C.S.T.	Westinghouse Elec. & Mfg. Co.	KYW 536 m.	Chicago, Ill.	Musical Entertainment (except Mon.)	1-2 hrs.
A. 81	2.0 a.m.	9.0 p.m. E.S.T.	American Radio Co.	KFQX 394 m.	Washington, D.C.	Concert (Thurs., Silent)	—
A. 20	2.0 a.m.	8.0 p.m. C.S.T.	"Kansas City Star"	WDAF 365.6 m.	Kansas City, Mo.	Musical Programme	2 hrs.
A. 67	2.0 a.m.	8.0 p.m. C.S.T.	Chicago Tribune Broadcasting Co.	WGN 370 m.	Chicago, Ill.	Vocal and Instrumental Music (except Mon.)	1 hr.
A. 109	2.0 a.m.	9.0 p.m. E.S.T.	Westinghouse Elec. & Mfg. Co.	KDKA 309 m. and 64 m.	Pittsburg, Pa.	Concert or Variety Entertainment (except Sat.)	50 min.
A. 110	2.0 a.m.	9.0 p.m. E.S.T.	Rensselaer Polytechnic	WHAZ 379.5 m.	Troy, N.Y.	Concert, Address, Dance Music (Mon. only)	2 hrs.
A. 111	2.0 a.m.	6.0 p.m. P.S.T.	"Morning Oregon"	KGW 491.5 m.	Portland, Oregon	Dinner Concert	1 hr.
A. 112	2.0 a.m.	9.0 p.m. E.S.T.	Jewett Radio & Phonograph Co.	WJR 517 m.	Detroit, Mich.	Variety, "Jewett Jesters" and "Paige Six"	1 hr.
A. 86	2.0 a.m.	8.0 p.m. C.S.T.	Wilbur Glenn Voliva	WCBD 344.6 m.	Zion, Ill.	Concert (Tues. and Thurs.)	2 hrs.
A. 87	2.0 a.m.	9.0 p.m. E.S.T.	Pittsburg Press, Kaufman & Baer Co.	WCAE 461.3 m.	Pittsburg, Pa.	Concert, Music (Mon., Tues. and Wed.)	1 hr.
A. 21	2.55 a.m.	9.55 p.m. E.S.T.	John Wanamaker	WOO 508.2 m.	Philadelphia, Pa.	U.S. Naval Observatory Time Signal, followed by U.S. weather forecast	—
A. 22	2.55 a.m.	9.55 p.m. E.S.T.	Westinghouse Elec. & Mfg. Co.	KDKA 309 and 64 m.	Pittsburg, Pa.	Do. do.	—
A. 24	3.0 a.m.	9.0 p.m. C.S.T.	Woodmen of the World.	WOAW 526 m.	Omaha, Nebraska.	Concert (Ex. Wed.).	—
A. 88	3.0 a.m.	7.0 p.m. P.S.T.	General Electric Co. Pacific Coast Broadcasting Station	KGO 361 m.	Oakland, California	News, Baseball Scores, Weather Report, Stocks and Shares (except Sat.)	—
A. 73	3.0 a.m.	7.0 p.m. P.S.T.	Radio Central Super Station	KFI 467 m.	Los Angeles, Cal.	Musical Programme	4 hrs.
A. 27	3.30 a.m.	9.30 p.m. C.S.T.	Fort Worth Star Telegram	WBAP 475.9 m.	Fort Worth, Texas	Musical Programme (except Sat.)	1¼ hr

No.	G.M.T.	Local Time prevailing.	Station.	Call Sign and Wave-length.	Town.	Nature of Transmission.	Approx. duration.
			WEEK DAYS (Contd.).				
A. 26	3.30 a.m.	7.30 p.m. P.S.T.	"Morning Oregon"	KGW 491.5 m.	Portland, Oregon	Market, Weather, News, Police Reports	15 min.
A. 62	3.30 a.m.	7.30 p.m. P.S.T.	State College of Washington	KFAE 526 m.	Pullman's Washington	Concert (Mon., Wed. and Fri.)	1½ hrs.
A. 82	4.0 a.m.	8.0 p.m. P.S.T.	"The Times"	KHJ 395 m.	Los Angeles	Concert	—
A. 68	4.0 a.m.	10.0 p.m. C.S.T.	Chicago Tribune Broadcasting Co.	WGN 370 m.	Chicago, Ill.	Dance Orchestra and popular songs (except Mon.)	1 hr.
A. 29	5.45 a.m.	11.45 p.m. C.S.T.	"Kansas City Star"	WDAF 365.6 m.	Kansas City, Mo.	Musical Entertainment	1¼ hr.
			SUNDAYS.				
A. 113	9.45 p.m.	4.45 p.m.	Westinghouse Electric & Mfg. Co.	KDKA 309 and 64 m.	Pittsburg, Pa.	Vesper Service	1 hr.
A. 91	11.0 p.m.	6.0 p.m. E.S.T.	John Wanamaker	WOO 508.2 m.	Philadelphia, Pa.	Organ Recital	—
A. 114	11.15 p.m.	6.15 p.m.	Shepherd Stores	WNAC 280.3 m.	Boston, Mass.	Church Service	1 hr.
A. 90	11.30 p.m.	6.30 p.m. E.S.T.	Henry Field Seed Co.	KFWK 266 m.	Shenandoah, Iowa	Divine Service	1 hr.
A. 115	11.30 p.m.	6.30 p.m.	Pittsburg Press	WCAE 461.3 m.	Pittsburg, Pa.	Dinner Concert, Will. Penn. Hotel	45 mins.
A. 116	11.30 p.m.	6.30 p.m.	Westinghouse Electric & Mfg. Co.	KDKA 309 and 64 m.	Pittsburg, Pa.	Dinner Concert	1 hr.
A. 79	Midnight	7.20 p.m. E.S.T.	Chesapeake Tel. Co.	WCAP 469 m.	Washington, D.C.	Musical Programme and Organ Recital	2 hrs.
A. 31	Midnight	6.0 p.m. C.S.T.	Woodmen of the World	WOAW 526 m.	Omaha, Nebraska	Bible Study Hour	1 hr.
A. 117	Midnight	7.0 p.m.	General Elec. Co.	WGY 379.5 m.	Schenectady, N.Y.	Carillon Programme	½ hr.
A. 118	Midnight	7.0 p.m.	Carletone College	KFMY 337 m.	Worthfield, Minnesota	College Vesper Service	1 hr.
A. 66	12.20 a.m. (Monday)	7.20 p.m. E.S.T.	American Tel. & Tel. Co.	WEAF 492 m.	New York	Musical Programme	2 hrs.
A. 33	12.30 a.m. (Monday)	7.30 p.m. E.S.T.	General Elec. Co.	WGY 379.5 m.	Schenectady, N.Y.	Church Service	1 hr.
A. 32	12.30 a.m. (Monday)	7.30 p.m. E.S.T.	Strawbridge & Clothier	WFI 395 m.	Philadelphia, Pa.	Church Service	—
A. 92	12.30 a.m. (Monday)	7.30 p.m. E.S.T.	Henry Field Seed Co.	KFNF 266 m.	Shenandoah, Iowa	Divine Service	1 hr.
A. 30	12.45 a.m. (Monday)	7.45 p.m. E.S.T.	Westinghouse Electric & Mfg. Co.	KDKA 309 and 64 m.	Pittsburg, Pa.	Divine Service	1 hr.
A. 36	1.0 a.m. (Monday)	7.0 p.m. C.S.T.	Westinghouse Electric & Mfg. Co.	KYW 536 m.	Chicago, Ill.	Service and Musical Programme	2 hrs.
A. 40	1.0 a.m. (Monday)	8.0 a.m. C.S.T.	Westinghouse Electric & Mfg. Co.	WBZ 333.1 m.	Springfield, Mass.	Concert or Music, etc.	—
A. 77	1.0 a.m. (Monday)	7.0 p.m. C.S.T.	Sear-Roebuck & Co.	WLS 345 m.	Chicago, Ill.	Church Service	1 hr.
A. 119	2.0 a.m. (Monday)	9.0 p.m.	Watch Tower	WBBR 272.6 m.	Staten I., N.Y.	Bible Lecture and Sacred Music	1½ hrs.
A. 93	2.0 a.m. (Monday)	8.0 p.m. C.S.T.	Wilbur Glenn Voliva	WOBD 344.6 m.	Zion, Ill.	Concert	2 hrs.
A. 120	3.10 a.m. (Monday)	9.0 p.m.	Woodmen of the World	WOAW 526 m.	Omaha, Nebraska	Chapel Service	1 hr.
A. 38	3.25 a.m. (Monday)	7.25 p.m. P.S.T.	"Morning Oregonian"	KGW 491.5 m.	Portland, Oregon	Church Service	1½ hrs.
A. 94	4.0 a.m. (Monday)	8.0 p.m. P.S.T.	General Electric Co. Pacific Coast Broadcasting Station	KGO 361 m.	Oakland, California	Divine Service	—
A. 43	5.0 a.m. (Monday)	11.0 p.m. C.S.T.	Fort Worth Star Telegram	WBAP 475.9 m.	Fort Worth, Texas	Dance Orchestra	1 hr.

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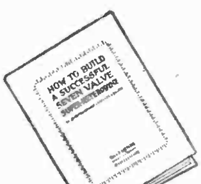
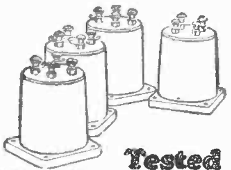


NEW EDITION of The Super-Het. Book

The third edition of this popular book has been enlarged and now contains "Step by step" instructions for assembling and wiring a Seven-Valve Super-Het. Receiver, as well as assembly photographs, new wiring diagram and hints on operation. Many amateurs have built successful sets receiving over thirty stations at Loud-Speaker strength with the aid of this book. Send P.O. to-day. PRICE **6d.**



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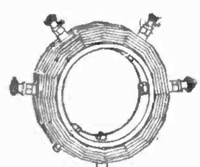

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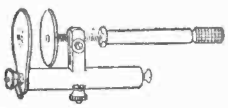
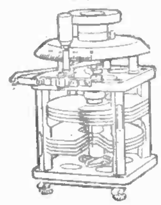


Neutrodyne Condensers

Designed for use in Neutrodyne circuits, this instrument has also proved exceedingly sensitive as a Vernier when used in parallel with a larger condenser. It is invaluable in Super-Het. circuits. Fitted in panel with single screw and ⅜ inch hole for spindle. PRICE **5s.**



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Each condenser has four alternative capacities, three single and one double. The two models cover most amateur needs.

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Vernier attachment 33 to 1 ratio, for either model, 5s.

A PRECISION CONDENSER FOR 10/-
See Page 542.

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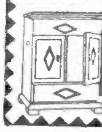

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"MODERN WIRELESS"
January, 1926.

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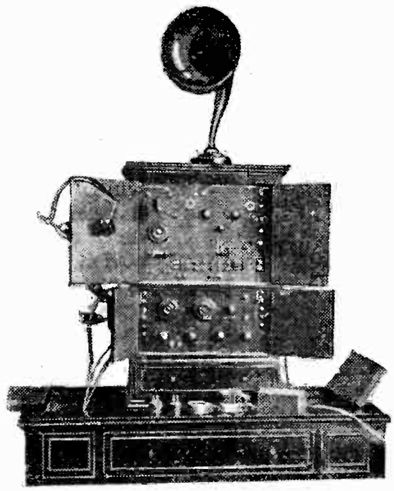
No.	G.M.T.	Local Time prevailing.	Station.	Call Sign and Wave-length.	Town.	Nature of Transmission.	Approx. duration.
SPECIAL DAYS.		**(Days refer to local time)**					
A. 44	11.30 p.m.	6.30 p.m. E.S.T.	General Electric Co.	WGY 379.5 and 1650 m.	Schenectady, N.Y.	Mon., Tues., Wed., and Thurs.—Hotel Music relayed Friday—Children's story	—
A. 47	12.30 a.m.	7.30 p.m. E.S.T.	John Wanamaker	WOO 508.2 m.	Philadelphia, Pa.	Except Tues.—Organ or Orchestral Concerts, Talks	3½ hrs.
A. 95	1.0 a.m.	7.0 p.m. C.S.T.	Woodmen of the World	WOAW 526 m.	Omaha, Nebraska	Thurs. and Fri.—Instrumental Music	—
A. 96	1.0 a.m.	8.0 p.m. E.S.T.	Strawbridge & Clothier	WFI 395 m.	Philadelphia, Pa.	Tues. and Sat.—Concert	—
A. 49	1.0 a.m.	8.0 p.m. E.S.T.	L. Bamberger & Co.	WOR 405 m.	Newark, N.J.	Mon., Wed., Sat.—Musical Programme, Talks	3 or 4 hrs.
A. 50	1.0 a.m.	8.0 p.m. E.S.T.	Willard Storage Battery Co.	WTAM 389.4	Cleveland, Ohio	Mon. and Wed.—Concert	2 hrs.
A. 51	2.0 a.m.	9.0 p.m. E.S.T.	Willard Storage Battery Co.	WTAM 389.4	Cleveland, Ohio	Saturday—Dance Programme	3 hrs.

Letters From Our Readers

SIR,—I made the set in the enclosed photograph from various designs in your Radio Press series, and am really delighted with same. I might add that I have also built and used your "Family Four" described by Mr. Harris in Envelope No. 2, and some of the crystal circuits described in the *Constructor*.

The main set is the "Transatlantic Four," described by Mr. Harris in MODERN WIRELESS for November, 1924, which you will see at the bottom of the cabinet. Above, on the left-hand side, is the "Fool-Proof Crystal Set," from the *Wireless Constructor*, January, 1925, and designed by Mr. Harris also, but instead of the "Eureka" detector I have substituted a "Burndept." This is connected by a D.P.D.T. switch to a "Two-Valve Power Amplifier," as described by John Underdown in MODERN WIRELESS, December, 1924, and this is also connected by the other throw of the switch to the "Transatlantic," so that by cutting out with the switch provided I am able to use as a five-valve with two L.F. stages.

In the small cupboard let in the top of the supporting cabinet is an "A.B.C. Wave Trap," which may be used if desired. This panel also contains the plugs for connecting to the accumulator at the base, on the right-hand side is the H.T. battery.



The loud-speaker may be switched over from either the top or bottom sets by a D.P.D.T. switch.

Wishing you every success with your new enterprise *Wireless*.—Yours truly,

Coventry. HORACE R. WARD,

An Improved Two-valve Receiver

SIR,—I wish to thank you very much for the "Improved Two-Valve Receiver" described in the January, 1925, issue of MODERN WIRELESS, by Stanley G. Rattee, M.I.R.E. I had a 2-valve H.F. and detector tuned anode set and converted it to the above-named set, and the results are more than 100 per cent. improved. I get all B.B.C. main stations excepting Cardiff at very good 'phone strength. Chelmsford, 2LO and 6BM I have to tone down for comfortable strength. On the loud-speaker I get Chelmsford, 2LO, 6BM and 5NO. The first two are good for an ordinary-sized room, the two latter are heard comfortably. Several Continental stations come in very loud on 'phones. Am using Marconi Osram D.E.3 valves, and get these results both with a 4-volt accumulator and with two dry cells in series. I have now put in a separate lead to the amplifier so that I can put up to 40 v. on the detector and up to 80 v. on the L.F. valve. Again thanking you.—Yours truly

Woking. E. M. HAINS

Some Common Faults

By JOHN UNDERDOWN

LAST month I dealt with the subject of certain faults peculiar to Supersonic-heterodyne receivers, and in this article it is proposed to consider briefly a number of more common difficulties chiefly experienced with straight sets.

Induction Effects from Alternating Current Mains

A very interesting case of induction from alternating current wiring has recently come to my notice, and probably the remedies which proved efficacious will be of interest to a large number of readers who are similarly troubled.

A straight, general-purpose type 3-valve receiver employing the circuit shown in Fig. 1, was installed for convenience in a wooden shed close to the house for which the set was to be used. The disposition of the garden and the receiving shed was such that long leads had to be taken through several rooms in the house in order to reach that in which it was desirous to have the loud-speaker. A preliminary test in the shed gave good loud-speaker results from the local station, 2LO, fifteen miles away. When, however, the loud-speaker was taken by means of twin flex leads to the room previously mentioned, the signals were almost completely drowned by a coarse, grating, continuous howl which sounded like the well-known tuning note with a loud buzz superimposed upon it.

Since the house lighting supply was

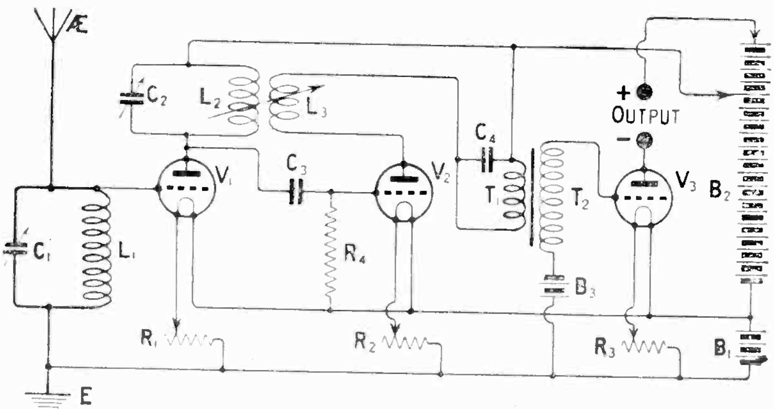


Fig. 1.—A straightforward type of receiver on which trouble was experienced from induction effects.

of the alternating current variety, the effect of bringing the loud-speaker leads by various routes was tried and found to vary the strength of the buzz, but not materially to affect the howling. From this experiment it was deduced that two faults were present simultaneously, namely, howling, which sometimes takes place when very long loud-speaker leads are used, and also induction from the wiring of the house-lighting system.

The Solution

After much experiment the difficulty was finally overcome by employing a filter arrangement at the set end and also leads of lead-covered twin flex, the metallic covering being earthed in several places. The scheme adopted will be clear from Fig. 2. The choke Z was an ordinary type such as is employed in choke-coupled amplifiers, whilst the condenser C was a 2 μF Mansbridge type. The lead-covered twin leads were taken by an external route to the room where the loud-speaker was required, and were actually secured to the outside walls, finally being brought into the house again through the woodwork of a convenient window frame.

Faults in Two H.F. Transformer Coupled Receivers

For listening to American broadcasting stations, receivers employing circuits on the lines of that shown in Fig. 3 prove both effective and simple to handle, more especially if the two H.F. transformers are tuned by a dual condenser. For efficient working it is essential, in this case, that the two H.F. transformers L_2 L_3 and L_4 L_5 should be perfectly matched, as also should the two halves of the dual condenser, shown as C_2 and C_3 respectively. Where good components are employed and the wiring is carried out in a suitable manner, little trouble is experienced, but small departures from these conditions often give rise to very puzzling faults.

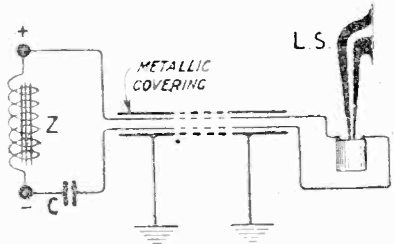


Fig. 2.—The trouble was overcome by using lead-covered leads with a filter at the set end

Unsuitable Dual Condensers

An unsuitable type dual condenser, although perfectly matched as far as capacity is concerned, generally results, in practice, in the set becoming absolutely unmanageable through uncontrollable oscillation. Where this component is responsible for trouble, it will generally be found possible to stabilise the set and obtain some results by dimming either of the H.F. valves on their respective filament resistances, and by no other means can oscillation be brought under control. The only remedy here is that of replacing the dual condenser by one of the well-known types proved to give satisfactory working.

Bad Matching

Where difficulty is experienced in obtaining oscillation with a set of the type shown in Fig. 3, employing a dual condenser for C_2 and C_3, bad matching of either the H.F. transformers or of the two halves of the dual condenser should be suspected. A test which throws useful light on the degree of matching of the H.F. transformers is to remove the first valve V_1 and its associated

H.F. transformer and plug from the grid of V_1 to the socket of the secondary winding of the first H.F. transformer which is connected to the grid of V_2.

Testing the Matching

If now a weak transmission is tuned in and the first transformer is inserted in place of the second, it will readily be seen, according to whether alteration of the setting of the dual condenser is required (all other controls remaining untouched), whether the two transformers are properly matched. If by carrying out this test on several sharply tuned weak transmissions on different wavelength covered by the transformers, it appears that the latter are correctly matched it is probable that the two halves of the dual condenser are not matched or that the particular wiring adopted is responsible for the spurious degree of stability.

By temporarily connecting a small vernier condenser in parallel with each half of the dual condenser in turn, when a weaker transmission is tuned in, it should be possible to adjust the tuning and determine where the fault lies.

A Potentiometer Fault

Should the potentiometer break down at its positive end, the set will behave in an extremely stable manner, and only an alteration to permit the application of direct magnetic reaction will give oscillation. With batteries and valves removed, the "click" telephone test should be carried out across the potentiometer winding to locate a fault of this type. If one side of the low-tension battery is connected to one end of the potentiometer winding, and one tag of a pair of telephones to its other terminal, tapping along the bared portion of the wire will give loud "plonks" in the telephones until the point is passed where the break has occurred.

From the break to the other end of the winding no clicks or only very feeble ones should be heard. With certain potentiometers it may be possible to repair the break, but in most cases it is best to purchase a new component.

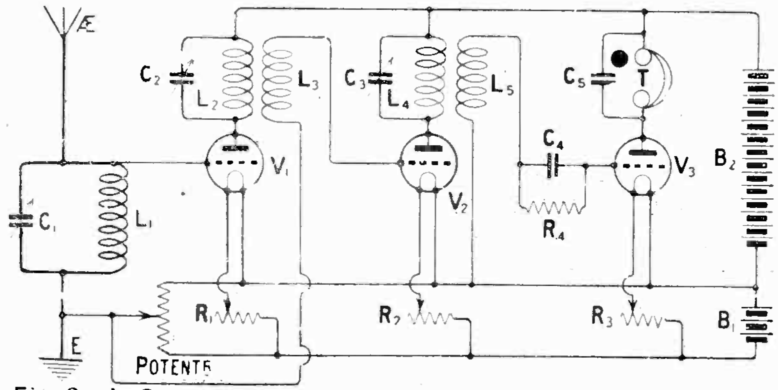


Fig. 3.—If C_2 and C_3 are the two halves of a dual condenser, the transformers L_2 L_3 and L_4 L_5 should be matched to obtain best results

Some Neutrodyne Faults

Neutrodyne receivers are becoming increasingly popular for long-distance reception, and some of the faults experienced in this type of set, and their remedies, will prove of interest.

With the receiver employing the simple 2-valve circuit of Fig. 4, the tuning of the condenser C_1 was found to vary from night to night, and sometimes during a transmission itself. Previous to any alteration being required on the setting of the aerial condenser C_1 a plop was always heard in the telephones.

A Short Circuit

This at once gave a clue to the trouble, which was due to the Neutrodyne condenser, shown as N.C., shorting through the plates touching, these remaining together after the set had been jarred. This placed the neutralising coil L_3 in parallel with the aerial coil L_1, which connection, of course, resulted in the inductance of the two coils being less than that of either employed separately, thus necessitating an increase of capacity with C_1.

Another trouble often experienced is that one setting of the neutrodyne condenser N.C. does not hold for the whole frequency-band covered by the neutrodyne unit L_3, L_4. In certain cases two settings are required, one holding, for example, roughly from 300 to 400 metres (1000 Kc. to 750 Kc), and the other from 300 to 500 metres, (1000 Kc. to 600 Kc.). Investigation has sometimes shown that this is due to the necessity of changing the size of the aerial coil to cover the whole of the broadcast frequency band. This difficulty can usually be overcome by employing either constant aerial tuning or the so-called auto-coupled arrangement shown in Fig. 4. By either means a suitable coil can be made to cover practically the whole of the 500 to 1,000 k.c. range, thus obviating any necessity for re-neutrodyning.

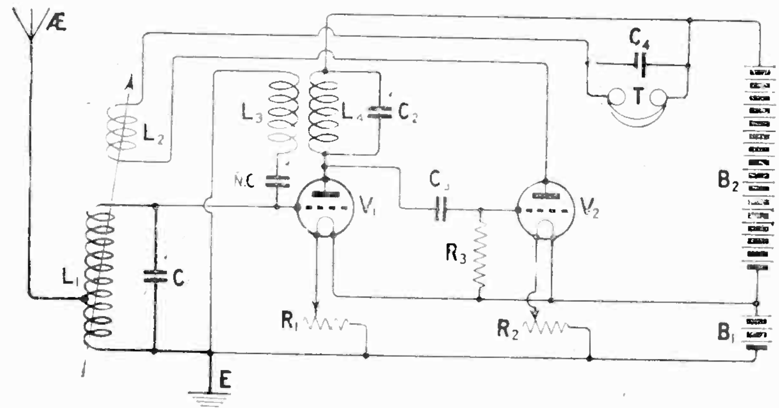
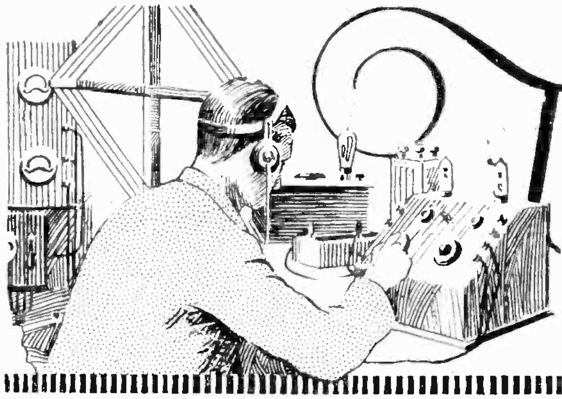


Fig. 4.—A short circuit on the condenser N.C. caused a puzzling fault

CAN YOU TRACE FAULTS?

Obtain a copy of the standard book on fault finding and get rid of the feeling of helplessness which is apt to assail one when a set breaks down. "Wireless Faults and How to Find Them," by R. W. Hallows, M.A. (Radio Press Ltd., post free, 1s. 8d.), is the standard book on the subject, and makes the tracing of even obscure faults a simple matter of working almost mechanically through a table of tests.

In replying to advertisers, use Order Form enclosed.



Tested by Ourselves

Combined Filament Resistance and Valve Holder

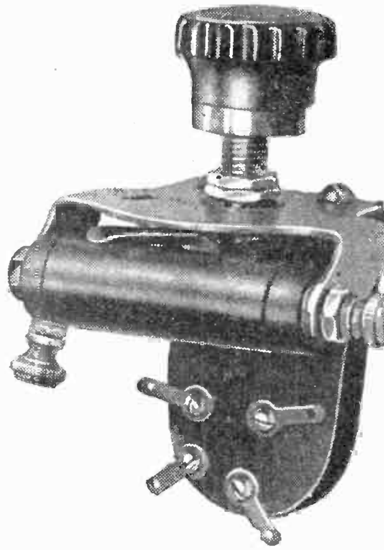
A GARNETT'S combined filament resistance and valve holder has been submitted to us for test.

Description of Component

This component is designed for back-of-panel mounting, and incorporates the filament resistance and valve holder in one unit. One-hole fixing is employed, and the rheostat knob is the only portion visible above the panel surface. This knob is of fluted black moulded material, a curved white arrow on the top of the knob indicating the direction of rotation for increasing the filament current. A brass nut is embedded in the knob, and enables it to be screwed on to the spindle. A circular lock-nut of almost the same diameter as the knob is provided, while one-hole fixing is secured through the agency of a screwed sleeve concentric with the spindle. Two nuts screw on to this, one to fix the sleeve to the panel, and the other to secure a metal plate to the sleeve. This metal plate serves to support the rheostat.

The resistance element of this rheostat consists of resistance wire wound tightly on a cylinder of insulating material. The rheostat arm is of curved section, so that as it sweeps over the resistance it makes smooth contact and does not scrape. It is fixed to the spindle by two nuts, and a spring washer causes it to be pressed firmly against the resistance winding. A stop is provided at the "On" position, and at the other end the contact arm is free to move clear of the resistance winding, so that the valve can be switched off by means of the rheostat knob. The resistance element and rheostat arm are supported by the metal plate beneath the spindle.

That part of the metal plate above the spindle carries a small right-angled insulating panel, which is fixed to it by two screws. This panel is about 2¼ in. long, and at its distant end four brass valve sockets are inserted. These are tapped at their lower ends and screws are inserted, and when screwed up these hold soldering tags in place against the base of the sockets. These tags are of sufficient length, but there is no adequate provision for fixing connections without the aid of soldering. Sufficiently large terminals are, however, provided for the rheostat.



This photograph clearly shows the construction of the component.

Laboratory Tests

The resistance of this rheostat was found to be 28 ohms, which is sufficient for controlling valves of the ·06 ampere class with a 4-volt battery. On test the rheostat was found to work smoothly and to be practically silent in operation. Rotation through 90 degrees was sufficient to turn the rheostat arm from the "On" to the "Off" position. The insulation resistance of the valve sockets was found to be infinite, and it was impossible to insert a valve in the wrong position so as to damage the filament by contact with the anode socket. The fit for several types of valves was found to be satisfactory.

Elwell Receiving Set

MESSRS. C. F. ELWELL, LTD., have submitted one of their Statophone receivers for test at our Elstree laboratories.

Description of Set

The complete receiver, which is self-contained except for the aerial system and low-tension battery, is enclosed in a mahogany cabinet. Two small doors at the base of the cabinet permit access to the two controls for tuning and reaction, and also a filament switch for three valves and an additional switch for a fourth valve when working distant stations. This last valve does not in any way affect the position of the other controls. Two large doors at the rear of the cabinet allow the components to be examined, while the loud-speaker opening at the front of the cabinet is protected by a fine-mesh net. Two neat slabs are supplied containing the tuning coils, one to cover the British broadcasting band and the other for the Daventry and high wavelength stations. These are inserted into position in a slot on the front control panel.

Laboratory Tests

The set was subjected to an aerial test, using the Mullard valves supplied—viz., 2 H.F. red ring, one D.F.A.4, and one D.F.A.1. The results of these tests can be summarised in the following manner :—

(1) Various stations are quite easily obtained, most of the B.B.C. stations being heard on the loud-speaker.

(2) Operating the tuning condenser produced very sharp resonance effects, and on slightly detuning from London the signals are cut down rapidly to a definite value. On further detuning, London's signal strength only decreases

slightly from this definite value, and consequently Bournemouth is received with 2LO as a background. This effect was still obtained when receiving Birmingham, but in this case the reduced background was not strong enough to unduly interfere with good reception.

(3) There are only two tuning controls to manipulate, and the whole set is easy to operate.

(4) With the loud-speaker supplied, clear reception was possible provided the signals were not too loud, but with loud signals a pronounced rattle in the loud-speaker was an unpleasant feature.

The Mullard P.M.4 Valve

OUR readers will probably have noticed the appearance of the new Mullard Power Valve.

Three Valves of the P.M.4 type have been sent to us for test, a practice which has previously been recommended as it enables us to test their uniformity. These valves are of the 100 milliampere class, and the rated filament voltage is 3·8 volts. The anode voltage necessary is 30 to 100 volts, which is rather lower than for most other power valves. Using these values, the makers state that the approximate impedance is 9,000 ohms, while the amplification ratio is 6, and the total emission 20 milliamperes.

Laboratory Tests

The valves submitted have been tested by us on our valve test bench, and the general results are shown in the accompanying table. It will be seen that both the impedances and amplification ratios are somewhat higher than the manufacturers state, but in no case is the discrepancy large enough to affect seriously the operation of the valve. The flash emission is also high, but this is an error on the right side. In one case the flash emission was exceptionally high, but the other constants of this valve were not very different from those of the other two. Moreover, on testing it in a receiving set, its performance was not appreciably different from the others.

The general performance of these valves was found to be quite good, and to compare favourably with that of other valves of the same type. A special feature was the entire absence of microphonic noises, which is in accordance with the maker's claim. The valves were found to handle quite a large amount of power without distortion, and can be recommended for general loud-speaker work. Amateurs should, however, confine themselves to as low a filament voltage as will give the necessary results. On test it was found that 3.0 to 3.2 volts gave quite an adequate anode current. Increasing the voltage above the latter value resulted in no appreciable increase in anode current, while the filament current rose above the rated value of 100 milliamperes.

The P.M.4.

The valves are pipless, while the black cap is of a hard insulating material.

(*Continued on page 551*).

Valve Type, P.M.4.
(Dull Emitter).
Flash Emission = 26 mA
for an Anode Potential of 60 V

Filament Potential = 3·8 V
Filament Current = 0·12 A
Flash Emission per Filament Watt = 57·0 mA

Anode Potential in Volts	Grid Potential in Volts	Anode Current in Milliamps	Amplification Ratio (μ)	Internal Impedance in Ohms (R_0)
60	—2·0	2·16	6·9	10500
70	—2·0	3·14	7·4	9600
90	—4·0	3·75	6·0	9400

MANUFACTURER'S RATING

Filament Potential = 3·8 V
Filament Current = 0·1 A
Anode Potential = 50–100 V

Amplification Ratio = 6·0
Internal Impedance = 9,000 ohms.
Flash Emission = 20 mA

Is Short-Wave Reception Worth While?

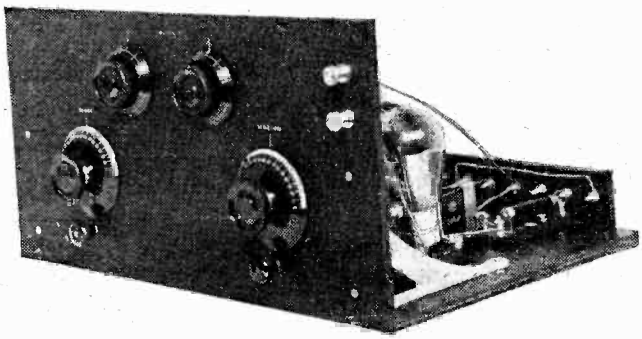
By L. H. THOMAS (6QB)

MOST of the radio enthusiasts who have been keen enough to acquire a working knowledge of the Morse Code need, by now, no proof of the extraordinary interest attaching to short-wave reception. The less fortunate listeners, however, who are only interested in the reception of telephony, must often be worried by the question, "Is Short-Wave Reception Worth While?"

The average broadcast listener's impression of long-distance reception on short-waves is intimately connected with cold, the early hours of the morning, and the unpleasant sensation of getting out of bed in obedience to the call of an alarm clock.

No Early Rising

The object of this short article is to show him that this need not necessarily be the case, and to give an idea of what may be heard with a short-wave receiver of quite average efficiency.



The short-wave receiver employing a detector and one resistance-coupled note magnifier, used by the author

In the first place, it *is* possible to receive American short-wave broadcasting as early as 10 p.m. on a night when the mysterious "conditions" that govern short-wave reception are fairly favourable. KDKA, the Westinghouse Company's station at Pittsburgh, is working on 61 metres (4920 Kc.), commencing at about 5 p.m. American time, and therefore may be heard here at about 10.30 p.m. WGY, however, the station of the American G.E.C. at Schenectady, is carrying out experimental transmissions on 40.8 metres (7350 Kc.) and has been heard by the writer as early as 9 p.m., corresponding to 4 p.m. by their time. His telephony is often strong enough to be heard three or four feet from the 'phones with an ordinary receiver of the "Detector and Note-Mag." type.

These two stations should be received without the least difficulty on any Broadcast receiver which has been slightly redesigned, the chief objects in view being the shortening and spacing of all leads, and the use, whenever possible, of "low-loss" components, especially where coils and condensers are concerned.

The Antipodes

For the more ambitious listener who has hopes of receiving Australia or New Zealand without the trouble of learning Morse Code, it will be a consolation to learn that several New Zealand *amateur* stations are audible in this country when using telephony, sometimes at quite good strength. The reception of these stations does not necessitate a nightly vigil, as the best time to listen for them is between 7.30 and 8.30 a.m. On the morning of December 12, the writer received intelligible telephony from New Zealand and Australia at 9.10 a.m., using the two-valve receiver illustrated on this page.

Broadcasting

The Australian broadcasting station 2FZ has also been heard in this country on about 45 metres (6667 Kc). The best time to listen for Australia is *not* the same as for New Zealand, but is between 6.30 and 7.30 p.m.

Learn Morse

The would-be short-wave enthusiast will, however, find it very well worth his while to persevere at the Morse Code. The best way of learning it is, after memorising the letters, simply to keep listening to Morse stations *that are sending faster than he can read*, and not to be discouraged even if he only succeeds in identifying one letter in each word. He will find himself almost unconsciously receiving more and more of every transmission to which he listens, and, when he is "Morse perfect," he may look forward to receiving almost every active country in the world without much difficulty. Short-wave reception is, therefore, *well* worth any trouble that may be spent in preparation.

The writer does not, however, recommend the use of one receiver for both the ordinary broadcast wavelengths and the short waves. It will certainly be preferable to keep a separate receiver for the latter purpose, particularly if the reader's broadcast receiver employs radio-frequency amplification, which is of little or no use at the higher frequencies.

One stage of audio amplification will be all that is needed for the reception of KDKA and WGY; in fact, the writer employs a stage of resistance coupled amplification for his own receiver.

A CORRECTION.

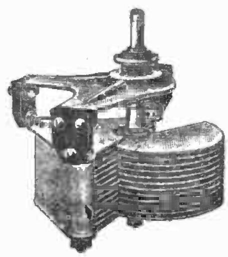
The "Liberty" detector employed in the crystal set in our last issue is made by the Radi-Arc Electrical Co., Ltd., and not by Messrs. Radiax, Ltd., as was stated.

More Guaranteed Components

Here are two more of the Utility range. Like all other Utility Components these are unconditionally guaranteed to give you complete satisfaction. If they do not, return them direct to us, and we will at once replace them. That is a plain guarantee and it will be plainly carried out.

"UTILITY" LOW LOSS CONDENSERS.

End-plate losses halved as only one end-plate is used. All solid dielectric external to electrostatic field. Exceptionally long spindle bearing automatically taking up wear and eliminating end play and end thrust.
50 to 1 Reduction Vernier Condenser available at slight extra cost.
Utility one hole fixing.



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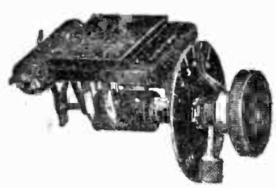

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New resolutions, new endeavours—progression in the world of wireless. And yet our energies are not fully productive unless the loud speaker—the voice of the receiver—performs its duty supremely well. Lucky the man who owns a "Sparta"! This speaker, designed by master craftsmen, will awaken your receiver to vigorous tuneful life. Down in the base lies the secret of its extraordinarily good reproduction—the tone modulator. Provided with six stops it allows perfect tone control throughout the complete range of vocal and instrumental reproduction.

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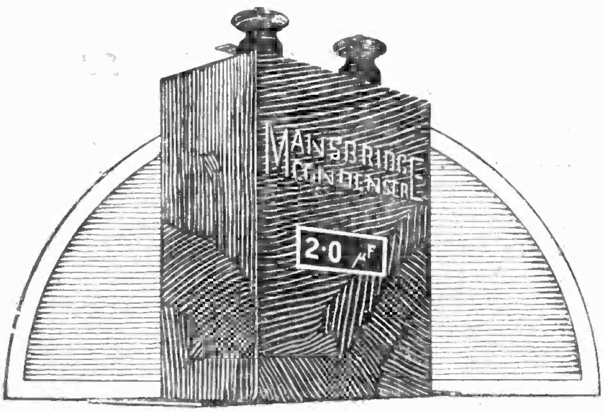
Type B ... ... **£5 15s.**
Types, HB, HHB **£6 0s.**
Type HHJ (Junior) **£2 10s.**

All Type "B" Speakers are characterised by the patent 6-position tone selector. This consists of an ingenious arrangement of blocking condensers, which smooths away all trace of harshness, resulting in a remarkably pure distinctness of tone.

SPARTA LOUD SPEAKER

Fuller's United Electric Works, Ltd., Woodland Works, Chadwell Heath, Essex.



Across your H·T·BATTERY

CRACKLING noises are frequently experienced in the Loud Speaker or telephones of a valve receiver. Such noises, although sounding like "atmospherics" are often due to the sudden changes of voltage which occur in H.T. Batteries.

The trouble can be overcome by fitting across the terminals of your H.T. battery a condenser whose capacity is sufficient to "smooth out" all inequalities in the voltage.

The Mansbridge Condenser (manufactured by the Mansbridge Condenser Co., Ltd.) is admirably suited to such a purpose; it is made in capacities from 0·02 microfarad to 2 microfarads at prices from 2/6 to 5/-. Your dealer will advise you as to suitable capacities, but you should be sure to look for the name "Mansbridge Condenser" embossed on the maroon-coloured case *as illustrated above.* It is your only assurance that the condenser really is made by the

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You can select any one of the big 5 world's Famous Loud Speakers, and we will deliver it free to your address for ONE POUND. The balance of purchase price we will accept by extended monthly payments.

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HENRI & CO. (Dept. A), 160, Victoria St., London, S.W. 1.

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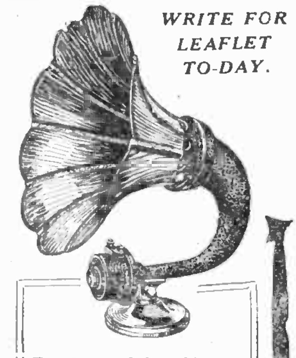

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RADION PYRAMID Power Valves 3-v., 4-v. & 6-v. types, Guaranteed Filament 22/6
(The finest power valves on the market).
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New 2-volt Power Valve 12/6
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RADION Reliable Valves

F.W. LÖWENADLER'S TRELLEBORG

FAMOUS GENUINE **EBONITE** PANELS

(*Contd. from page* 546.)

Marconi Valves for High and Low Frequency Working

READERS who have used Marconi valves of the DE5, DER, and other types will be pleased to learn that there are now available some Marconi dull emitter valves of the 120 milliampere class.

Description of Valves

In all, four valves have been submitted to us for test, *i.e.*, one each of the four types—DE8LF, DE8HF, DE2LF and DE2HF. The former two of these require a 6-volt battery, while the latter two can be worked with 2 volts. The DE8 valves are large and have piples bulbs. The plate and grid are of a flat rectangular shape, while the filament is in the form of an inverted V, the two ends being secured at the base, while the centre of the filament is hung over a support at the top of the valve.

The DE2.

The DE2 valves are smaller in size than the DE8 valves, and are pipless, while the getter renders them almost opaque. This type of valve employs the usual cylindrical anode.

In all four valves the pins have spring sides, and are not split. The caps are of hard black insulating material, and are provided with a ridge to indicate the position of the anode pin. A letter A renders identification still easier. A particularly desirable feature is that the caps are hollow inside, and as thin as is consistent with mechanical strength. This is useful in reducing the self-capacity of the high-frequency valves.

Laboratory Tests

In the case of the DE2HF the amplification ratio varies with the high-tension used, this quantity being greatest with a high anode potential. In the case of the DE8LF there is a smaller relative variation of impedance with anode voltage. For the other two valves both the amplification ratio and

SIX-SIXTY VALVES

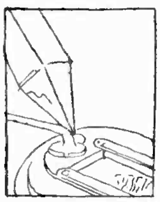
The following data should be added to our list of valve data in last month's issue. :—

Fil. volts	1·5-2
Fil. amps.	·3
Impedance	27,000 ohms.
Amplification factor	10-12

The new Sangamo Condenser, actual size; accuracy guaranteed. Solidly moulded in smooth brown bakelite, this condenser sets a new standard of neat compactness.

Sangamo

An accurate fixed condenser, unaffected by Heat



SIMPLICITY IN ASSEMBLY.—When connecting up in the ordinary way, simply clamp the leads under the terminal screws; if preferred, just tack with solder in addition. When connecting up with bus-bars remove the condenser terminal screws, pass the bus-bars through the screw holes and tack up with solder. The soldering process can be carried out without any risk of burned fingers. No cutting of leads is required.

Temperature or humidity changes, or even rough usage, will not affect the Sangamo Condenser. Soldering has no effect whatever upon the capacity—there is nothing to melt or burn. This feature of permanent accuracy is necessary to bring out the highest efficiency of any circuit—especially in reflex circuits.

Made in all standard capacities and supplied with or without grid leak clips.

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impedance seem to be independent of anode voltage within wide limits. In our tests a somewhat lower filament current was used than the makers specify. This was done because the valve constants were not found to vary appreciably with filament current under the conditions employed, and it is desirable to underrun rather than overrun a filament. Further, although the filament current was lower than the manufacturers' rating, the filament potential was well up to the rating. These slight inconsistencies are generally found in valve filaments, but in the valves tested they were all on the right side.

The D.E.8.

On testing in Radio Press receiving sets the valves were found to function satisfactorily in their various capacities. They were also a good fit for a number of valve sockets, and only slight traces of microphonic noises were present.

Vee Cee H.T. Battery

A SAMPLE of their standard 60 volt high-tension battery has been submitted for a thorough practical test by Messrs. Vee Cee Dry Cell Co., Ltd. It was contained in a cardboard case measuring 9 in. by 3 in. by 3 in., and was tapped at 18 points, which were unmarked save for the terminal ones. It was given an extensive practical trial of several hours a day on most days in the week, supplying current to a small broadcast receiver taking about one to two milliamperes, and also for occasional use in experimental work with multi-valve receivers. After just over three months' use the voltage on open circuit still showed over 60 volts, and the battery was quite fit to use with a small receiver, provided that the customary two microfarad blocking condenser was placed across it. In view of the usual brief life of block H.T. batteries when submitted to the searching test of daily broadcast reception, often for seven hours a day, this must be considered a commendable performance for a battery of but moderate size. For regular use with multi-valve receivers and especially in power amplification a much larger battery is naturally needed.

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Subscribers know the service rendered by this Radio Press Trade journal. It saves their time and is a guide to keen buying.

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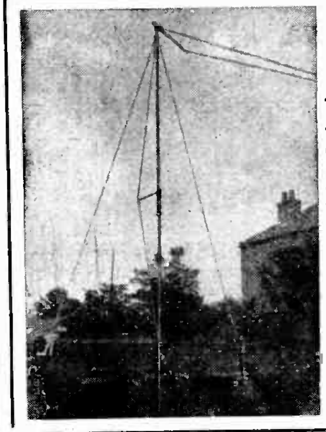

30 ft. "TURRET JUNR" AERIAL MAST 39/6

TO FIX ON FENCE OR WALL.

The Cantilever saves all back guys, thus obtaining the full length of garden. Designed by Naval experts in two sections of the finest Columbian timber steel spreader securing bands, strainer and all guys, 39/6. Clamps for bolting mast to fence, 5/- pair.

40ft. Telescopic "TURRET III." 68/9. 45ft. Telescopic, £4 10s. 6d. 45ft. Super do., £6 15s. 6d. 58ft. Super do., £6 19s. 6d.

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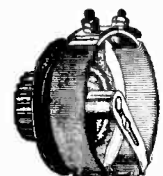

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The new Dual Rheostat — a "Peerless" product in every way. Specially designed to meet the demand for a resistance equally applicable to bright or dull emitters. It has two windings — one offering a resistance of 6 ohms, whilst a continuation of this is of 30 ohms resistance. The resistance element is wound on a hard fibre strip under great tension. One hole fixing is provided and the terminals are placed in convenient positions. The contact arm has a smooth, silky action, and all metal parts are nickel-plated.

3/9 PEERLESS 3/9 DUAL RHEOSTAT

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THE BEDFORD ELECTRICAL & RADIO CO., LTD.,
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For efficient results, absolute accurate capacity and low loss are essential.
You must therefore fit THE

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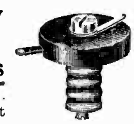

which are guaranteed by our work's laboratory test. The only grid condenser having a three point connection.
The DORWOOD has often been used in sets described in Radio Press publications. This is another guarantee of its efficiency

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PRICES:

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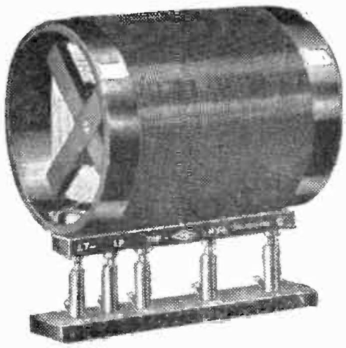

The *First* Low-Loss H. F. Transformer

This H.F. Transformer (patent applied for) represents an entire departure from all other designs. In selectivity and amplification it is far ahead of the ordinary barrel type of Transformer. Its primary is aperiodic, and its exclusive design and shape make it the last word in low-loss and efficiency. The secondary is air spaced on a grooved ebonite former, and each one is made to an exact standard, resulting in the condenser scale reading being practically identical in each successive stage of H.F. amplification. The main feature of this new Peto-Scott production is that the capacity coupling has been reduced to an absolute minimum, resulting in an exceptional degree of selectivity.

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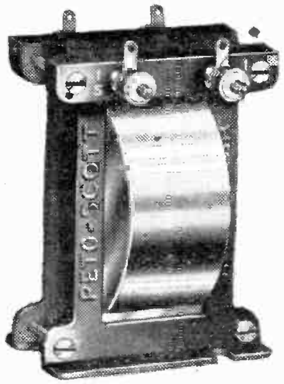
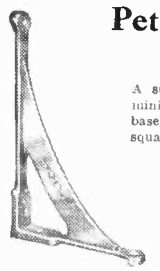


Max - Amp Transformer

Experimenters know that to get the best results from their Sets they need components specially built for the job. For two years the Max-Amp has been recognised as one of the best "All-purposes" L.F. Transformers. Now, however, so many enthusiasts appreciate the necessity of special ratios for special purposes, we have re-designed the Max-Amp in three distinct Models: (a) Red Band for Reflex use; (b) Blue Band for general use and also as a first stage; (c) Black Band for second stage following a Blue Band Max-Amp. All these fine quality transformers are supplied in handsome metal-shrouded cases and fully guaranteed. All one price **19/6**



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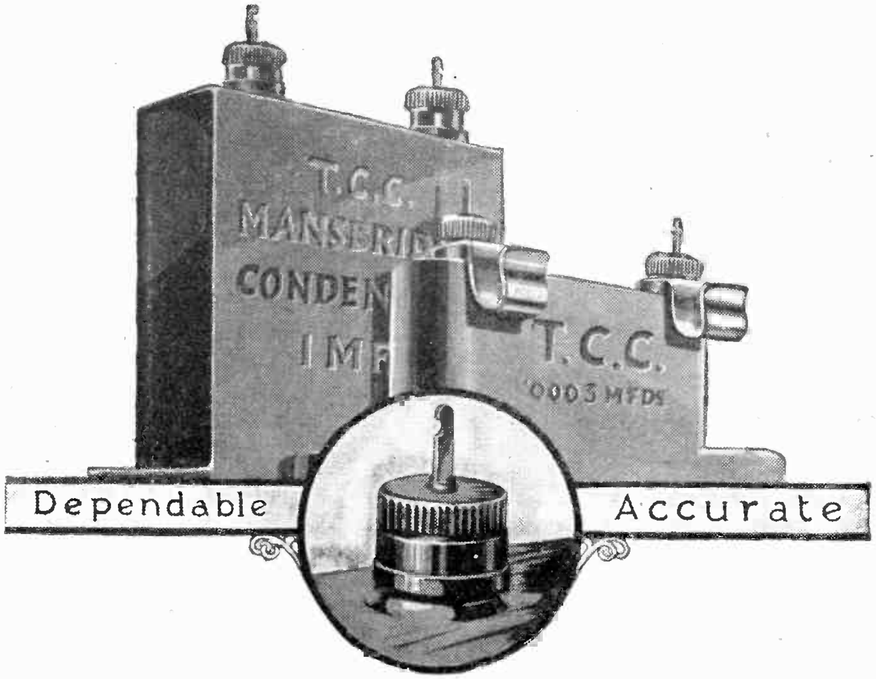

Twenty years of knowing how!

THERE'S one thing every manufacturer needs but which money can't buy—experience. It is experience which has brought T.C.C. Condensers to the forefront to-day. Experience in manufacturing all types of fixed condensers—experience in dealing with the problems peculiar to insulation and capacity—experience in producing millions of condensers, large and small, Mansbridge and Mica.

Money could not buy this experience. It can only be obtained by paying the price—the price of the passing years. For twenty years the Telegraph Condenser Co. Ltd., have been designing and building all types of Condensers. This invaluable knowledge is now passed on to you in the form of T.C.C. Condensers. By specifying T.C.C. in your next Set you will be assured of extreme accuracy and uncommon dependability. Remember, all T.C.C. Condensers in metal cases are genuine Mansbridge, while those in moulded cases are Mica. Each case is green in colour and bears the sign T.C.C. stamped on its side.

Look for the name T.C.C. Mansbridge stamped on the side of the green metal case.

PRICES AND CAPACITIES.

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Mansbridge, ·4 mfd. –	3/2	Mica, ·004 to ·001 –	2/4
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The Telegraph Condenser Co. Ltd., West Park Works, Kew.

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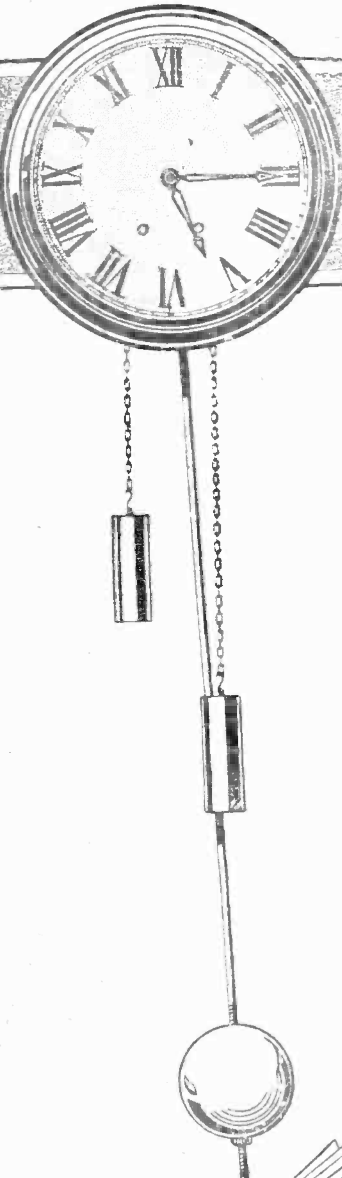

When you are not at home!

—Can Mother listen to afternoon wireless

—the kiddies enjoy the Aunts and Uncles

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Through feminine eyes a receiving set with its battery leads is to be viewed with suspicion—perhaps a shock or two lurks within.

SOLVE THE PROBLEM WITH A SWITCH

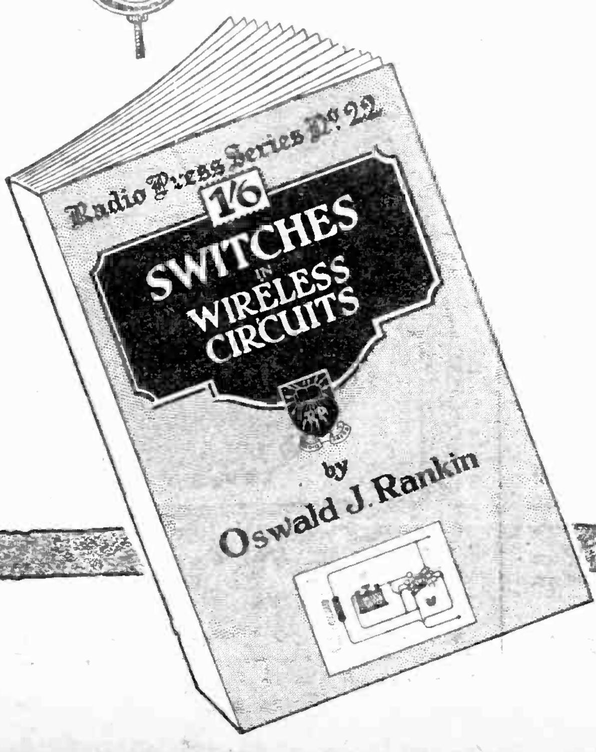
and leave your battery leads permanently connected.

There are innumerable uses for switches in Wireless, each making for simple control of the set. A word of warning—there's a right and a wrong place in the circuit for the switch. Don't ruin your batteries, don't break the wrong part of a circuit.

"Switches in Wireless Circuits" shows you clearly where to put them, and why they are placed there; pictorial and theoretical diagrams make it easy for the novice to understand, while experimenters wishing to lay out a compact and convenient control board will find a great amount of valuable advice on switches and their uses. Get a copy on the way home.

To please mother and the kiddies, let the first result of your buying this book be the fitting of control switches so that they can safely listen in when you are not at home.

Obtainable from all Newsagents, Bookstalls and Wireless Dealers or direct from Dept. M, Radio Press, Ltd., Bush House, Strand, London, W.C.2. Price Post Free 1/9.



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"CLIXIE"

"If you'll always remember what RADIO CONDIT is and act accordingly, you'll never go wrong in handling it," says CLIXIE.

"CONDIT is made of copper tape curled up into the form of split tubing equal in diameter to 16-gauge wire. The two reasons why you shouldn't twist it about like ordinary wire are obvious, first, because it amounts to wire with the middle left out; second, because it's split.

"So bend CONDIT carefully with your fingers. Avoid acute angles. With normal care you can 'persuade' it into practically any shape without opening the split. If the tubing *does* open at the split, no real damage is done; the effect of the split is to eliminate lateral surgings. That effect is unimpaired.

"When you *have* to use pliers, for terminal-loops, and the like, make them round-nosed pliers, please!"

Fingers to bend CONDIT No Pliers, please!

RADIO CONDIT

(P. Patd.)

THE H.F. CONDUCTOR

Per packet of six 2-ft. lengths
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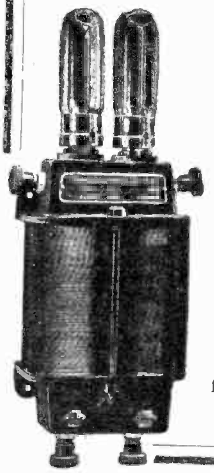
For £4 only

You can purchase the battery charger illustrated below and thus be certain of having your accumulators fully charged and under your own supervision at all times.

This is for working on alternating current circuits, is made to operate on practically all voltages and frequencies, and has an output of approximately 9 volts 2 amps.

Price includes rectifying valve, resistance lamp and also flex and adaptor for plugging into ordinary lamp socket.



YOU need a battery charger. Why not ask your dealer for particulars of the

"ELLA"

or you can write or 'phone

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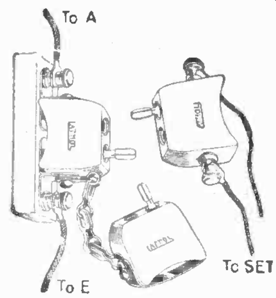
Telephone: Holborn 6323,

for their folder covering all models for both A.C. and D.C. supplies.

Athol

TRADE MARK

AERIAL-EARTH PLUG



for safety first, last and all the time.

As simple as the simplest switch, but twice as efficient. Enables the set to be entirely separated from aerial; and couples the aerial direct to earth.

A spark-gap attachment is provided should the set be inadvertently left connected up.

Plugs and sockets air-spaced and mounted in high grade porcelain.

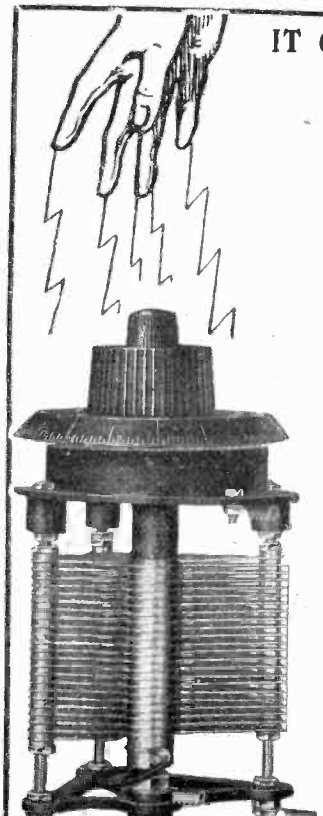
A safety insurance for 4/6

ATHOL ENGINEERING CO.

Cornet Street, Higher Broughton, MANCHESTER.

'Phone: Hr. Broughton 469.

IT CAN'T GET PAST THE Fulstop



VARIABLE CONDENSER

Fulstop Condensers cut out all hand capacity, and every model made is unconditionally guaranteed to this effect. The new Super Fulstop has wonderful selective powers. Designed with a patent clockwork multigear, it gives the use of two ratios of movement: a 2 to 1 and 125 to 1, thereby enabling minute adjustment to be made with case. You can't go past a station with a Fulstop.

The Fulstop is a no-loss condenser, perfectly square law, and has brass vanes. Send for full descriptive leaflet. All models are guaranteed for twelve months.

SUPER FULSTOP VARIABLE CONDENSER.

·00025 ... 25/6 ·0005 ... 28/6
·001 ... ... 30/6

Also two other models.

STANDARD FULSTOP (Geared 2 to 1) Guaranteed to Abolish Hand Capacity

·0002 ... 9/6 ·0005 ... 11/3
·0003 ... 10/3 ·001 ... 13/6

Plain Fulstop (no gear).

If any difficulty in obtaining, write us.

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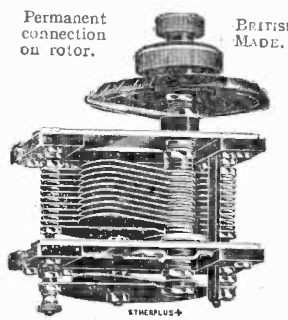
ENSURE PERFECT RECEPTION

Permanent connection on rotor.

BRITISH MADE.



FIT THESE "ETHERPLUS+" Variable Condensers in your Set.

The "Etherplus+" Low-Loss Brass-vaned condensers, with Vernier, cost only **12/6** each in the .0003 and .0005 capacities (without Vernier **11/-**). Yet you can have implicit confidence that whatever else may go wrong in your set, your condenser is *all right*.

Without Vernier.

No.	Capacity.	Price.
W/83	.00025	10/-
W/84	.0003	11/-
W/85	.0005	11/-
W/86	.001	14/-

With Vernier.

No.	Capacity.	Price.
W/87V	.00025	11/6
W/88V	.0003	12/6
W/89V	.0005	12/6
W/90V	.001	15/6

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CROIX The World's Greatest Transformer.

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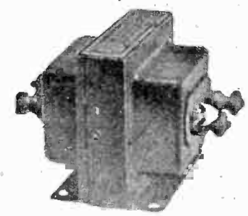
Ratio 5/1 9/- each.



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SOME OPINIONS.

40, STATION ROAD, ENFIELD, Nov. 17th, '25.
DEAR SIRS,—I purchased a "Croix" Transformer to-day, and feel I must write and tell you how satisfied I am with it. I was surprised to find that the results obtained were quite equal to others more than double its price, and I have nothing but praise for it. This was purchased as a result of your advert. in the "Wireless Constructor." Wishing you every success in the future.
Yours faithfully, W. FORSTER.

Mr. S. E. PALMER, 41, THORNFORD ROAD, LEWISHAM, writes on the 28th of October, 1925: "I must say that my customer was highly pleased with the pair of Croix Transformers, Ratio 5/1 and 3/1. Splendid results."

33, CHURCH STREET, ROTHERHAM, Nov. 5th, '25.
DEAR SIRS,—I had one of your "Croix" Transformers brought to me to try out. I gave it a thorough test and kept it, and honestly say it is quite as efficient as any I have, and some of them cost me eight times the price of the Croix. (Enough said.)
Yours faithfully, ALFRED FRANCE.

WARNING.

This is to give notice that genuine "Croix" Transformers will in future be boxed in white boxes with the trade mark "Croix" stamped in black and gold on each end, and will be numbered individually. These boxes are marked in English, and substitutes should be refused. No other Transformers are genuine or guaranteed by us, and the trade and public are warned against them

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RADIAX (H.E.) LOW LOSS COILS

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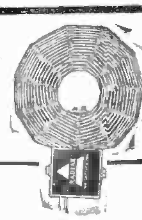
IF you desire improved tuning, volume and selectivity, insist on Radiax Coils. Each one is engraved with trade mark and size. They are strong, all the turns are bonded together, and they are of reasonable size. Packed in individual containers.

No. 25	1/6	No. 75	2/3	No. 200	4/3
,, 35	1/9	,, 100	2/9	,, 250	4/9
,, 50	2/-	,, 150	3/-	,, 300	5/3

Unmounted coils 9d. each less. Set of nine mounted, 27s.



New Catalogue of all components Super Heterodyne material, as well as all types of sets complete and for constructors. Enclose 3d. stamps.

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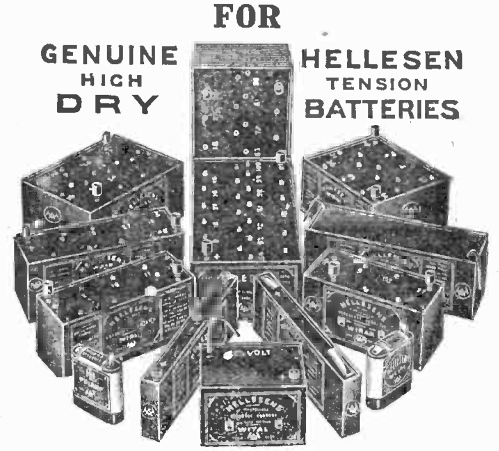
"OUR FIRST ADVERT" FOR

GENUINE HIGH DRY **HELLESEN TENSION BATTERIES**



For the first time this season we have a stock of these famous batteries, and we are therefore advising customers immediately so that they may know that HELLESEN BATTERIES are available from stock for the first time in three years. Such a demand is in itself the best recommendation possible.

MORE EXPENSIVE THAN SOME OTHERS THEY SELL ON QUALITY BECAUSE:—

THEY ARE CHEAPER TO USE!

Delivery from Stock.

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H.P.

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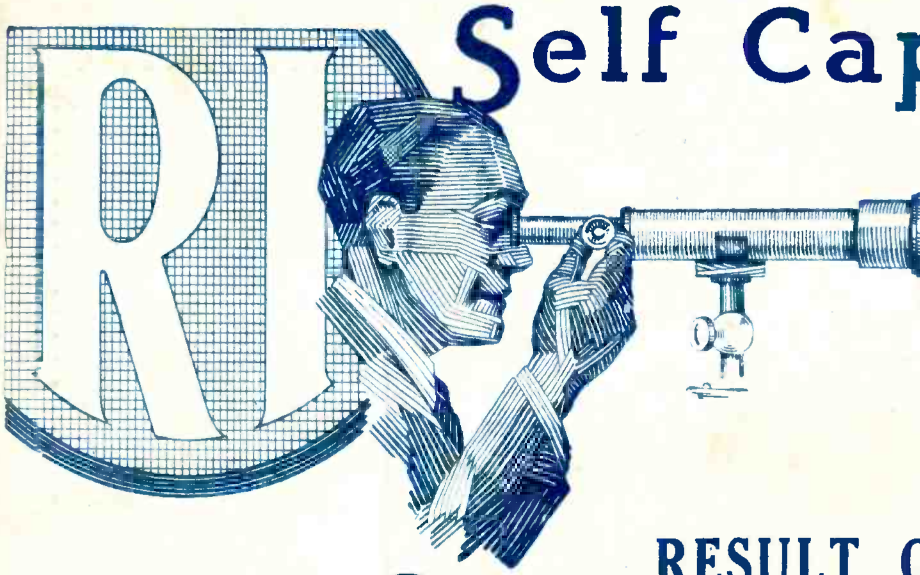
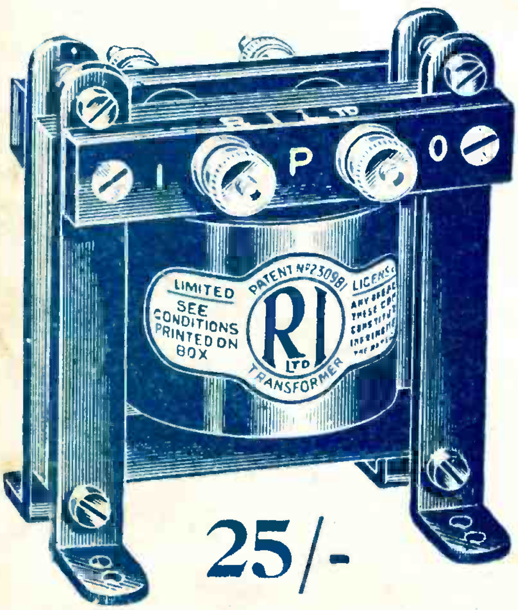


THE RESULT OF SUPREME TECHNICAL DESIGN.



25/-

When buying R.I. Transformers see that they are contained in the R.I. Standard Sealed boxes.

The R.I. famous intervalve transformer is the only one on the market to-day with the remarkably low self-capacity of 18 micro-microfarads. After extensive research in our laboratories, and by making use of the results obtained by eminent investigators in the same field, we found that the only possible way in which the transformer could be improved was in the sub-division of the windings, thereby reducing the self-capacity. This innovation was hailed as a great advance in the design of the intervalve transformer, and since then nothing has been done to improve it.

Now the result of the remarkably low self-capacity of the R.I. Transformer is the perfect and natural reproduction of speech and music. The personality of the artist lives in radio reproduction if an R.I. Transformer is used.

Unsurpassed tonal beauty is the result of the faithful reproduction of every fundamental note together with its attendant delicate overtones.

Test it for yourself—the only real test. Take any simple receiving circuit and couple it to an amplifier built with an R.I. Transformer, with any ordinary valve, and you get perfect music or speech. In order to get equally good results with any other transformer you will have to use special valves, and in most cases you will get inferior results.

Over half-a-million R.I. users will confirm this. You cannot have better proof of the efficiency and value of a component that has obtained a classic name in the Radio Industry.

Write for the R.I. Blue and Gold Catalogue free on application.

RI LTD

THE MARK OF BETTER RADIO

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