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Wireless Weekly

and the Wireless Constructor.

Vol. 4.
No. 11.

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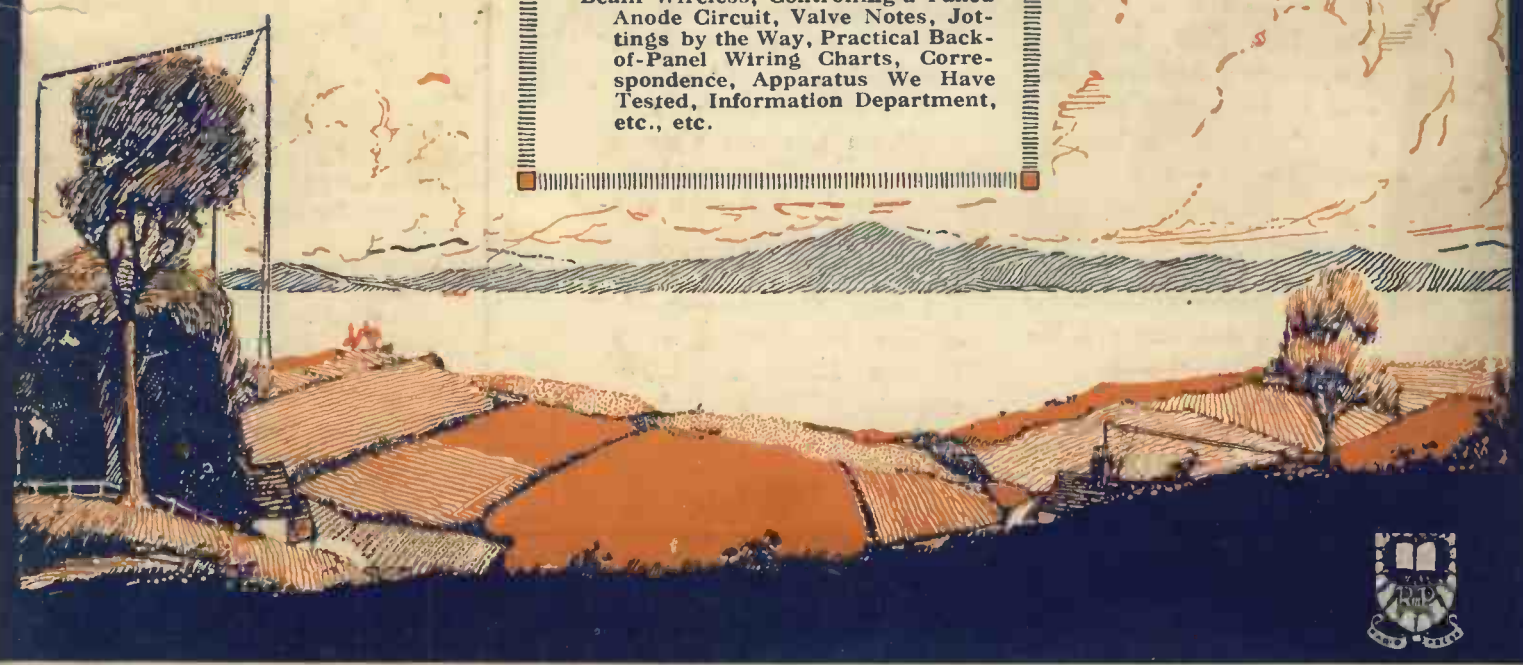
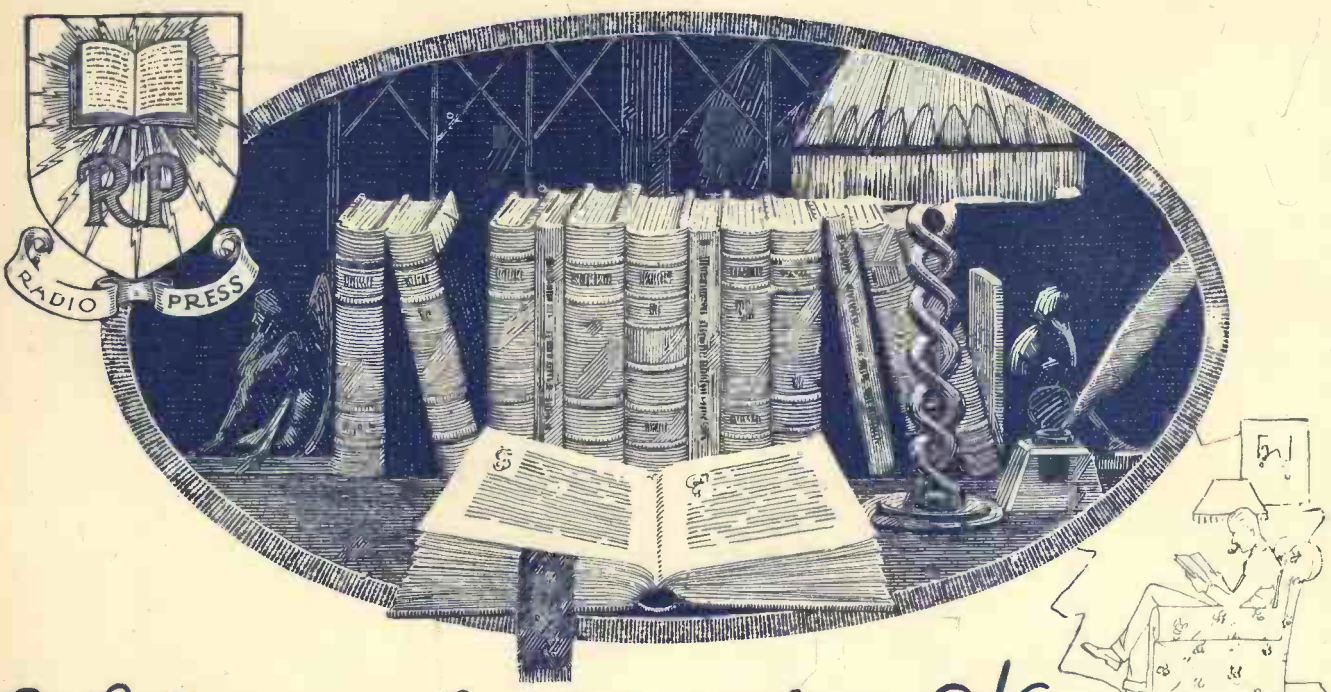


How to obtain Loud Signals

By Capt. H. J. ROUND



A Reference Library for 2/6.

WITH the large number of really good Books on Wireless published by Radio Press Ltd., it is a little difficult for an enthusiast to pick out the most useful of them. The Book ***500 Wireless Questions Answered***, however, by its immense sales, has already proved itself as being the most popular — two editions having been exhausted since last November.

Its wide scope—coupled to the fact that it deals only with live and useful information—is rendering it indispensable to every Broadcast listener and experimenter.

Certainly, previous to its publication it would not have been possible to have obtained one half of the information contained within its two covers under an expenditure of several pounds. And even then the information would not have been given in such a concise and compact form, well indexed, and available at a moment's notice.

Such a Book as this will save its cost many times over—it can certainly be described as a *Reference Library for half-a-crown.*

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Miscellaneous problems.

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2/6

500 Wireless Questions Answered

By G.P. Kendall & E Redpath.

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RADIO PRESS SERIES No. 13.

Wireless Weekly

Vol. 4, No. 11
July 16, 1924

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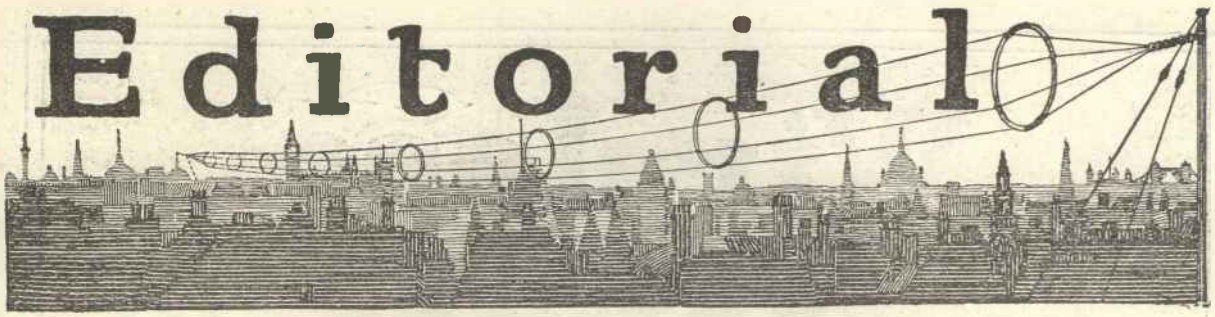
Editorial



Further Aid for Experimenters

FROM the date of its inception it has been the aim and ideal of Radio Press to render the fullest possible service, not only to the wireless experimenter who has already learned the fundamentals of the art, but also to the beginner, whether he is aiming to become a serious experimenter or merely at obtaining the best results from apparatus he has purchased. Furthermore, Radio Press has always realised the fundamental importance in giving the clearest possible photographs, diagrams and wiring guides for the construction of sets at home, a branch of the art the importance of which is now fully realised by all parties.

The unique editorial facilities possessed by the Radio Press organisation, and the full sympathy between its members and the great wireless public, has accounted more than anything else for the success they have attained. The policy of seeing that every set described really works, and works *well*, and is made from parts readily obtainable in good quality, has been abundantly justified, and we are naturally proud of the reputation we have gained for reliability in this regard.

A Missing Link

For some months, however, we have felt there is still one branch of wireless in regard to which the experimenter and home constructor cannot be said to be fully catered for. It is known that in the best regulated of wireless workshops, sets are occasionally made which fail to function, although everything seems to have been made in the proper way and all connections appear correct. Only experts, and frequently only a few of the experts, are able to place their finger on the real fault, which may prove of a particularly elusive nature. A well designed three or four valve set, if good components are used, is not a cheap piece of apparatus to build, and it is most disheartening to find, after the best possible work has been put into a set, that it still fails to give the results required.

Having actually tested the sets we describe we are of course in a position to say definitely that every one will work just in the way described, and it might be thought that the possession of this knowledge would prevent our taking further interest in the matter. We feel, however, that the interests of the readers are ours in every way; we have therefore made arrangements which will add still further to the service we render.

Firstly, the actual sets described in *Wireless Weekly* and *Modern Wireless* can now be seen and examined by any interested reader who cares to call at Radio Press offices. Naturally this service is limited in time, for with the number of sets produced in these two publications the office would soon be full. We have made a rule that the set described shall be on exhibition for three weeks after the date of publication of the paper in which the set is described, after which they will be withdrawn.

The Service Department

The second important addition is that we have now established a Service Department, where, for a nominal fee, readers' sets made according to our designs can be examined, tested and reported upon and defects remedied in those cases where they have failed to work. Readers of our publications are thus in the highly favourable position of knowing that the articles of a constructional nature are accurate and reliable, that they can see the sets themselves, and that, if necessary, on those few occasions when they fail to work properly the Radio Press Service Department will tell them what is wrong.

It should be unnecessary to point out that if any defects can be shown to be due to any fault on the part of our publications no charge will be made for the tests referred to.

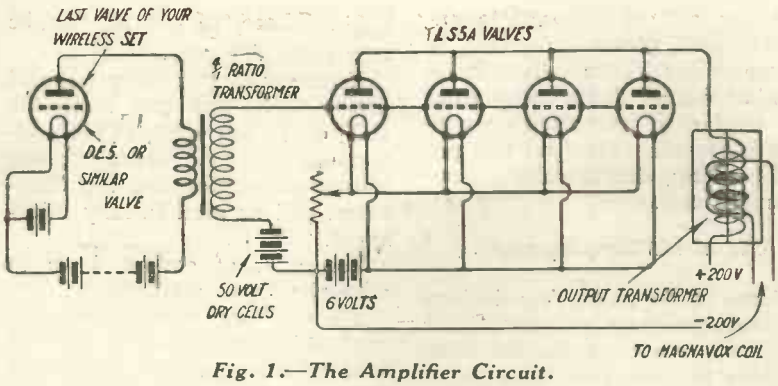


Fig. 1.—The Amplifier Circuit.

How to obtain Loud Signals.

By H. J. ROUND.

An article by one of the greatest British receiving experts giving practical details of a real power amplifier

CAPT. ECKERSLEY is always preaching quality first, but a lot of people still want a noise, and I propose to show you how to make quite a loud noise without much more distortion than you get at present.

Your wireless receiver wants to be moderately distortionless—resistance amplifiers with no reflex arrangements are usually pretty good. The loud-speaker I propose to work with is the Magnavox, and the quality out of doors will be very fair. The Magnavox principle is probably better for very loud sounds than that in use in the Amplion, as the forces and the reactions can be made more linear over a wide amplitude. This remark only applies to the principles involved, not particularly to the instruments named here.

A Curious Fact.

It is rather curious that the Magnavox principle seems to have been first conceived by Sir Oliver Lodge; that is, it is an English invention, whereas the Amplion principle is the original Bell telephone, an American invention, and yet the use in the two countries has been inverted.

Both the large and the small Magnavox will be suitable for the experiment.

The valves I propose to use are a kind I have designed particularly for the purpose. This valve is, in all particulars except the grid, a copy of the M.O. L.S.5, but this grid I have opened up until the impedance has fallen to 2,000 ohms and the "m" value to 2. The valve is called the "L.S.5.A."

A Fine Small Power Valve.

This type of valve (I mean both L.S.5 and L.S.5.A) for small power purposes is probably the finest tube in existence. Its filament is of a specially treated thoriated tungsten, apparently capable of any amount of ill-treatment, and the vacuum is extraordinary. Originally rated by the manufacturers at about 120 volts, and 4.5 volts on filament, I constantly run these valves at 500 volts with 25 watts loss at

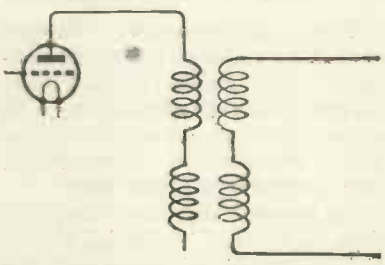


Fig. 2.—The Equivalent Circuit when using Valves in Parallel.

the plate, and the only damage seems to be bulb blackening from the nickel anode. Although the filament is rated at 4½ volts, I have run for long intervals at 7 volts on banks of the valves, and so far have not damaged a single tube.

The L.S.5 itself is an ideal valve in an amateur transmitter, and the L.S.5.A is ideal as the modulator with the L.S.5 as oscillator. These valves, after considerable use, should be handled carefully, as the filaments tend to become brittle.

The Step-up Transformer.

The one serious fault about these valves is the price. Whether this can be reduced I have no knowledge.

If the last valve of your wireless set is of the 201 A variety (M.O.D.E.5—B.T.H.B.4), then you will want a good 4/1 step-up transformer. Any valve of more impedance than this will require either less transformation ratio or some element of transformer damping. It would be much nicer if two transformers were obtainable here instead of the one. That is, a step down then step up again. The intermediate circuit then permits one to put the loud-speaker amplifier away from the wireless set. I do not think any such transformers are on the market, however.

I will now give the circuit to be used (Fig. 1), and details of the one or two parts which must be built up.

How to Make the Output Transformer.

The iron core output transformer will have to be made up, and a rough indication of the method of design will be given here.

In general the power valve system should have connected to it an effective absorbing resistance from two to three times the resistance of these valves, providing undistorted volts to the grids of the power valves are unlimited.

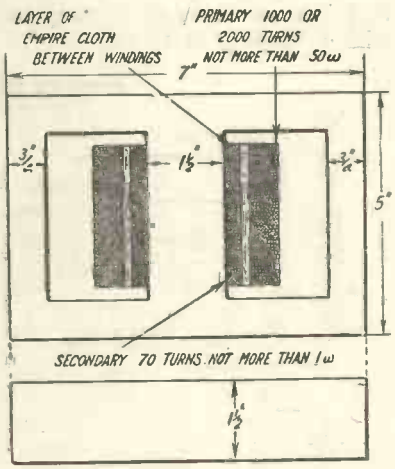


Fig. 3.—Details of the Output Transformer.

If we choose four valves in parallel, the resistance will be 500 ohms and our equivalent circuit will be Fig. 2.

It is fairly obvious that the choke should be higher in impedance at any important frequency than an assumed 1,200 ohms output resistance, otherwise it will short-circuit the lower frequencies.

Let us say at 300 cycles $2\pi nL$ should be 3,600 ohms. This gives

$$6 \times 300 \times L = 3{,}600$$
$$L = 2 \text{ Henries.}$$

If we take a stalloy core of the dimensions shown here, 1,000 turns on the central core will give about 2 Henries. These can be wound layer winding or section wound on the middle line, just as you like, and will constitute the primary of our transformer. The ohmic resistance should be kept low so as not to lose D.C. voltage.

The Magnavox Winding.

Now as to the secondary. A Magnavox winding is about 6 ohms, so that our secondary winding should be $1{,}000 \times \sqrt{\frac{6}{1200}}$ =70 turns. The resistance of the wire in this case should be less than 1 ohm. Incidentally I forgot to say that the Magnavox transforme- should be removed and leads taken directly to the moving coil terminals. These leads should be kept under 1 ohm in resistance.

In case you only want to use one-power valve, it is advisable to put 2,000 turns of primary on with a tapping at 1,000.

A lay out of a complete receiver and power amplifier is shown, but keep the loudspeaker out of doors away from the receiver if its polarising current is on, otherwise you will get bad howling, due to valve microphonic action.

Use of Milliamperemeter.

Some of the correcting devices I have previously written about* will help you to make the tone suitable to your ear.

A milliamperemeter reading up to 200 milliamperes will be very useful to watch blasting—*i.e.*, the needle should not move too much when working—and a low-resistance hot wire meter in the moving coil circuit will be handy to watch for overload of the coil —half an ampere should be the limit.

High Tension Supply.

The high-tension battery should be either a good accumulator—say, Exide 24 A.Y.G.1, 50-volt units—or the mains, with a low-resistance smoothing choke and Mansbridge condensers. Dry batteries will not last.

To prevent reaction, the negatives of the L.T. batteries should be connected, or, if using the mains for the power valves, connected through a Mansbridge condenser to prevent earthing of the mains.

The value of grid negative in general is about $\frac{H.T.}{4}$ for these valves, or for any valve about $\frac{H.T.}{2m}$ These, of course, can be very small dry cells.

If the power you can get is still not enough, you can raise the H.T. up to 400 volts, suitably increasing the grid negative; but beware of burning out the Magnavox coil or mechanically injuring it.

You will, of course, have to raise the input strength.

The milliamperemeter will also be useful for watching blasting in your amplifier, which should not distort until distortion shows in the power bank.

If you wish to connect two or three Magnavox instruments to the same set, the secondary turns will have to be altered to get the best effect. You can work them out in the same way as for one Magnavox.

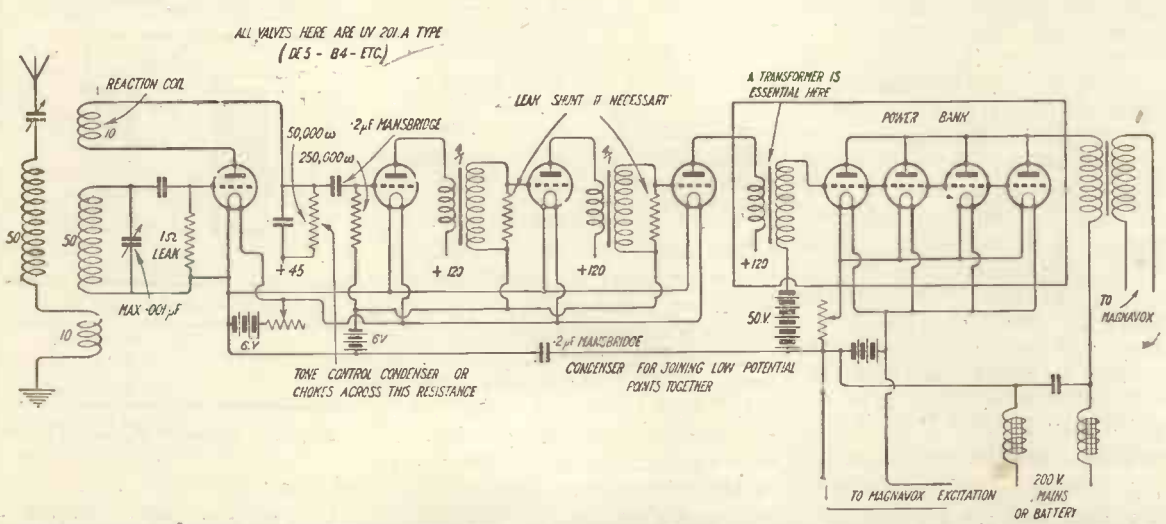
Connections for Several Loud-Speakers.

If instead of raising the voltage you wish to double the power, you can increase the number of valves to eight, decreasing the transformer primary to 700 turns.

Care should be taken in use to disconnect the Magnavox before making any changes in the set, as the loud bangs made by disconnection in the amplifier may damage the loud speaker.

A long, straight, wooden horn, say 4 or 5 ft. long and about 18 in. at the big end, will increase the volume of low tones. This can be made as a square cone with good effect. It should taper down to the Magnavox orifice in diameter internally.

**Modern Wireless*, April, 1924, issue.



Connections and details of a complete receiver. All valves should be mounted on rubber, antimicrophonically. Those who prefer may use resistance-capacity connections instead of four-to-one transformers.

GOOP-WAYFARER No. 761

Synopsis of Previous Chapters

New Readers Can Begin Now

(Professor Goop and Wireless Wayfarer, having invented the most wonderful circuit that the world has ever seen, are giving it to readers of *Wireless Weekly* in serial form. The talented authors have dealt so far with the aerial tuning inductance, the condenser which gingers it up and the leads which connect it to the set. If you have not started to construct, pull up your socks and get down to it. If you are a new reader start your career well and

BEGIN THIS THRILLING SERIAL NOW)

Vital Components

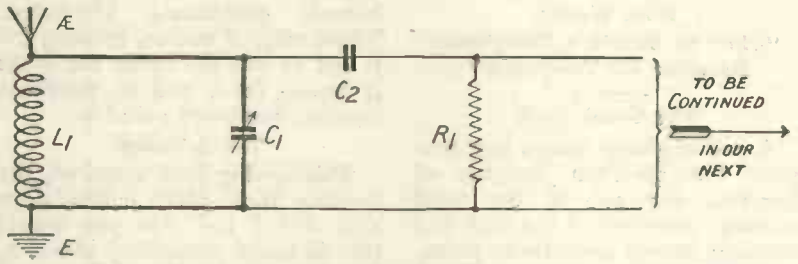
We come this week to two of the most important parts of the new Goop-Wayfarer circuit. These are the grid condenser and grid leak. A condenser is called a condenser because it does not condense; a leak, on the other hand, gets its name from the fact that it does leak. You will thus see that there is good reason for the names which we give to all our wireless parts. What would happen if a condenser did condense and the leak did not leak I cannot think, but Professor Goop is studying this problem deeply and I hope before long to tell you something of the results that he has achieved in this direction. And now the probability is you want to know something about the work done by the grid condenser. It is a hot day, and, as I have explained before, summer is not a time when a man should really be called upon to work. Still I will do my best to help you. Possibly it will save both of us trouble if I quote the explanation given by Professor Popoff in his little book "Wireless Without Tears." As the Professor has acquired by correspondence no less than seven degrees from the Postal University of Saskachumbo, Conn., U.S.A., it goes without saying that he is a man of considerable erudition, and that his words must carry weight.

And There You Are

"The grid condenser," writes Professor Popoff, "is the most important component of the wireless set (I said that, too). The way in which it functions is difficult to understand and still harder to explain. I notice that most writers of books upon wireless skate over this part in an airy way and leave the reader no wiser. Others produce bewildering masses of figures and any number of weirdly-shaped curves. But they again quite fail to make clear the purpose served by the grid condenser. I do not propose to imitate either of these types of author, and will endeavour to make the function of the grid condenser perfectly clear to all who have patience to read my little book." This is the end of the chapter on the grid condenser, and as there is no further mention of it in the book I take it that the Professor expected that very few would have the patience to peruse his immortal work. Anyhow I have quoted one of the most lucid explanations of the grid condenser's working to you, and that should be enough. If you do not now understand fully just what the thing does it might possibly be better for you to give up wireless as a hobby and to take instead to the making of wool mats or to the rearing of silkworms. Alternatively you may write to me about it, enclosing three cigarette pictures and a block of ice, and I will answer you fully when my working season comes round.

Now for the Grid Leak

Now that we have arrived at a pefect understanding on the part played by the grid condenser I can go on to explain with equal clearness precisely what the grid leak does. Its chief function is to produce atmospherics so as to give the sorely-tried amateur a good excuse for closing down when his set refuses to work. If you must buy grid leaks never purchase those of good quality, for these are apt to do their leaking in comparative silence. Go to some small shop in a by-street which displays "guaranteed 2-megohm grid leaks" at sixpence a time. A perfectly silent grid leak is most unsatisfactory, for you never know whether it is working or not. If, however, you fit a real ear-rattler there will be never any doubts on that score.



The Goop-Wayfarer No. 761 circuit as revealed to date. Addition of the grid leak R1 is described herein.

Constructional Details

It was my firm intention to tell you exactly how to make both the grid condenser and the grid leak, but, as I have remarked before, the weather is hot and I feel sure that if I did so you would be far too lazy to make them up for yourself. If, therefore, you will kindly purchase them from the little shop round the corner you will save both of us a great deal of trouble. One little difficulty seems to arise here, which is that with your natural love of truth you may find it hard to claim that these things are genuinely home made. A knotty point, I admit, for those who are not the possessors of thoroughly well-trained consciences which speak only when they are spoken to. A simple solution of the difficulty is to enclose both of them in small home-made boxes provided with terminals. Then, if you are asked the question "Is this your own make?" you may lay your finger on the box and say, with a slight shrug of the shoulders, "Oh, great Scot, yes, I made that!" If your questioner thinks you are referring to the contents of the boxes, that is his look out.

Next Week:

"How to Obtain a Telephone Receiver for Twopence"

The Great Trek

A pall of gloom hangs just now over the northern heights of London, for one of the most eminent members of the staff has recently moved from those parts, flitting, as the swallows do when they have had enough of our climate, towards the milder south. When it was rumoured that he had the intention of leaving, a deputation, headed by the Mayor wearing his chain of office and the latest thing in civic millinery, waited upon him to beg him to change his mind. They pointed out that his aerial had long been a local landmark, and that if he went the prosperous and residential area would soon become deserted. He explained, with a choke in his voice, that though his heart was in Hampstead he yet must bid them adieu. His last touching words, "I don't want to leave you, but I feel I've got to go," brought tears to every eye; but in spite of these manifestations of grief he remained adamant. Lest there should be any misunderstanding, I think that I had better tell you first of all why the move became necessary. The house which he occupied had been selected, of course, because of the admirable position which it offered for the erection of an aerial. Towering steel masts were erected and between these was slung a glorious sausage which was the envy of all beholders. Unfortunately, the garden beyond was owned by one who had a rooted dislike to aerials. To him it was an eyesore, and he resolved to blot it out from his line of vision.

Deinodendron Togoense

He purchased a sapling of the Togoland Shooter (Deinodendron Togoense) which he planted on his side of the wall quite close to the mast. The main feature about the Togoland Shooter is that it shoots. It has been known to grow at the rate of more than a foot a day under suitable conditions. The early shoots of the Shooter produced little effect, but as it more and more nearly approached the height of the mast, the wireless man's signal strength began to fall off, and there came a time when he found himself completely blanketed. There was, of course, nothing for it but to sell the house for what it would fetch and to purchase another one more suitable.

The Advance

This having been acquired, the moving took place a few days ago, and I feel that you would like to know something about it, in case you should ever be called upon to change your abode. The procession across London consisted of four pantechnicons marching in column of route with precisely the correct intervals between radiator and tailboard. The first contained the household furniture, the other three what we may call the effects. In one were packed thirty-seven wireless sets, fourteen accumulators, the steel mast, the sausage and sundry small components. The next was devoted chiefly to valves, whilst the last was stuffed to overflowing with condensers, wire and other miscellaneous bits and pieces. All went well until Westminster Bridge was reached, but here a sudden cry of anguish was heard from the owner, who was riding at the head of the procession in a Tin Lizzie. Being one of those who are always willing to help (provided that the work is not too hard), I had gone down to give a hand, and was enacting the part of rearguard mounted upon a motor scooter. Hearing the cry, I hastened to the front, brushing aside a motor bus and overturning two or three taxis as I did so.

A Terrible Moment

"What is it?" I asked, as soon as I had reached his side. "Tell me, tell me everything and keep nothing back." His sobs were so violent that I could make nothing of what he said, but at last, when I had stroked his hand for a time, he calmed down sufficiently to gasp out, "What shall I do? I have left Philip behind." "Philip?" I asked, "Philip?" "Yes, yes," he sobbed, "Philip. The light of my eyes, the joy of my heart, the most faithful grid-leak that ever man possessed." This was indeed a tragedy, and I joined him in his weeping. There was, of course, nothing for it but to go back again to rescue Philip, for goodness only knew what might happen to him if he fell into bad hands.

Back Once More

With the help of half a dozen policemen, mounted and dismounted, and amidst the cheers of the onlookers we executed the manœuvre known as right reverse—no easy business this with a column of pantechnicons on Westminster Bridge; and cheered by M.P.s who had assembled upon the Terrace to watch our progress, we made our way slowly back to the grim north in search of the missing Philip. You may imagine the emotion which racked us both as we went. I am glad to say that we found him nestling in cotton wool in his little box which had been left behind on the mantelpiece. The meeting between him and his owner was one of the most touching scenes that I have ever witnessed. Thereafter all went well. Our progress from north to south went off without a hitch. The only thing that is worrying me is that I have rashly promised to go round next Saturday to help to stick up the aerial mast. As I have remarked before, it is hot just now. . . . .

WIRELESS WAYFARER

RADIO PRESS SERVICE DEPT., LTD.

Experience having shown that many of our readers who wish to have their sets tested by the Service Dept. find it impossible to bring them during ordinary office hours, it has been arranged that the Test Dept. shall remain open until 8 p.m., and it is hoped also to remain open on Saturday afternoons when the necessary arrangements have been made. An announcement regarding this last will be made at a later date.

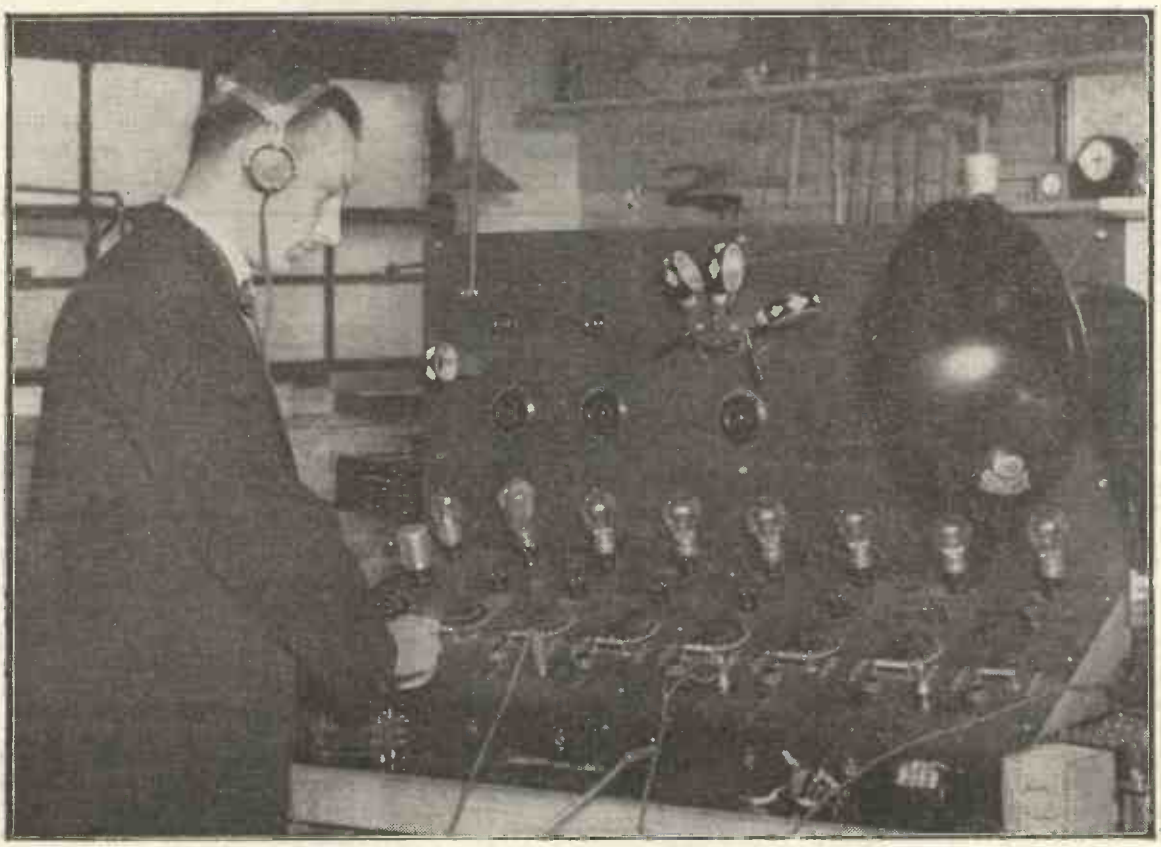
The address of the Service Dept. is Grecian Chambers, Devereux Court, Strand, W.C.2, and readers can easily locate it by looking for the entrance to Devereux Court in the Strand; it is almost opposite to the Law Courts.

The scale of charges for the testing of sets has been fixed, provisionally only, at 2s. 6d. per valve in the case of multi-valve sets, "dual" valves to be counted as two. Thus, the fee for a complete test and report upon an ST100 receiver would be 7s. 6d. For information regarding any special cases ring up Central 1497.

Radio Tests on a Train

Experiments in wireless transmission and reception carried out by the Radio Society of Great Britain on Friday, the 4th inst., on a special coach attached to a train running from King's Cross to Newcastle gave very satisfactory results. Calls from the Radio Society's station were received until broadcasting began, and at 8 p.m., when the train was travelling between Potters' Bar and Hatfield, at 60 miles an hour, the chimes of Big Ben were heard. An amateur station at Bedford was called, and when the train was near St. Neots, Bedford replied that they had heard well the train calling during the earlier part of the journey. A four-valve receiving set for broadcast had to be closed down for a time, as it was interfering with a special three-valve receiver for short-wave reception on 185 metres, but later broadcast programmes from London and Birmingham were enjoyed. The aerial used was a double length of wire 40 ft. long fixed about 18 in. below the roof of the coach. Our photograph on another page shows the interior of the experimental coach.

AN EXPERIMENTAL EIGHT-VALVE RECEIVER.



This photograph shows Mr. Bertram G. Calver of Hurlingham, with a special multi-valve set he has built. Such an instrument as this obviously requires highly skilled handling.

A Useful H.F.-Detector Receiver

By
STANLEY G. RATTEE,
Member I.R.E., Staff Editor.

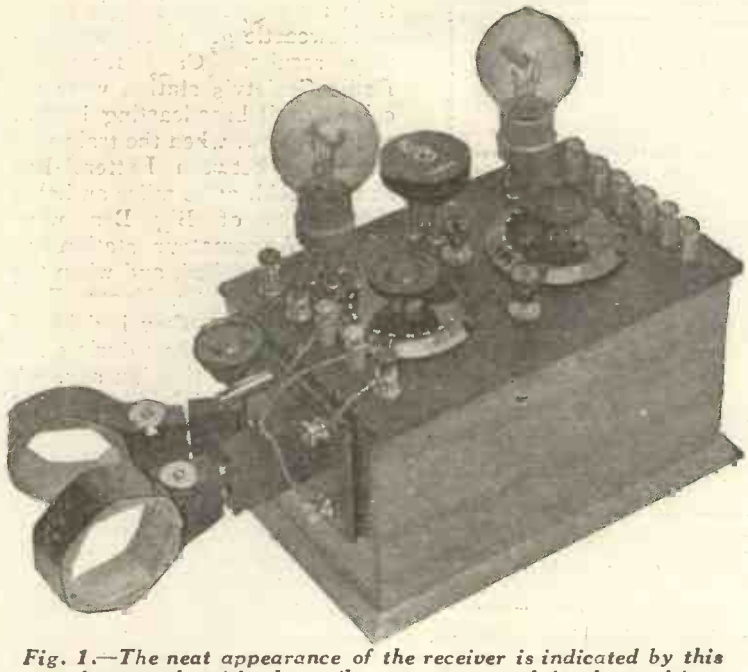


Fig. 1.—The neat appearance of the receiver is indicated by this photograph with the coils, etc., mounted in the positions as used.

OF the three possible arrangements of coupling high-frequency valves, this receiver uses the well-known transformer method, but as a departure from the more usual practice, the secondary or grid circuit is tuned in preference to the primary winding.

The circuit employed is one given by Mr. John Scott-Taggart in his "Valve Notes," Fig. 1, in the July 2 issue of *Wireless Weekly*, with the addition of constant aerial tuning.

The results obtained in S.E. London with this circuit indicate that with ordinary, careful tuning Cardiff, Bournemouth and Birmingham may be received with sufficient strength to give comfortable telephone reception, whilst with more careful manipulation Manchester and Aberdeen may also be received. With the receiver tuned to London signals are of sufficient strength to work a small loud-speaker with ample volume for a small room.

Comparative Results

Compared with the more usual two-valve circuit in which the first valve is coupled to the detector by means of a high-frequency transformer with tuned primary and the reaction coil is in series with the telephones and plate of the detector valve, the results obtained are somewhat in favour of the receiver described in this article, though the instrument calls for more skill in its operation than does the more usual arrangement.

Experimental Observations

It may be observed, in the course of experiments, that the receiver has a tendency towards self-oscillation, but with careful adjustment of the H.T. voltage and the use of a small coil for reaction, this tendency will be no more pronounced than in other circuits in which reaction is incorporated; provision for the use of a small reaction coil is obtained by means of constant aerial tuning as advocated in the "Valve Notes" referred to above.

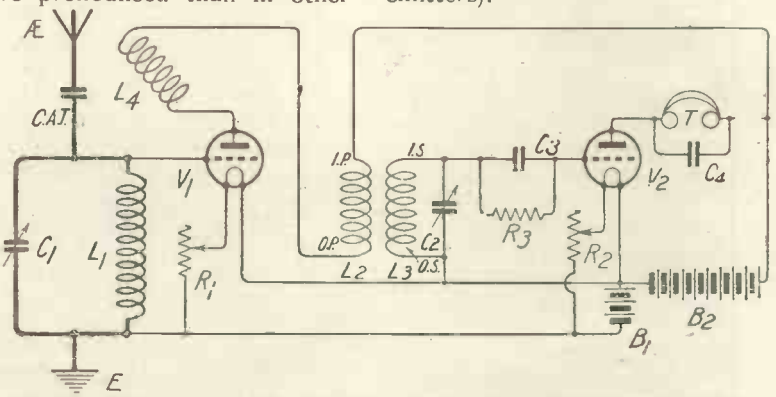


Fig. 2.—The circuit of the receiver. Note that constant aerial tuning is employed.

Components

The receiver as illustrated is made up of the following components, and though no special manufacture of these is advocated, the values must be strictly adhered to:—

1 ebonite panel measuring 9 in. by 5¾ in. by ¼ in.
1 0.0005 μF variable condenser.
1 0.0003 μF variable condenser.
1 0.0001 μF fixed condenser.
1 0.0003 μF grid condenser.
1 0.002 μF fixed condenser.
1 2 megohms grid leak.
2 Lissenstat minors.
3 valve-holders or, alternatively, 12 valve-socket pins.
11 terminals.
1 H.F. plug-in transformer to cover the wavelengths desired.
Set of plug-in coils for the wavelengths desired.
1 two-coil holder.
1 60v. H.T. battery.
1 accumulator (6v. for bright emitter valves or 4v. for dull emitters).
Quantity of tinned copper for connecting purposes.

The Circuit

The circuit arrangement of the receiver is the same as that given in Fig. 1 of "Valve Notes" in the July 2 issue of this journal, with the exception that constant aerial tuning is added, and for

A Broadcast Receiver in which reaction is obtained by the little-used method recently described in "Valve Notes."

the guidance of new readers the modified circuit is given in Fig. 2.

The reader who has little experience of sensitive circuits would do well to first lay out his components upon the table and then roughly connect them up as shown, and so assure himself that he understands the circuit before making positive connections with solder.

This method will, in the event of a misunderstanding of what is required, make itself manifest before time in careful workmanship has been expended. Further, this rough lay-out of components will make the finding of any fault an easier and less tedious occupation.

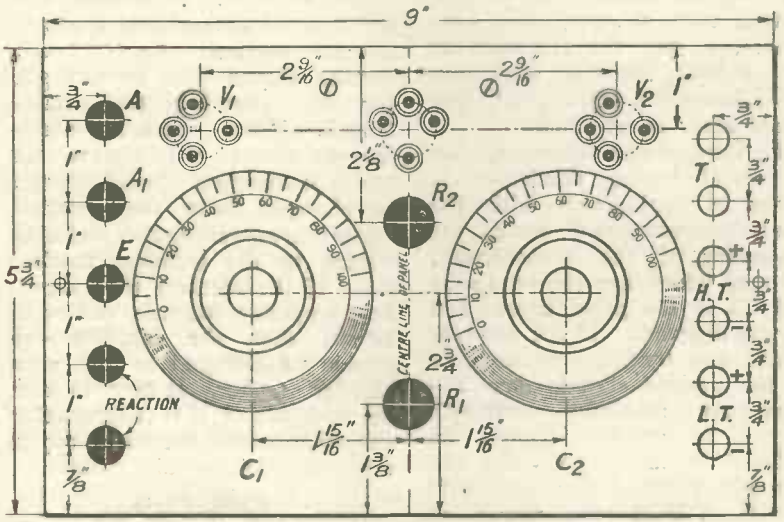


Fig. 3.—The layout of the panel, showing dimensions and purposes served by the various terminals.

The Panel

This is made from the ebonite appearing first in the list of components and is drilled in accordance with the instructions given in Fig. 3.

There are now on the market certain makes of ebonite which, besides having a glossy finish, are guaranteed to be free from surface leakage, and readers when buying ebonite should assure themselves whether or not the material purchased bears that guarantee. In cases where this specially prepared ebonite is not supplied, then the panel must be subjected, after the drill holes have been made, to a thorough rubbing on both sides with fine emery cloth in order to remove any impurities which may be embedded in the surface as a result of the tinfoil treatment which constitutes a part of the manufacture of most ebonite.

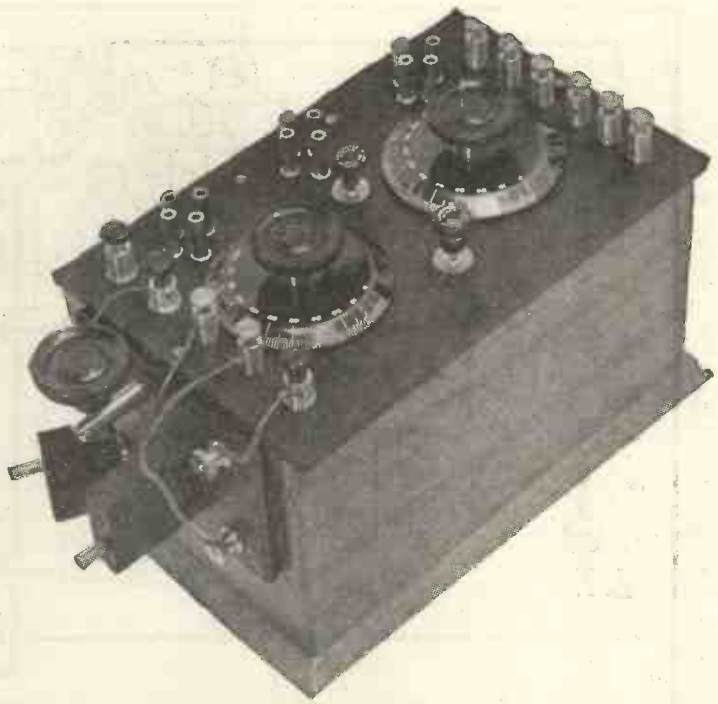


Fig. 4.—Illustrating the disposition of the parts upon the panel, the coils, valves, etc., having been removed for clearness.

Wiring Up

The wiring of the receiver may be seen in the photograph, showing the underside of the panel, and may be more clearly followed in the practical wiring diagram given in Fig. 5. It will be observed that stiff wire is used for connecting purposes, but in cases where readers prefer to use the somewhat easier method of soft wire and insulating sleeving there is no reason why this latter method should not be used so long as all leads are kept as short as possible and are well spaced.

H.F. Transformer Connections

The connections to the H.F. transformer are given in the wiring diagram to give satisfactory results with the transformers tried, namely, a McMichael, Ediswan and Formo, but it may be found that with other makes of transformers these connections may vary, and in any case before finally connecting the receiver the practice of changing over the connections should be tried, meaning IP or OP to plate IS or OS to grid.

Whilst on the subject of transformers, it is interesting to note that I was recently informed by Mr. Percy W. Harris that even with a given make of transformer one could not be sure of

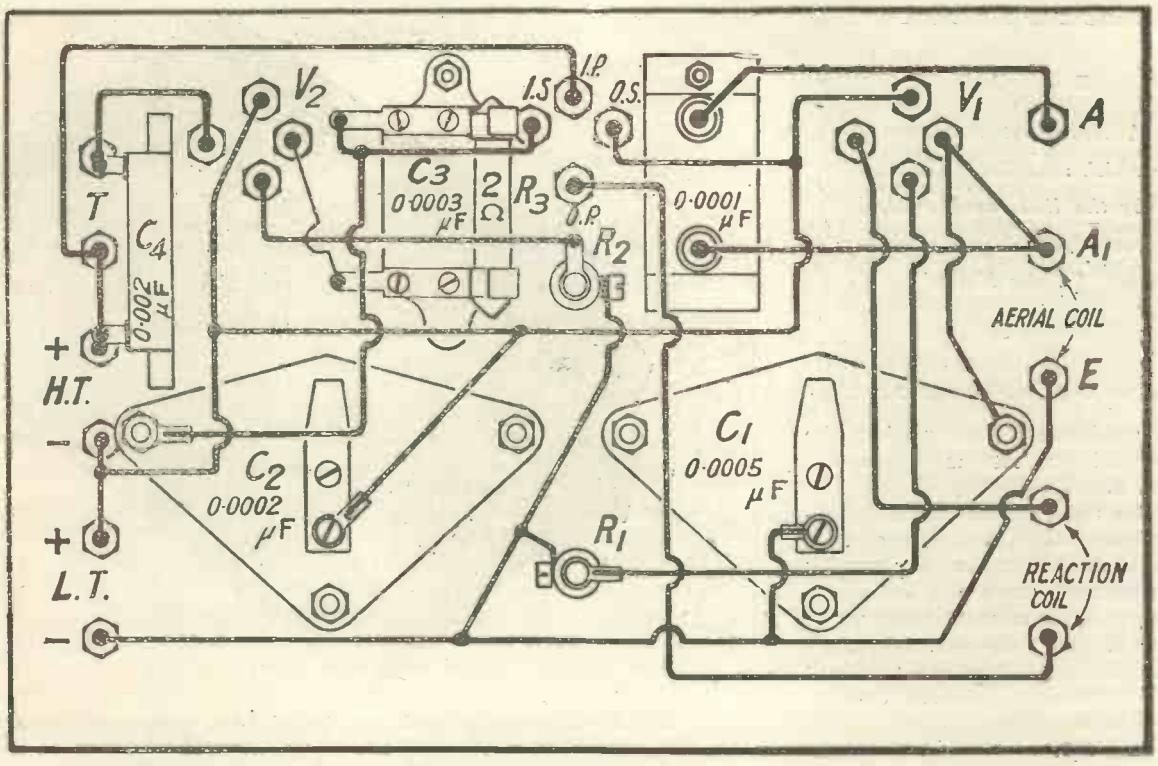


Fig. 5.—Practical wiring diagram, the values of the condensers, etc., being shown.

one transformer being the same as another, and, as an illustration of this fact, he pointed out that with two transformers of the same make one was wound clockwise whilst the other was wound in the opposite direction!

Coils for B.B.C. Wavelengths

The operating of this instrument is much the same as when using any other H.F. detector combination, with the exception that with this receiver a little more careful manipulation is called for to obtain the best results.

For the reception of the B.B.C. stations using wavelengths up to 420 metres the aerial should be connected for constant aerial tuning—that is, to the terminal marked A in Fig. 3, and the earth should be connected to the terminal marked E. A No. 50 plug-in coil should be inserted in the aerial coil socket and a No. 25 coil in the reaction coil socket.

Operating the Receiver

The aerial and reaction coils should be turned to a right angle position and the H.T. battery connected. Plug a suitable H.F. transformer into the middle valve holder, and light the valves to a suitable degree of brilliance; it should be noted that the average H.F. transformer for broadcasting is wound to cover wavelengths from 300 to 600 metres with a .0003 µF condenser, so for the reception of the B.B.C. stations excluding the 1,600-metre station only one transformer is required.

To tune to the desired station the aerial tuning condenser is varied in conjunction with the condenser connected across the secondary of the transformer, both of which are shown as C1 and C2 in the panel layout and wiring diagram. If the receiver shows any tendency to oscillate as the desired signals are approaching maximum strength the H.T. voltage should be reduced to about 50 volts and the set retuned for the best results. With the maximum signal strength obtained in this way the moving coil should be brought nearer to the fixed coil, taking care that the set is not made to oscillate, and slight adjustments made on the condensers C1 and C2.

For the reception of the B.B.C. stations with wavelengths above 420 metres the operation is precisely the same, but using in the aerial socket coil No. 50 or 75 and coil No. 25 for reaction.

The 1,600 m. Station

For the new B.B.C. station on 1,600 metres the aerial coil should be a No. 150 (without constant aerial tuning) and a 100 or 150 for reaction whilst the transformer should also be changed for one covering that wavelength. When receiving wavelengths above 600 metres the aerial connection should always be changed from the constant aerial tuning terminal A and connected to the terminal marked A1. If the receiver then shows any tendency towards self-oscillation, then the reaction coil should be changed to an even smaller number. It may, in fact, be understood that the smaller the reaction coil the less likely is self-oscillation to take place.

Radio Paris

For the reception of Radio Paris the same transformer and coils are used as in the reception of the 1,600-metre station. On indoor aerials, however, one size larger aerial coil may be needed for these longer waves.

Valves

It may be taken that any general-purpose receiving valve may be used with this receiver, and since suitable filament resistances are fitted these remarks

also cover the range of dull-emitting valves. Care must be taken when using this receiver that no excess of H.T. voltage is applied to the plates of the valves, otherwise the operator will experience considerable difficulty in obtaining that fine adjustment of reaction which is so desirable in the reception of distant stations.

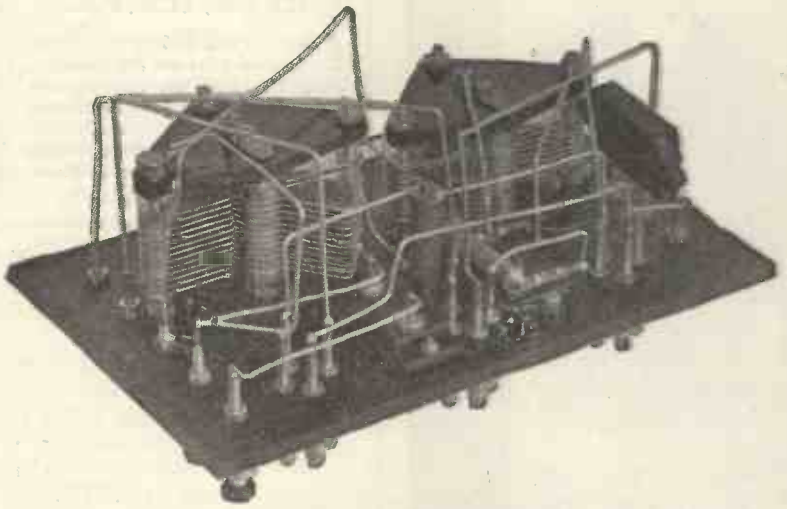


Fig. 6.—The underside of the panel, the terminals on the left being A, A1, E and Reaction.

Test Report

It is interesting to note that when first testing this receiver after completion, using a No. 50 coil in the aerial, with a No. 25 for reaction, 50 volts H.T., and constant aerial tuning, the first station picked up was Cardiff. After a careful searching the stations mentioned in the beginning of this article were also received the same evening. Tested on a different aerial in S.W. London, the same results were obtained, the tuning being much the same in its operation as when using the first aerial.

As an interesting two-valve receiver for the man who is careful in his operation, the set described is worthy of construction.

Full-sized Drawings

For the guidance of those readers, who, desirous of making this receiver, prefer to work from full-sized drawings, blueprints of the practical wiring diagram may be obtained.

When applying for these blueprints application should be made to the offices of Radio Press, Ltd., quoting Blueprint No. 55, and enclosing 1s. 6d.

□ □ □

How to Hear 5XX

The following is taken from a leading evening newspaper:—

"With the majority of crystal sets a variable condenser used in series—that is, in line between the aerial and the set—will enable the owners to tune in Chelmsford without any great trouble.

"In any event the use of a variable condenser should bring in the powerful broadcasting from this station with almost the strength of a one-valve set."

In case any readers should have tried this and failed, it should be pointed out that the condenser should be in *parallel* and not in series as suggested in our contemporary. In any case some crystal sets will not have enough inductance to reach the wavelength even with a condenser.

□ □ □

A Useful Tool for the Amateur

ONE of the handiest little tools that the amateur can obtain is the automatic centre punch, which saves an immense amount of time in marking out panels and also makes for great accuracy in centring. It consists of a holder within which is a spring-and-striker mechanism not unlike that contained within the bolt of a rifle. The holder contains also a steel rod, at whose outer end is a fine punch point. The tool is extremely easy to use. One simply places the punch point upon the mark where it is desired subsequently to drill a hole, and presses the handle downwards. During the movement of the handle under pressure the striker is carried upwards, compressing the spring. The compression continues until a tripping piece is reached, which releases the spring and causes the striker to be driven hard down upon the head of the pointed rod. In use, one, of course, sees nothing of its action, all that happens is that the handle is pushed downwards until a sharp click is heard. The tool is then lifted and a punch mark appears upon the panel. With one of these little tools one can punch-mark a large panel with the utmost accuracy in two or three minutes. R. W. H.

LATE NEWS

In connection with the article entitled "The Fascination of Continental Broadcasting," we learn as we go to press that the wavelength of the Ecole Superieure des Postes et Telegraphes has now been changed to 385 metres approximately.

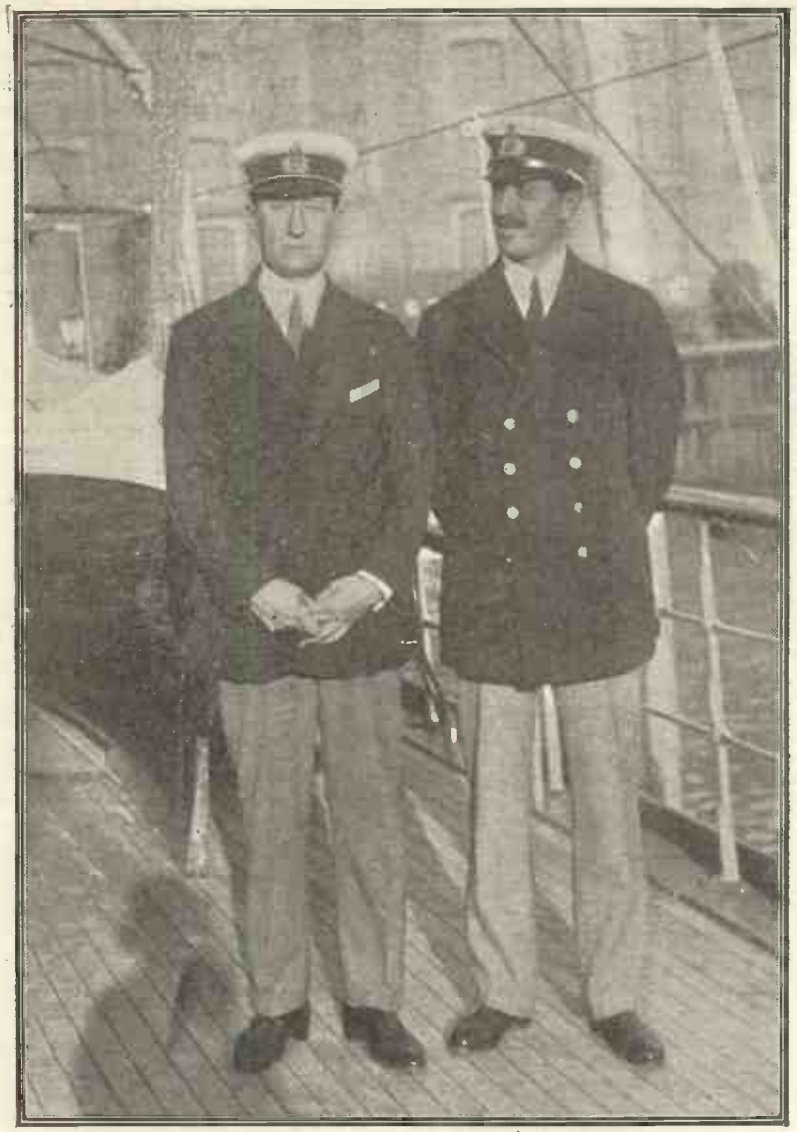
This change is probably temporary.

Beam Wireless

By SENATORE GUGLIELMO MARCONI, G.C.V.O., LL.D., D.Sc.

A Paper read before the Royal Society of Arts on Wednesday, July 2, 1924, on results obtained over very long distances by short wave directional wireless telegraphy, more generally referred to as the beam system.

(Continued from page 298.)



Senatore Marconi, on left, on board his yacht "Elettra," on which these famous experiments were carried out.

THE great value of the reflectors was demonstrated by average measurements made, which showed that the value of the energy received when both reflectors were used was 200 times that of the energy that could be received without reflectors.

In April, May and June of last year a series of long-distance tests were carried out under my direction between a small experimental transmitting station at Poldhu in Cornwall and a receiver installed on the S.Y. "Elettra."

The Arrangements at Poldhu

Mr. C. S. Franklin was responsible for most of the design and operation of the transmitting arrangements at Poldhu, and Mr. G. A. Mathieu was in charge of the receiving apparatus on the yacht, where I also was present during the whole of these tests. Mr. Mathieu was able to make some valuable calculations based on the observed results, especially in regard to the absorption or attenuation of the waves brought about by sunlight.

The principal objectives of these tests were :—

(1) To ascertain the reliability of signals transmitted on approximately a 100 metre wave over considerable distances with or without making use of a transmitting reflector.

(2) To investigate the conditions which affect the propagation of short waves, and to ascertain the maximum reliable ranges obtainable by day and by night in respect to the power and wavelength employed at the sending station.

(3) To investigate and determine the angle or spread of the beam of radiation when employing a transmitting reflector, especially with regard to the possibility of establishing long-distance directional wireless services.

During the tests carried out on the S.Y. "Elettra" no receiving reflector could, of course, be employed, and it will therefore appear obvious that the strength of the received signals and the ranges covered must have been considerably less than could have been obtained had it been possible to use a fixed receiving station equipped with a suitable reflector.

Present Impressions

Up to the present time the general impression prevailing amongst most technical experts in regard to the behaviour of short waves is, I believe :—

(1) That their range during day time is variable and short.

(2) That the night ranges are exceedingly variable and freaky, with a great deal of fading, and altogether too unreliable to allow of the carrying out of commercial work.

(3) That any considerable amount of intervening land or mountains very seriously reduces the distance at which it is possible to communicate.

The tests carried out between Poldhu and the "Elettra" proved by the definite results obtained that the above impressions or

assumptions must be erroneous, at least in so far as they may concern waves of about 100 metres long, for we observed :—

(1) That the day ranges proved to be reliable and not inconsiderable.

(2) That the night ranges were much greater than anyone, myself included, had anticipated, and no doubt very considerably exceeded the maximum distance to which I was able to proceed on the yacht.

(3) That intervening land and large portions of continents do not present any serious obstacle to the propagation of these waves.

In carrying out these tests we discovered that it is by no means correct in dealing with these waves to refer to distances covered during daylight as day-ranges, as the strength of the signals which can be received during the hours of daylight varies definitely and regularly in accordance with the mean altitude of the sun over the space or region intervening between the two stations.

Daylight Effects

This discovery, based on the observed results, makes it safe to infer that our tests, which took place mainly during the months of May and June, and partly within the tropics, were carried out at the most unfavourable time of the year for daylight transmission (as the sun reaches its maximum altitudes during June in the Northern Hemisphere) and over what is a most difficult region on the West Coast of Africa.

The Austin Formula

Perhaps one of the most remarkable scientific results of the experimental work carried out on my yacht was to ascertain quite definitively that the coefficient of the well-known Austin Formula for the propagation of the waves was defective when applied to short wave phenomena.

It will be remembered that this absorption factor is an exponential of the form $e-x$, where x the negative index is given by Austin as the product of a Constant multiplied by the ratio of the distance between the stations and the square root of the wavelength used.

Slightly modified values for that constant have been suggested by several scientists during recent years, and a different value has also been suggested for daylight and night communication.*

The results of our measurements and observations are that for short waves of the order of 100 metres this constant must be replaced by a variable, which is a a linear function of the mean altitude of the sun calculated on the great circle track between the two stations.

In other words, the coefficient of absorption is a function of the time, the seasons and the relative geographical situation of the stations, and can now easily be ascertained for wavelengths of the order of 100 metres.

Our tests obviously showed that short waves behave quite differently in their propagation from long waves, and that the weak period at sunset and sunrise followed by a recovery in signal intensity observed with the long waves over great distances, is not true in the case of short waves.

Short and Long Waves

It is also obvious that there is probably no sharp limit between short and long waves, and that the change in the behaviour of short waves, of say 100 metres, and that of the long waves of, say 10,000 metres, may follow a slow process of transformation.

Very likely over very long distances as the wavelength increases there may be a tendency for the signals to recover progressively during the period of no signal, for short waves, and this may form the object of further very interesting investigation.

In regard to the x's (or atmospheric disturbances) these usually appeared to be, during day-time, less severe than those experienced when working with the longer waves up to now employed for practical radio telegraphy.

Night-time Reception

During night-time, even when receiving at St. Vincent, which is situated at 2,230 nautical miles from Poldhu, and well within the tropics, the strength of received signals was so great that absolutely none of the x's or atmospherics which we there experienced ever approached being able to interfere in any way with the reception of signals or messages from England.

During the tests to the "Elettra" on 97 metres wave the Poldhu transmitter consisted of 8 glass valves (standard M.T.2) worked in parallel, the input to the valves being 12 kws. The radiation from the aerial was approximately 9 kws. The parabolic reflector concentrated the energy towards Cape Verde and gave a strength of field in that direction which would have required a radiation of approximately 120 kws. from the aerial without a reflector to produce the same effect.

S.Y. "Elettra"

For the purpose of the experiment a special receiver with independent aerial was installed and added to the wireless gear of the "Elettra."

The receiving aerial was a vertical wire, the top of which was at a height of 20 metres above sea-level.

The receiver consisted of an aerial circuit, a closed condenser intermediate circuit, a frequency changer, two high-frequency tuned amplifications, and an autoheterodyne detecting valve to which could be added two stages of low-frequency amplification.

After carrying out a few preliminary tests in Falmouth Harbour on April 11, the "Elettra" sailed for Cape Finisterre (Spain).

(To be continued)

* Based on the so-called night effect which I discovered early in 1902. (See *Proceedings of the Royal Society*, Vol. LXX, by G. Marconi, June 12, 1902.)

KING'S SPEECH TO BE BROADCAST

The opening of Liverpool Cathedral on July 19 will be exceptional in that the ceremony is to be broadcast, and thus listeners-in will again have an opportunity of hearing their Sovereign's voice. Commencing at 11.50 a.m., there will be an organ solo, followed at 12 noon by the reception of the King and the clergy. Next comes the King's reply. This will last until 12.20. At three o'clock the consecration service will take place, when an address will be delivered by the Archbishop of York. This will be followed by the dedication.

Random Technicalities

By PERCY W. HARRIS, Assistant Editor.

Some notes of interest to both the home-constructor and the experimenter.

WITH reference to my notes in the previous issue, I am glad to say Messrs. Peto & Radford, the well-known accumulator makers, have now written to me regarding the use of Hudson's soap as a preventative of frothing. Their letter was reproduced in last week's issue, so I need not quote it here. It is interesting to note that, according to Messrs. Peto & Radford's opinion, no ill-effects will occur by the application of this soap, and they themselves have used it. I still continue to receive appreciative remarks from readers on this subject, and in every case so far the application of this soap powder has proved a cure.

* * *

I have just been carrying out a most interesting series of experiments which I am sure will surprise the great majority of our readers, particularly those who do not believe the theory which I have preached so consistently for many months, that the actual physical dispositions of the parts of a receiver has a good deal to do with its efficiency. Perhaps the simplest way to tell the story will be to describe just how I stumbled across the effect I am about to describe.

* * *

I have, I suppose, in my study about twenty different makes of intervalve transformers, ranging from some very cheap specimens up to the most expensive on the market. In getting together data for a book, I recently tested a number of transformers in a particular circuit, the apparatus being so arranged that the rapid change from one transformer to another could be made. As the experiment involved changes in both primary and secondary connections, the transformers were not wired up to a switch.

I was testing on loud Morse signals, and had already disconnected the secondary of one transformer and connected the leads to another (the primary leads of the first transformer still being in place), when I found that signals were still coming through! A glance at the apparatus showed that the detector valve was connected to the primary of one transformer, while the note-magnifying valve was connected to the secondary of another, the two transformers being several inches apart. A few minutes thought showed that the coupling which existed between the two valves could only be in a few places, *i.e.*, in the stray field upon the first transformer to the second, coupling due to the use of a common high tension battery or coupling due to long straying leads. Signals were still audible, although weak, when the transformers were separated as much as eighteen inches. I could not pursue the experiments at the moment, so put them by for a few days.

* * *

The need of preparing these notes for the present issue led me to think that I might spend an hour or so on further tests in this direction, and I have just completed them. Summarised, the results are as follows:—

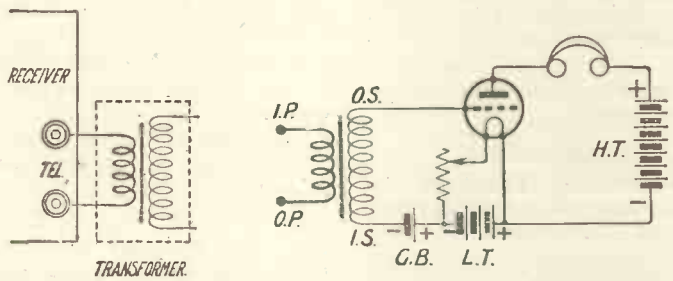
(1) The field of an intervalve transformer and its leads is sufficiently strong to influence another at a distance of 15 to 18 inches, even when the shortest possible leads are used for both pieces of apparatus and when *separate L.T. and H.T.* are used.

(2) Whilst there is a difference in degree of coupling when we change the angular relations of the two transformers, there is still enough coupling at a distance of a foot or so to give signals at any angle.

(3) I could distinguish very little difference in coupling between transformers which have no shielding and those which are claimed to be perfectly shielded.

(4) That transformers vary in the sharpness of the minimum which can be found, the shielded types seeming to have more uniform distribution of field and far less difference between minimum and maximum than is the case with any unshielded type.

(5) That connecting the two cores together and to earth does not in any way reduce the effect referred to.



Showing the relative positions of the two sets and their connections to the transformers.

With these few facts to consider, readers should have something to think about. Those kind friends who imagine that I am suffering from the results of overwork are invited to try the experiments for themselves. Any set which normally will give moderate loud-speaker effects on the local broadcasting station, with its output terminals connected to the I.P. and O.P. of one transformer and the I.S. and O.S. of the second transformer connected to a note-magnifying valve in the usual way, will quickly show you that a pair of "shielded" transformers, 10 in. apart, will pass just enough energy for you to hear the speech or music in an amplifier. You will find the effect, whether you use separate H.T. and L.T. or common H.T. and L.T.

N.P.L. Calibration Waves

A PROGRAMME of standard waves is now being transmitted from the National Physical Laboratory W/T Station, Teddington. These transmissions are of accurately known radio frequencies covering the range between 60 kc/s and 360 kc/s (kilocycles per second).

The transmitting system consists of a master valve oscillator operated entirely on batteries and arranged to permit of fine smooth adjustment of the frequency of the oscillations generated.

This master oscillator serves to feed the grid-filament circuit of a power valve set operating on an anode potential of 2,500 volts. The aerial and an adjustable aerial inductance coil, together with an open scale small condenser, form an oscillatory circuit in the anode circuit of the power valve.

By this arrangement the variations in the aerial capacity or other conditions in the power valve circuit are rendered of almost negligible effect on the frequency of the waves transmitted.

The adjustment of the frequency of the transmitted waves is made as follows :—

The waves are received into the amplifier of the standard multivibrator wavemeter, and produce an interference tone with the selected harmonic of the multivibrator representing the frequency under transmission. This interference tone is conveyed by telephone wires to the transmitting hut. The master oscillator frequency is then adjusted—with a power circuit also in operation—until the interference tone is reduced to beats of one or two per second. The minute changes in frequency during the transmission of a dash are continuously corrected by adjustment of the small variable condenser shunting the aerial. This method of adjustment forms a very sensitive means of holding the frequency constant.

The steadiness of frequency normally attained is of the order of ± 3 cycles per second at a frequency of 360 kc/s, and at a frequency of 60 kc/s it is of the order of 0.5 cycles per second.

The absolute accuracy of the frequencies is determined entirely and only by the tuning fork controlling the standard multivibrator wavemeter. The average frequency of the tuning fork is within 2 parts in a hundred thousand of its nominal value of 1,000 cycles per second. The variations of frequency of the fork are comprised within a belt of ± 2 parts in a hundred thousand.

The maximum probable error in the frequency of the transmitted wave is therefore about ± 5 parts in a hundred thousand. and the mean probable error is of the order ± 2 parts in a hundred thousand.

The present programme of transmissions is as follows—

Time, G.M.T.	Frequency kc/s.	Approximate Wavelength.	Indicating Group.
15.00–15.03	360	833	N1
15.08–15.11	280	1,072	N2
15.16–15.19	200	1,500	N3
15.24–15.27	180	1,667	N4
15.32–15.35	120	2,500	N5
15.40–15.43	100	3,000	N6
15.48–15.51	75	4,000	N7
15.56–15.59	60	5,000	N8

The programme will be transmitted in the following form :—

At 14.58 G.M.T. CQ, CQ, CQ de5HW 5HW 5HW repeated for 2 minutes at a frequency of 360 kc/s.

From 15.00 to 15.03 { N1 N1 N1———20 sec. dash———transmitted 6 times altogether. The aerial current will then immediately be transmitted on the same frequency and will be given twice. The wait signal.—.—. will then be given.

Five minutes interval.

From 15.08 to 15.11 { N2 N2 N2———20 sec. dash ———transmitted 6 times. The aerial current. . .

During the five minutes interval short dashes will be heard whilst exact adjustment of the next frequency is being made, but they are not to be considered as part of the programme.

The effective height of the aerial is of the order of 25 metres, and the aerial current varies from about 5 amperes at 360 kc/s to about 2 amperes at 60 kc/s.

Transmissions take place on alternate Tuesday afternoons.

The Radio Society of Great Britain

THE Society has received a communication from the Swedish Radio Exhibition, Gothenburg, inviting British Amateurs to take part in the Exhibition, to be held in Gothenburg during the period of the Swedish Fair, August 4 to 10, 1924. The promoters are particularly anxious to enlist the support of British experimenters, some of whom, they hope, will be disposed to send radio apparatus, circuit diagrams, photographs or other articles of interest connected with the science of radio.

In an endeavour to encourage amateurs to send apparatus, the exhibition authorities are offering several trophies, which can be competed for by foreign amateurs, including, of course, British. They further offer to insure all apparatus exhibited, and state that the only charges which exhibitors are asked to meet, will be the freightage costs to and from the exhibition.

Any members of the Radio Society of Great Britain who desire further information on the matter are invited to communicate with the Honorary Secretary of the Society, 53, Victoria Street, S.W.1, or, if they wish, direct with Mr. Bertil Lind, 14, Garlinge Road, West Hampstead, N.W.2, who is the London representative of the Swedish Exhibition Authorities.

A Cancelled Meeting

The ordinary meeting of the Radio Society of Great Britain intended for Wednesday, July 23, 1924, at the Institution of Electrical Engineers is cancelled.

ADDRESSES WANTED.

Will Messrs. P. Saunders and James Baker please advise our Sales Dept. of their respective addresses?

Valve Notes

By

JOHN SCOTT-TAGGART,

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

Fine Adjustment of Reaction

FAR more depends upon the fine adjustment of reaction for long-distance reception than most people imagine. In the case of many sets the adjustment is crude in the extreme, and the only real method of adjusting the degree of reaction is by detuning after the circuit has been made to oscillate, and this, of course, is a most undesirable procedure.

An idea which may be very simply carried out is that illustrated in Fig. 1.

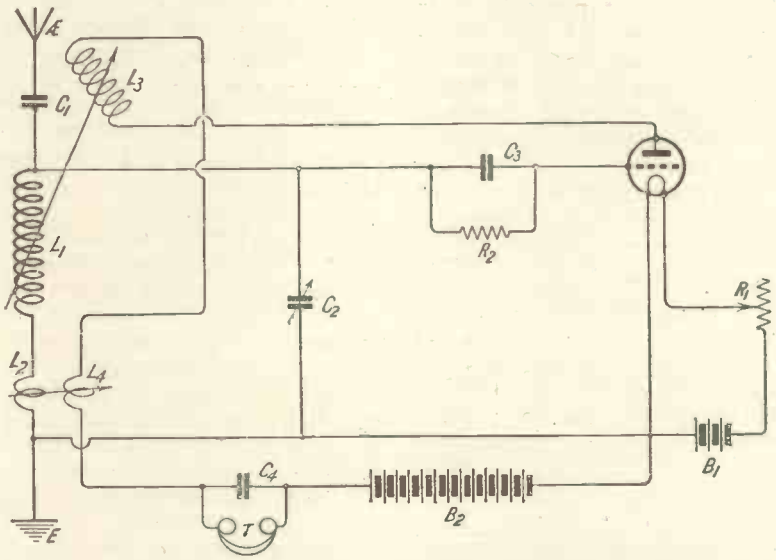


Fig. 1.—An arrangement of reaction control by which a very fine adjustment is obtained; a vernier effect being given by varying the coupling between L2 and L4.

Vernier Control

In this circuit the main inductance L1 has coupled to it the main reaction coil L3, but in addition we have two small inductance coils L2 and L4. The adjustment between L2 and L4 is normally kept medium, so that by increasing or decreasing the coupling between L2 and L4 a so-called vernier adjustment of the reaction is possible. The coupling between L1 and L3 should be such as to produce a reaction effect, but the coupling between L2 and L4 may be arranged to give either a reaction or a reverse reaction effect.

The coils L2 and L4 should, of course, be very small, and should preferably be smaller coils than the No. 25 plug-in type. The new coils now on the market for 100-metre work would do quite well when the wavelengths to be received are between 300 and 500 metres.

A Modified Arrangement

A modification of the Fig. 1 scheme is illustrated in Fig. 2. This simpler arrangement may be used with a three-coil holder, and it will be seen that the small reaction, or reverse reaction, coil L4 is now coupled to the main inductance L1. Various modifications and combinations are possible using this idea.

A Different System

A different system for controlling reaction is that illustrated in

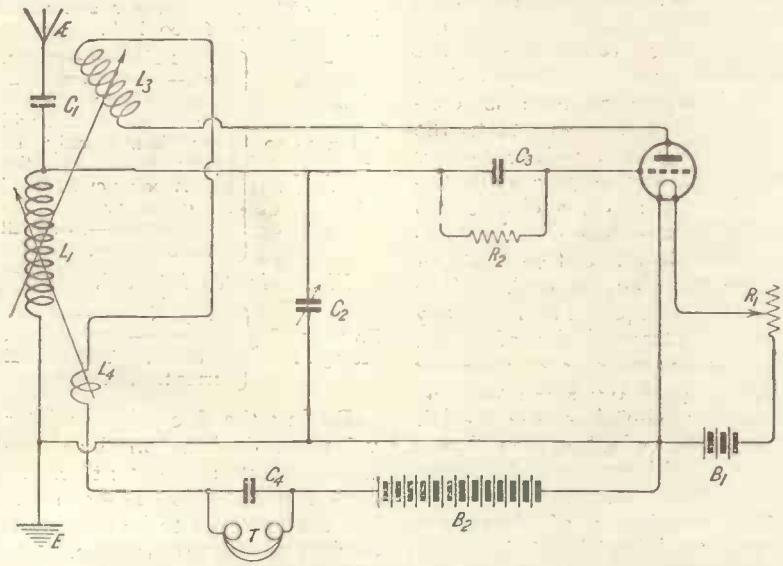


Fig. 2.—Another arrangement in which a similar control may be obtained using a three-coil holder.

Fig. 3. The degree of reaction is now varied by inserting a resistance R_3 in the grid circuit of the valve, shunted by a variable condenser C_3 of very small capacity. The resistance L_3 may have a value of almost anything above 100 ohms—a gridleak will do. The use of a variable condenser here will make very little difference to the tuning of the main circuit, which is always one of the troubles when varying the reaction. A disadvantage of this arrangement is that it is liable to be affected by small incidental capacities, such as hand capacities.

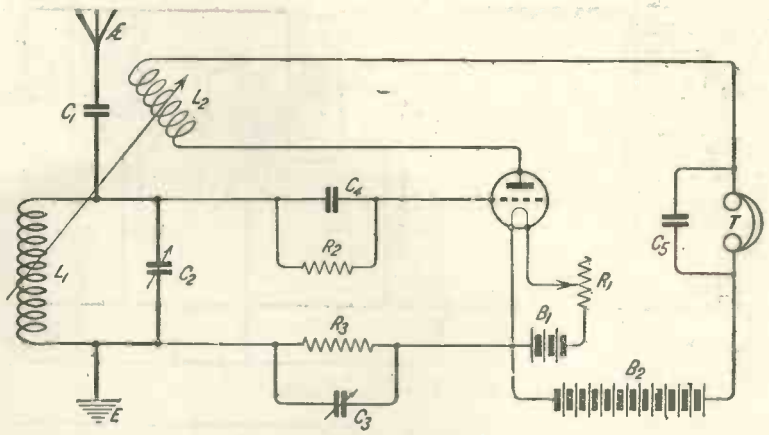


Fig. 3.—The inclusion of R3 and C3 in the grid circuit will give a fine adjustment, but is liable to be affected by hand capacities.

Ebonite Making at Siemens' Works

Ebonite is made of pure rubber and ebonite dust worked together between rollers. After this it is calendered into sheets and wound upon wooden mandrils between calico (as shown on the right of the illustration). The plastic sheet from the mandril is then plied up to the required thickness and cut into sheets of standard length, after which a sheet of metal foil is placed on either side, and it is rolled down (shown in the background) so as to exclude all possibility of air bubbles. In this form the sheets are stacked in the vulcanisers, where they remain for several hours. After vulcanisation the sheets are allowed to cool and the metal foils are stripped off. It sometimes happens that sheets so made have a conductive surface, and this manufacturing surface, or foil surface as it is called, should always be removed on ebonite used for electrical work. Sheets can be supplied with the foil surface removed on a machine specially installed for the purpose, pumice powder being the abrasive used, with water.

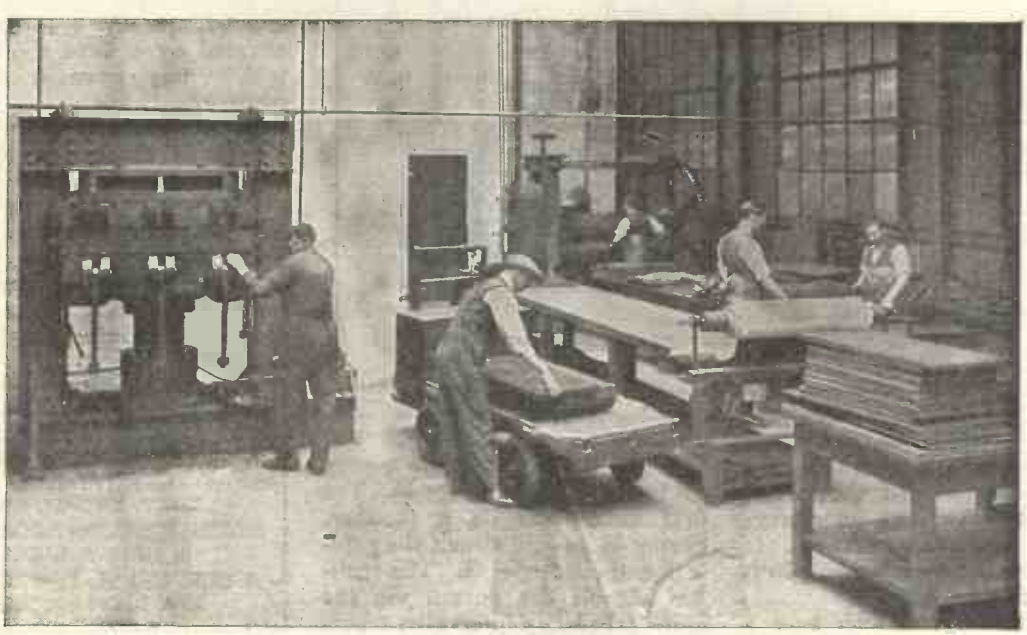
WHO WILL HELP THIS READER?

SIR,—I wonder if you would be kind enough to find me amongst your readers someone to correspond with who is interested in radio. I spent several years in England, and should very much like to hear from someone in "The Old Country." At present I am a radio operator in the Army, but at the same time am a keen amateur.

Yours faithfully,

H. M. BOUCHIER.

Headquarters Company,
34th Infantry,
Camp Meade,
Maryland, U.S.A.



Our photograph shows the rolling of ebonite between calico.

Practical Back-of-Panel Wiring Charts

By OSWALD J. RANKIN

A Detector and Note Magnifier Circuit.

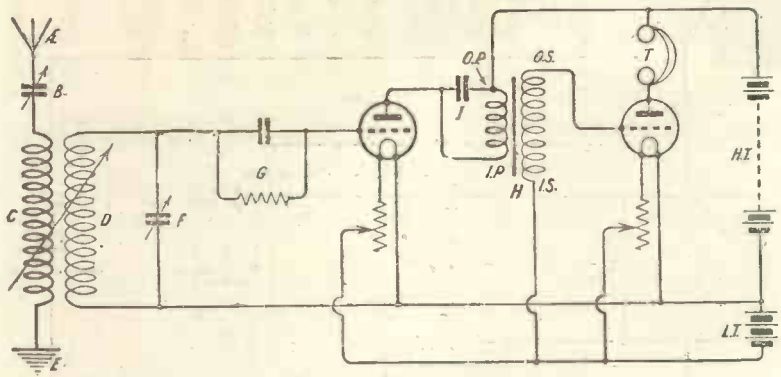


Fig. 1.—The circuit.

The aerial circuit is tuned by the coil C and variable condenser B, which is in series with the coil. The coil D, which is shunted by the variable condenser F, forms the closed or secondary circuit, the two coils C and D being coupled together. Greater selectivity is obtainable by this method than by the more usual single coil aerial circuit.

Owing to the fact that both the aerial and secondary circuits must be exactly in tune to the incoming signal, in order that the latter may be heard, careful tuning is necessary on both the variable condensers if the best results are to be obtained. Close coupling between the two coils will give the loudest signals from any given station, but when the coils are slightly separated the selective property of the circuit will be observed, as interfering stations can be reduced in strength without seriously affecting the desired signals.

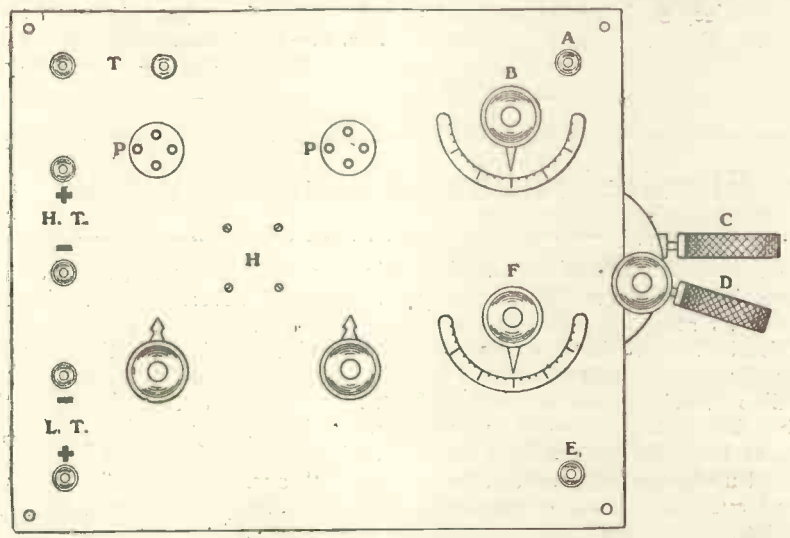


Fig. 2.—The lay-out of the panel.

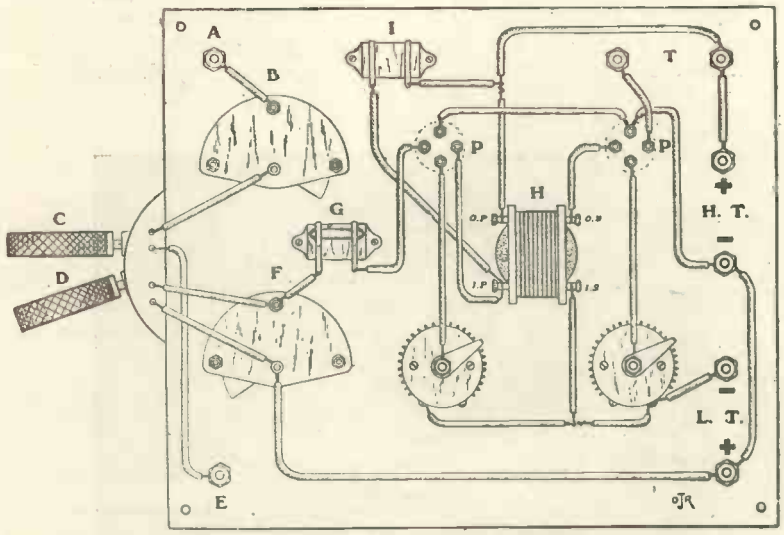


Fig. 3.—The practical wiring diagram.

The condenser B may have a value of 0.001 μF, while 0.0005 μF is a suitable value for F. The first valve acts as a rectifier, having in its grid circuit the grid-leak and condenser G. The rectified signals are passed via the low - frequency intervalve transformer to the second valve, which thus acts as a note magnifier, the telephones being included in the anode circuit of this valve.

The primary winding of the low - frequency transformer is shunted by a fixed condenser I, which may have a value of 0.001 μF.

In the circuit diagram, Fig. 1, the IP of the transformer H is shown connected to the anode of the first valve, and in general it will be found that this form of connection gives the greatest satisfaction, but before permanently connecting up, a reversal of these connections may be tried.

OUR NEXT ISSUE

A WAVETRAP FOR 1600 M. CRYSTAL SETS
By G. P. KENDALL, B.Sc.

SIMPLE WIRELESS RECORDING
By PERCY W. HARRIS.

A NEW 1600 M. TUNING COIL
By A. D. COWPER, M.Sc

The Fascination of Continental Reception

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

Readers who have satisfied themselves in the reception of British Broadcasting should "try their hands" at tuning in the continental transmissions. This article gives many useful hints.

Clocks at the Eiffel Tower station, controlling the time signal emission.

IF your sole object in wireless is purity of signals, and your aim entirely directed towards getting perfect reproductions at loud-speaker strength without distortion, then do not attempt to listen to distant stations, for it is impossible to do so without losing purity of tone by reason of the interference to which one is subject, and which it is practically impossible to eliminate entirely in the present state of wireless.

If you do not mind putting up with a few atmospherics, or now and again with a little interference from some coastal station transmitting on spark or C.W. using a similar wave, and are prepared to overlook an occasional distorted note, or one which is not quite as clear as Big Ben sounds when in sight of the 2 LO aerial, then to you the lure of foreign lands will no doubt have some attractions.

Travelling by Wireless

If you are a traveller, in imagination or fact, have visited the Continent, or intend doing so, if you are interested in languages, the thoughts and methods of other countries, their customs and literature, then Foreign Station reception will have its fascination to you—the fascination of listening to someone speaking to you across the sea that makes us an island, speaking from the other side of the water, hundreds of miles away. Many such people are at your disposal for the turning of a dial, and if you are an enthusiast you will not be discouraged by failures and difficulties, but by perseverance will endeavour to achieve better results each time.

It will be a good idea for beginners to log down their receptions, and to draw up a chart giving the readings of their condensers and tuning keys, noting also the size of the coils employed and amount of reaction, etc. One important thing in Continental reception is to be able to obtain any definite station as quickly as possible, and this with certainty.

First Attempts

The first time a new station is received it will be possible to identify it without doubt when the name of the station is given out, but for several Continental stations this only occurs at the beginning or at the end of the transmission — sometimes both, but not always. For later reference, it is necessary that the station may be identified by the position of the tuning dials of the instrument, as there will be no other means of knowing to which station you are listening.

By consulting the time-table of Continental stations given on the next page, it will also, by this means, be possible to tune in the station you require before the actual transmission begins. This procedure is a very useful one, as a good deal of the usual information regarding the programmes and other interesting news is given at the beginning of the transmission.

It is also satisfactory to be able to give your friends any station that may be mentioned, and this in a few moments. When very conversant with the various Continental stations it will be found possible in some cases to switch over from one to another in as easy a manner as a telephone operator switches over from one subscriber to another.

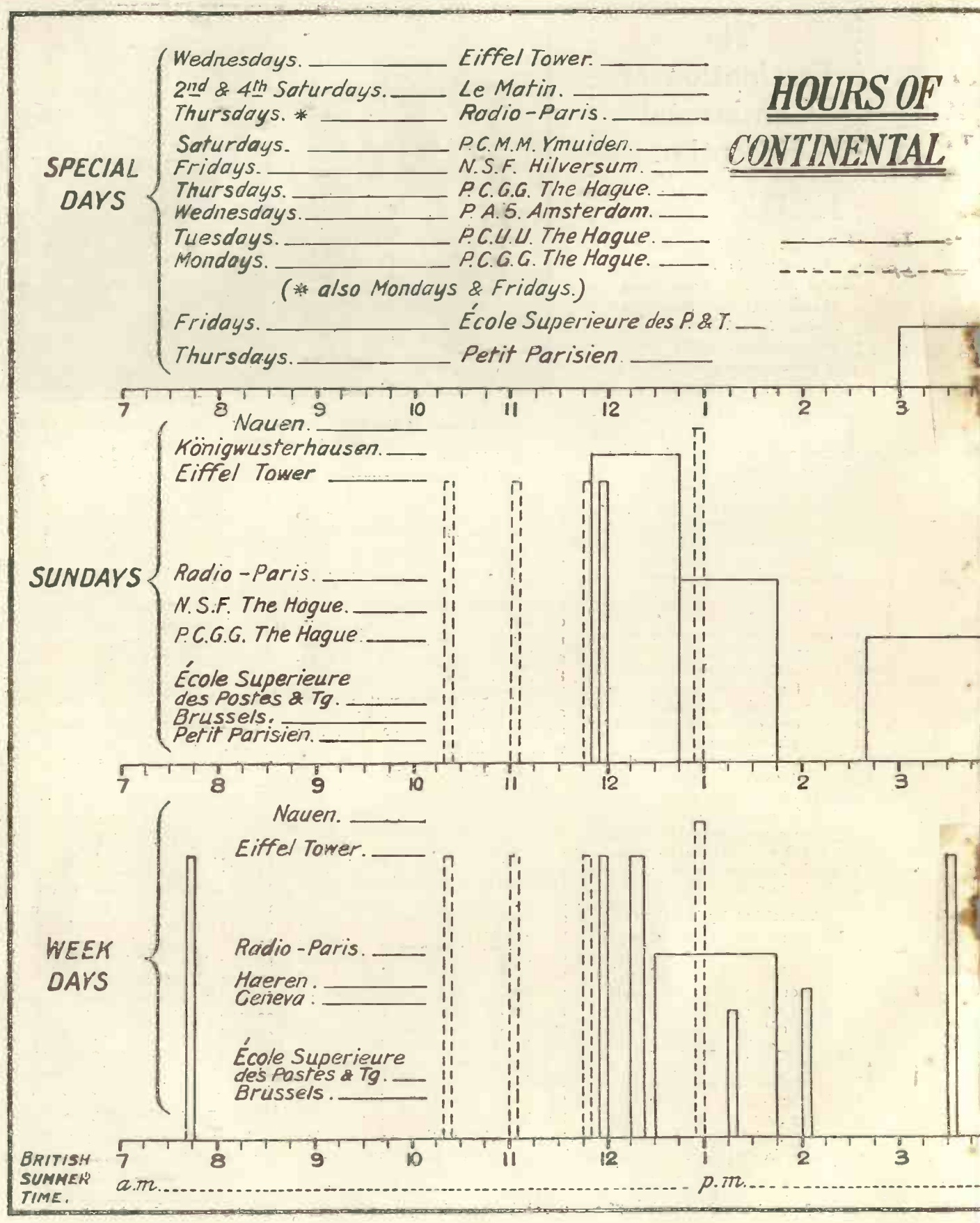
Standard Expressions

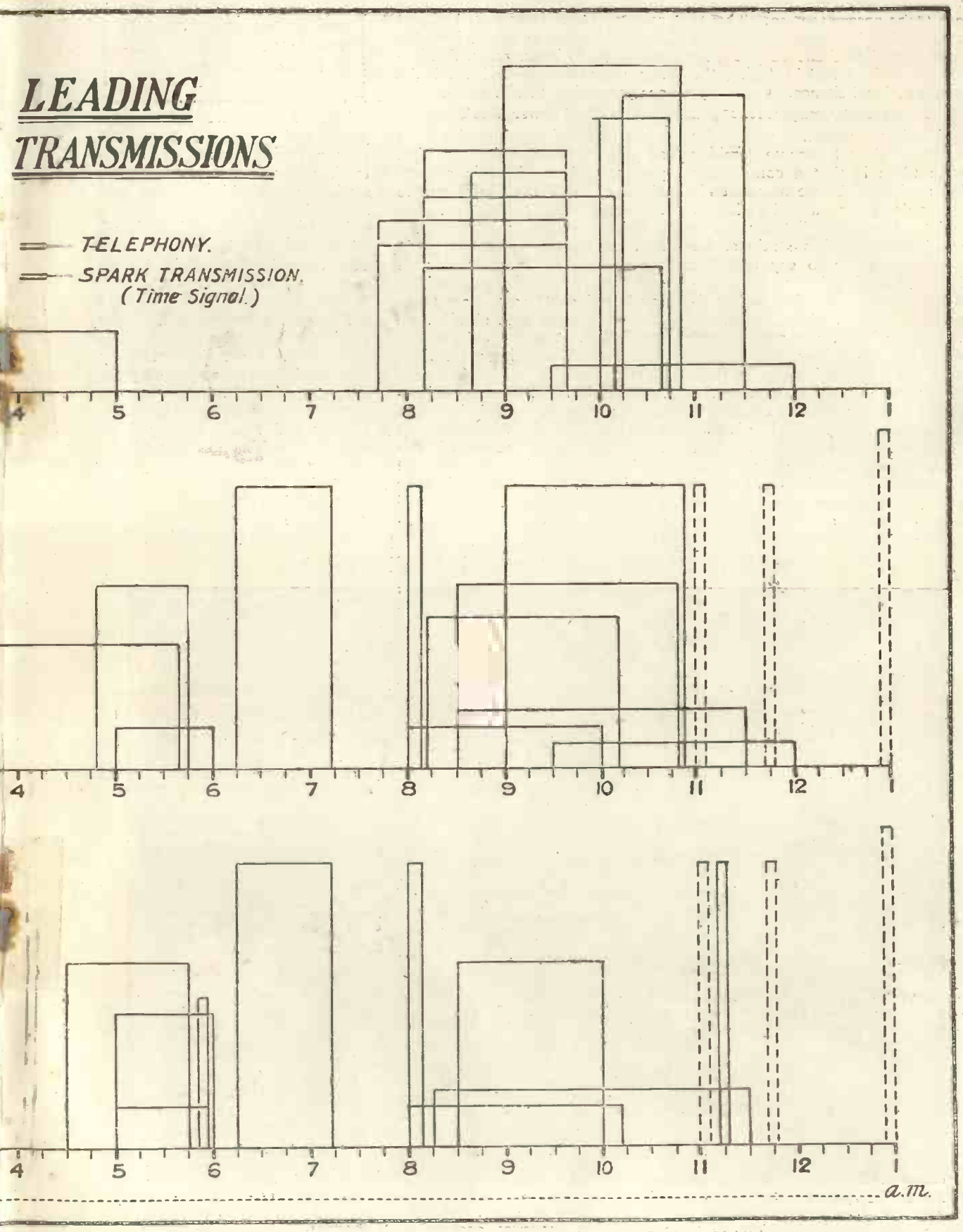
The enthusiast should endeavour to get familiar with the various expressions which the announcer of each particular station uses. It will be found that this is not difficult, even if only little of the language is known. It is our intention at a later date to give some of the standard expressions used with their translations in order to help the beginner to understand what is taking place.

Several stations, alive to the fact that they are heard in other countries, give out their items in several languages—English in particular — also occasionally sending out special announcements for their British listeners.

Programme Times

A great many of the Continental transmissions take place at the same time as the B.B.C., but there are several intervals in the course of the day during


HOURS OF CONTINENTAL
SPECIAL DAYS
Wednesdays. — Eiffel Tower.
2nd & 4th Saturdays. — Le Matin.
Thursdays. * — Radio-Paris.
Saturdays. — P.C.M.M. Ymuiden.
Fridays. — N.S.F. Hilversum.
Thursdays. — P.C.G.G. The Hague.
Wednesdays. — P.A.5. Amsterdam.
Tuesdays. — P.C.U.U. The Hague.
Mondays. — P.C.G.G. The Hague.
(* also Mondays & Fridays.)
Fridays. — École Superieure des P.&T.
Thursdays. — Petit Parisien.
7 8 9 10 11 12 1 2 3
SUNDAYS
Nauen.
Königwusterhausen.
Eiffel Tower
Radio-Paris.
N.S.F. The Hague.
P.C.G.G. The Hague.
École Superieure des Postes & Tg.
Brussels.
Petit Parisien.
7 8 9 10 11 12 1 2 3
WEEK DAYS
Nauen.
Eiffel Tower.
Radio-Paris.
Haeren.
Geneva.
École Superieure des Postes & Tg.
Brussels.
7 8 9 10 11 12 1 2 3
BRITISH SUMMER TIME.
a.m.
p.m.


LEADING TRANSMISSIONS
TELEPHONY.
SPARK TRANSMISSION.
(Time Signal.)
4
5
6
7
8
9
10
11
12
1
a.m.

which the only stations working are those across the sea. This is an additional incentive to getting accustomed to their reception, so they may be tuned in during the hours of local silence.

Interesting Comparisons

Another reason why the amateur should become familiar with them is that a comparison is available between what is being done abroad and at home. Being a regular listener to a good many foreign stations, we do not hesitate to say that the B.B.C. service is in many respects well ahead of most Continental stations. The latter, on the other hand, are not so tied down to regulations, and in this way are able to include in their programmes items which the B.B.C., under present contracts, is apparently not able to give its licensees. Among these I might mention news in the early part of the day. Certain Continental stations have also provided their hearers with a description of sporting events—such as Rugby, Football Associations, cycle racing, etc., transmitted direct from the stadium whilst the play was actually in progress, furnishing their listeners with all the accompanying thrills.

High Power Work

Some Continental stations are at present broadcasting on high power, and are in this respect ahead of the B.B.C. in regard to its new Chelmsford station.

Such high-power stations can be received on crystal sets in some cases and comfortably on one valve. In many parts of the south and south-east coast these stations are easier to obtain than the B.B.C. stations, and come in with greater signal strength.

We shall in our subsequent articles deal with various stations, giving all possible information and advice. We hope that this will enable many of our readers to receive the distant Continental stations, and thus provide them with an additional wireless attraction—regular Continental reception.

How to use the "Wireless Weekly" Key Chart of Continental Broadcasting

The key chart on pages 348 and 349 forms not only a rapid means of ascertaining what broadcasting stations are working at any particular hour, but also acts as a guide to which station it is advisable to listen to first. The time line is divided into quarter - hour intervals. The spaces between vertical lines indicate the time occupied by the particular transmissions. Different stations are indicated by different heights, as shown by the names on the left. Thus at 5.30 p.m. (bottom line) Brussels, Geneva and Radio Paris are all working, and Radio Paris will be the first to finish (at 5.45 p.m.). Brussels and Geneva will carry on until 6 p.m., while between 5.45 p.m. and 6 p.m. Haeren will come on for a few minutes.

RADIO SOCIETY'S TRAIN EXPERIMENT

Inside the special radio coach during the experiments conducted by the Radio Society of Great Britain. The members present, reading from left to right, are: Mr. Philip R. Coursey, B.Sc., Mr. L. McMichael, Mr. Maurice Child, Mr. Andrewes, and Mr. F. H. Haynes.

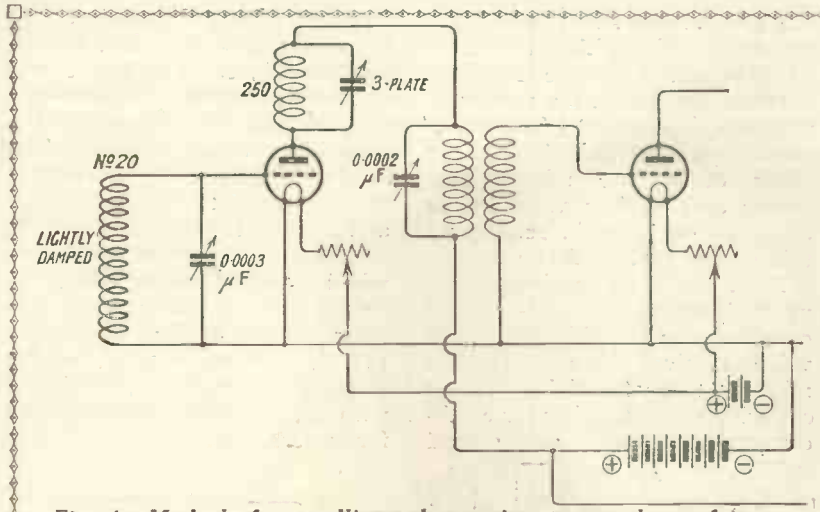


Fig. 4.—Method of controlling a low-resistance tuned transformer H.F. coupling.

Controlling a Tuned Anode Circuit

By A. D. COWPER, M.Sc., Staff Editor.

A valuable contribution to the discussion on how to obtain the best high-frequency amplification

(*Concluded from page* 300.)

A two-plate condenser, with the plates well separated, will often suffice on the shorter waves, with a loose-coupled grid-circuit on the first valve. In the second an ordinary "vernier" or three-plate condenser suffices, or even a low-minimum one of .0001 nominal capacity. It will surprise many experimenters to find by actual trial how small a capacity is needed to pass enough to produce self-oscillation here. By placing this condenser at minimum, both the H.F. amplification and the reaction effect are at a minimum, and the circuit is perfectly stable. If the minimum of this condenser is small enough, with critically-tuned anode of low H.F. resistance, by slowly increasing the capacity of this variable condenser both H.F. amplification and reaction increase, until the circuit passes almost imperceptibly and quite smoothly into quiet oscillation. With care it can be held at a point where strong C.W. Morse is heard heterodyned, but without actual continuous oscillation. Naturally a radio-choke must be provided to bye-pass the D.C. component of the plate-current whilst effectively isolating the plate for H.F.; this is the usual coil of around 250 turns and of low distributed capacity. If two stages are used, the chokes used should be of different values, but of adequate size in each case, i.e., not under 150 turns for the broadcast band, and proportionally for longer waves.

The effect of this small series condenser is to necessitate a large P.D. or drop across it, when introduced into the complex oscillating circuit which makes up the "tuned-anode" circuit, thus cutting down at once the available tuned impulses which set this circuit into sympathetic oscillation when signals are received on the grid of the first valve, and also the P.D. across the anode and grid of the first valve, resulting from the oscillations thus built up in the tuned anode, which would normally produce self-oscillation.

Practical Experiment

Practical trial of this simple device will assuredly convince careful experimenters of its value, the maximum available H.F. amplification being reached with remarkable selectivity, and an exceedingly smooth control over reaction at the same time. The effect on the tuning of the tuned anode by adjustment of this small series condenser will be found to be very small, and is compensated for automatically with a little experience.

An interesting modification of the Hazeltine Neutrodyne circuit, recently published in an American journal, which approaches very closely in principle the "Bridge" method of control described by Mr. Scott-Taggart in *Wireless Weekly*, Vol. I, Nos. 12 (p. 720) and 13 (p. 741), also lends itself to an adaptation for use in tuned-anode circuits.

As in the "bridge" circuits described in the articles mentioned, in this neutrodyne circuit transformers are used with a secondary coil (which may be tuned or not) without the tap to which the neutrodyning condenser is connected in the original neutrodyne; the primary has a *centre* tap for connection to the H.T. plus, the tuning condenser is arranged right across both halves of the inductance, whilst one end is connected to the plate of the first valve and the

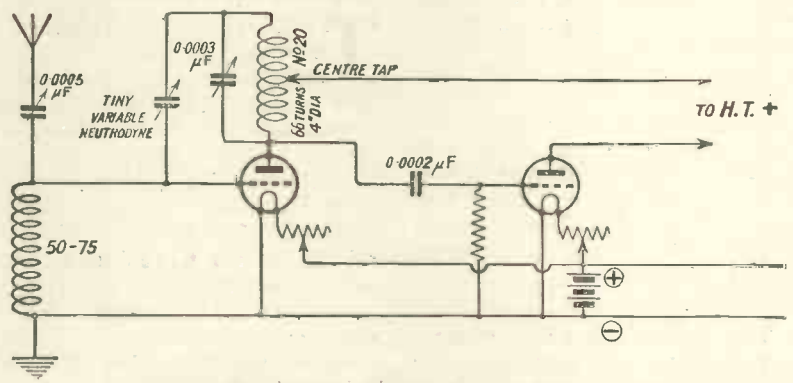


Fig. 5.—Illustrating a bridge-neutrodyne control.

other end *via* the tiny neutrodyning condenser back to the grid of the same valve. A balanced bridge is thus set up, so that the feed-back along the path of plate-to-grid capacity is exactly balanced out by a feed-back *via* this small neutrodyne condenser, and complete stability results.

To adapt this to tuned-anode coupling, the secondary of the transformer is simply omitted, and the usual small coupling condenser of .0002 μF capacity

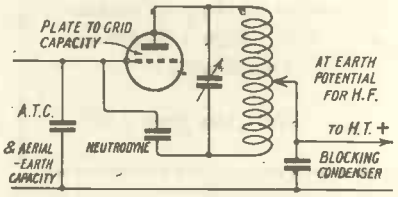


Fig. 6.—The circuit of the essential H.F. neutralizing bridge.

passes on the impulses directly to the grid of the second valve. The circuit in Fig. 5 is obtained. For sharp tuning and the maximum build-up of signals, low-resistance circuits should be used—there is no need here to introduce deliberate damping; the writer tried accordingly an efficient inductance of 66 turns of No. 20 S.W.G. d.c.c. wire on a waxed cardboard former 4 in. diameter, 4½ in. long, with a centre tap for the H.T. plus connection, tuned by a .0003 μF parallel condenser over the broadcast range and beyond. The circuit operated exceedingly well on trial, giving the sharpest possible tuning and ultra-selectivity, whilst oscillation and reaction could be controlled in the smoothest manner by means of the (variable) neutrodyning condenser. The anode and A.T.I. must of course be kept well apart, preferably both at an angle of 60 degrees to the horizontal to minimise accidental couplings.

The Neutrodyning Condenser

The principal difficulty and one which some experimenters may probably find discouraging, is the extremely minute value needed for the neutrodyning condenser, which should be variable, and also free from hand-capacity effects. Actually the writer used two *two*-plate "vernier" condensers *in series*; the minimum capacity of even a two-plate condenser especially constructed for such refined work proved to be too great. A small fixed condenser in series with a two-plate variable will give the required control; the sizes are a matter of practical experiment. The maximum capacity required is of the order of a few micro-micro-farads only. A wavemeter is almost a necessity in setting up this circuit for the first time.

As a matter of curiosity this neutrodyned tuned-anode coupling was combined in a two-valve receiver with a "transmitter" type of aerial-tuning—a coil with centre tapping for earth-connection and a second tapping, giving 8 aerial turns, for the aerial connection, and of low resistance. The result was certainly the most selective—and the hardest to tune—that the writer has come across. The local "big noise" (2LO at 13 miles) seemed to be balanced on a razor-edge, and had to be sought with a wave-meter. Those who live near GNF or GBL, and do not mind devoting an hour to tuning-in once for all to the B.B.C. station desired, might find it worth while to experiment with it; it is not recommended for general use.

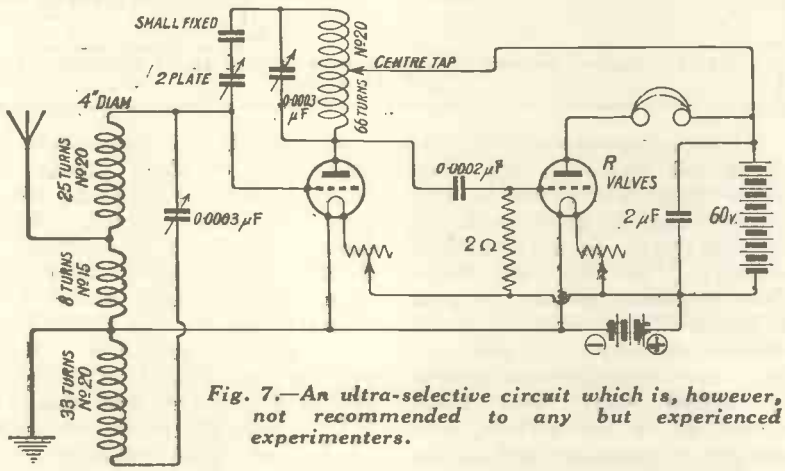


Fig. 7.—An ultra-selective circuit which is, however, not recommended to any but experienced experimenters.

All-British Wireless Exhibition, 1924.

THE second great exhibition, devoted exclusively to the development of wireless, and organised by the National Association of Radio Manufacturers, will this year be held at the Albert Hall, Kensington, from September 27 to October 8 inclusive. The public will be admitted, at a charge inclusive of tax, of one shilling and sixpence at 12 noon on the opening Saturday, and thereafter, excepting that on the first Tuesday, the price of admission from 10.30 a.m. till 6 p.m. will be half-a-crown.

It is believed that this is the first occasion upon which the Albert Hall has been used for trade exhibition purposes. It has been selected because of its convenience, comfort, and accessibility.

A very large floor space is available, and upon this a uniform system of open stands, each on its own raised platform, will be erected.

An elaborate and conspicuously tasteful scheme of decoration in blue and gold has been devised, and in every way the organisers have aimed at setting in this exhibition a new standard of pleasure to the visiting public.

It is hoped that, in addition to the displays which will be made of British radio products and now generally admitted to be the best in the world, the British Broadcasting Company will give a regular programme of demonstrations.

During the past year wireless in the British Isles has made immense strides forward in popularity, and it is not too much to say that it has now become an important factor in the life of the nation.

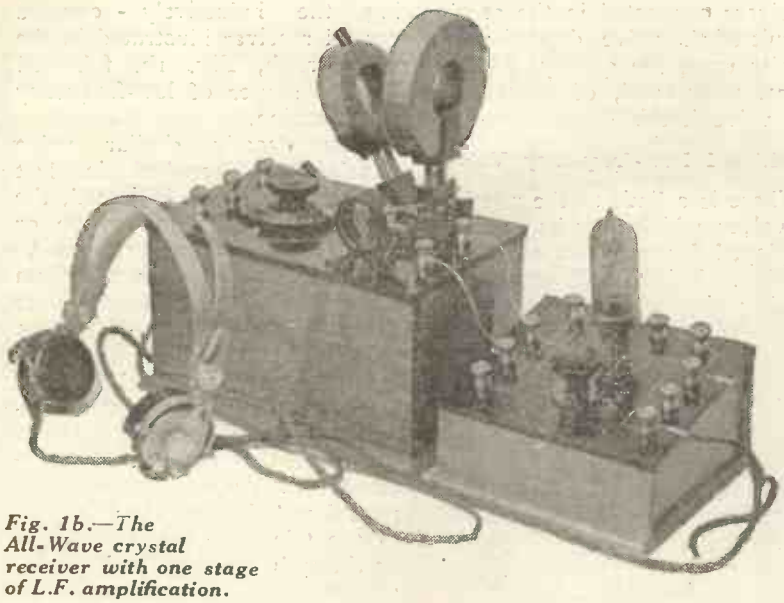


Fig. 1b.—The All-Wave crystal receiver with one stage of L.F. amplification.

How Every Crystal User may become a Valve Expert

By E. REDPATH, Assistant Editor

Continuing from last week's instalment, the present article deals with further methods of using a valve as a low-frequency amplifier.

The Valve as a Low-frequency Amplifier

Fig. 1a is a theoretical circuit diagram and Fig. 1b a photograph of an inductively coupled crystal receiver with an untuned or aperiodic secondary circuit (the construction of which is described by the present writer in the current issue of *Modern Wireless*), with the diagram valve panel added so as to provide what is often termed "one stage of low-frequency amplification."

Apart from the advantage due to the variable coupling between the plug-in coils L1 and L2 (Fig. 1a), the transfer of energy from the aerial circuit to the detector circuit may be made to give rise to higher potentials in the detector circuit than are available across the inductance L1 itself, providing that the coil L2 consists of a greater number of turns than the coil L1.

If L2 comprises, say, twice as many turns as L1, a much higher initial potential will be available to actuate the crystal detector D, and subsequently to effect a variation in the potential of the grid with respect to the filament of the amplifying valve.

For certain technical reasons, however, it is impracticable to employ either a very tight coupling or to obtain a high "step-up" ratio by the use of an exceedingly large number of turns in the coil L2.

The Iron Core Transformer

Accordingly another type of transformer, designed to give a strong electro-magnetic coupling, together with a fairly high "step-up" ratio (varying from 1 :4 to 1 :10) is employed and connected in circuit at a point where it will be clear of oscillatory or high-frequency currents, namely, *after* the detector.

Figs. 2a and 2b show a theoretical diagram and pictorial arrangement respectively of a simple single-circuit crystal receiver with the input or primary winding of such a transformer connected to the telephone terminals, the secondary winding (S) of the transformer being connected to the grid and negative filament terminals of the valve panel, the battery and telephone connections of which are as in previous diagrams.

In this arrangement the rectified pulses of current passing the detector traverse the primary windings (P) of the iron core transformer. This primary winding will probably consist of some 3,000 to 3,500 turns of insulated wire wound upon a soft iron core, and, in accordance with the well-known electro-magnetic law, these varying or pulsating currents induce other currents in the secondary winding (S), which will consist of from 15,000 to 20,000 turns of very fine insulated copper wire. The increased potential variations thus obtained are applied to the grid and filament of the valve, with results as already described.

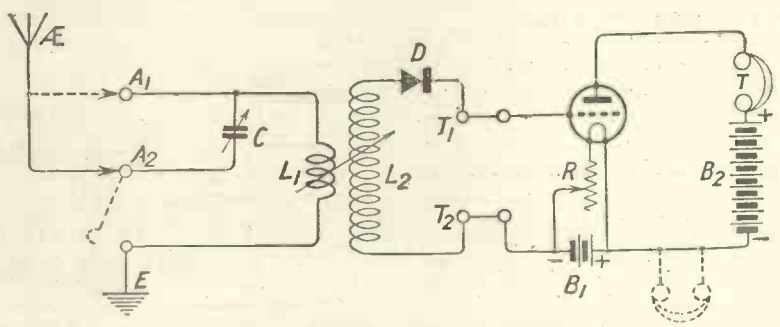


Fig. 1a.—Theoretical diagram of the arrangement illustrated in the photograph above.

Referring to Fig. 1a, an iron core transformer could be introduced by connecting the primary of the transformer to terminals T1 and T2, and the secondary winding to the grid and negative filament terminal on the valve panel.

There are, of course, practical limits to the potentials which can

be usefully applied to the grid and filament of an amplifying valve. With the ordinary type of receiving valve and moderate anode potential (say up to 60 volts), really large variations of grid potential may cause the anode current to reach the end of the straight part of the characteristic curve. In extreme cases saturation point may be reached, though this is not likely to occur with less than two stages of amplification and strong incoming signals.

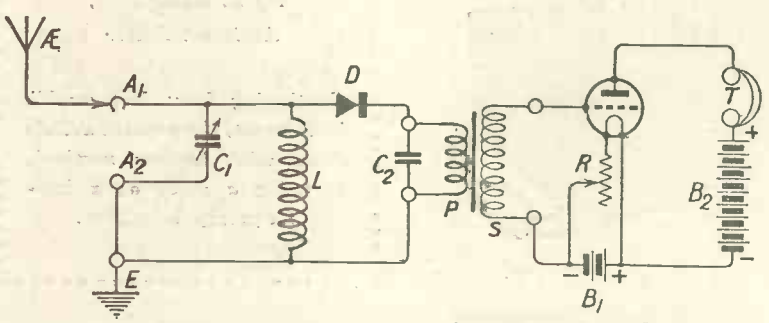


Fig. 2a.—Circuit arrangement showing method of employing an iron-core transformer.

In order to obtain the best results, it is important to connect the ends of the secondary winding of the low-frequency transformer to the grid and filament of the valve in a certain manner, dependent upon the connections of the primary winding. To ascertain with a minimum amount of trouble which is the correct method in any particular case, connect up the primary winding and then connect each end of the secondary *in turn* to the grid of the amplifying valve, temporarily omitting the filament connection altogether. When the correct secondary wire is connected to the grid, signals in the telephones will be found to be almost as strong without the filament connection as with it.

Provided that fairly good signals are receivable upon the crystal detector alone, the addition of a low-frequency amplifying valve will increase the signal strength some five or six times.

For all-round efficiency the arrangement indicated in Figs. 2a and 2b in which an iron core step-up transformer is employed, will be found the most satisfactory. The actual degree of magnification obtained and the purity of the resultant sounds emitted by the telephone receivers connected in the anode circuit of the valve depend principally upon the quality of the transformer, and, of course, of the valve itself.

Additional Low-frequency Valves

There is a limit to the number of valves which may be usefully employed for purposes of amplification. With fairly strong incoming signals, it will probably be found that two valves of the ordinary receiving type are the most that can be employed satisfactorily, the variation in anode current of the second valve being so considerable as to reach, or at any rate approach, saturation value.

This value, it will be remembered, is determined by the total electron emission from the valve filament. Accordingly, if it is found necessary to add a further or third valve, it should be of a type known as a "power valve," designed to have a very heavy electron emission from the filament, and usually operating with a fairly high-anode voltage of from 150 to 300 volts.

Fig. 3a is a theoretical circuit diagram and Fig. 3b a pictorial illustration of a circuit comprising the inductively-coupled crystal receiver illustrated in the photograph, Fig. 1b, followed by two stages of low-frequency amplification.

Two exactly similar valve panels, as described in last week's article, are indicated, the filament lighting and anode or H.T. battery being common to both valves. The output from the crystal receiver is applied to the grid and filament of the first valve (V1), via the iron core step-up transformer T1.

By means of the small two-way switch, indicated at K in the diagram, the output or anode current of V1 may be made to pass direct through the windings of the telephone receivers TEL, or through the primary P of the second transformer T2. In the latter case the current variations are inductively applied to the grid and filament of V2, and the resulting low-frequency variations of anode current of this valve actuate the telephone receivers.

Other Methods of Inter-valve Coupling

Before leaving this section of the subject, and passing along to consider the question of high-frequency amplification, it is desired to mention two other methods by which the valves of a two or three-valve amplifier may be coupled.

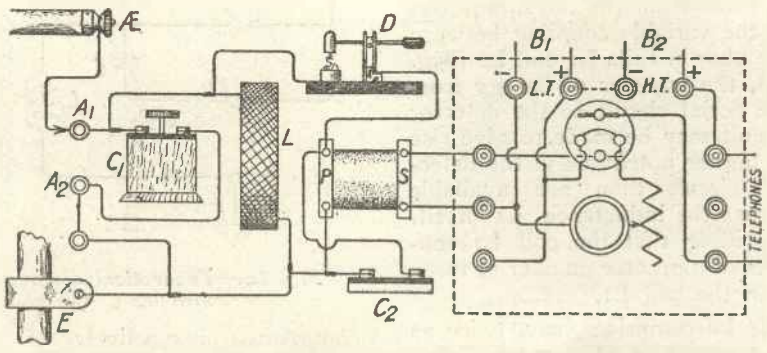


Fig. 2b.—Pictorial representation of Fig. 2a, with "diagram" valve panel as described last week.

Both methods are illustrated in Fig. 4, reference to which will show that in the anode circuit of the first valve, actually between the anode itself and the positive terminal of the H.T. battery, an iron-core choke-coil is introduced. For experimental purposes, either the secondary

winding of an ordinary inter-valve transformer, or the fine wire winding of a step-down telephone transformer, may be tried, or a serviceable choke-coil may be constructed by winding from 10,000 to 12,000 turns of

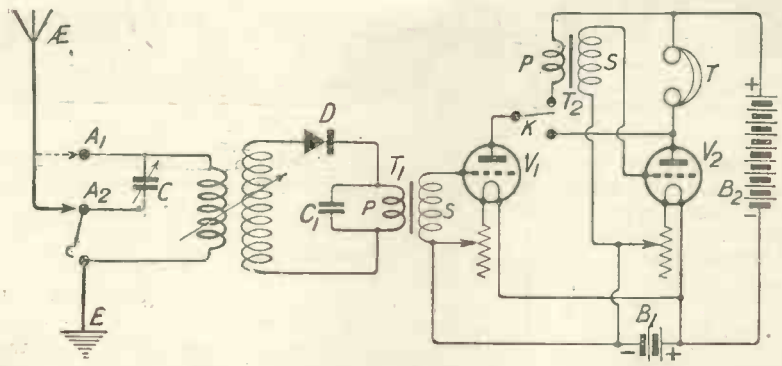


Fig. 3a.—A theoretical circuit diagram showing arrangement for two stages of L.F. amplification. The crystal set is the "All-Wave" receiver.

No. 40 or No. 42 S.W.G. d.s.c. copper wire upon a core consisting of soft iron wires, No. 20 S.W.G. or finer if obtainable, ⅜ in. in diameter and about 4 in. long.

The iron core should be carefully insulated by means of thin silk tape, and each end should be fitted with a piece of ebonite about 1½ in. square, which, if made a tight fit upon the iron core, will retain the winding in position and provide a convenient mounting for the terminals to which the commencing and finishing ends of the winding may be connected.

Referring again to Fig. 4, the anode end of the iron-core choke is connected to the grid of the second valve (V2) through a fixed condenser C1, having a capacity of about 0.005 μF to .3 μF. Low-frequency pulsating currents in the anode circuit of the valve V1 set up differences of potential between the ends of the winding of the iron-core choke.

These changes in potential are passed on to the grid of the second valve (V2), via the fixed condenser C1, and, as the grid of V2 would otherwise be entirely insulated and therefore in a position to collect and retain a negative charge due to intercepted electrons, a grid discharge or leakage path is provided by connecting a suitable resistance R1, usually of a value of about 1 megohm, between the grid itself and the negative side of the filament.

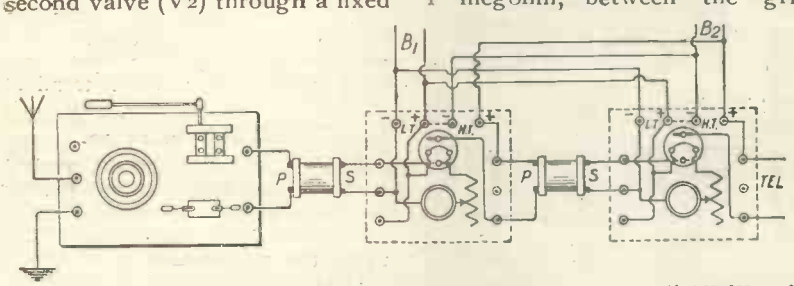


Fig. 3b.—A pictorial representation of Fig. 3a, using the "All-Wave" crystal set and two "diagram" units.

Resistance-capacity Coupling

Between the anode of the second valve V2 and the positive terminal of the high-tension battery a 100,000-ohm resistance is introduced, which gives rise to an effect similar to the iron core in the anode circuit of V1, although in this case the effect is due to resistance alone, whilst in the case of the choke-coil it is due to the very high inductance of the coil.

The varying potentials at the anode end of the resistance are again passed on to the grid of the subsequent valve, via a fixed condenser (in this case C2), whilst the grid of the valve V3 is maintained at a suitable average potential by means of the resistance R2. The condenser C2 and resistance or leak R2 may be of similar values to C1 and R1 respectively.

Neither of these methods is as efficient as that in which a really well-designed and well-made step-up transformer is employed, whilst, in the case of the resistance-capacity method, it is necessary to employ a somewhat higher value of anode voltage than usual in order to compensate for the loss introduced by the resistance. The results obtained with a three-valve low-frequency amplifier are found in practice to be very satisfactory indeed as far as the purity of the resulting signals is concerned, but the actual magnification obtained with three valves is found to be about equal to that yielded by a two-valve transformer-coupled amplifier.

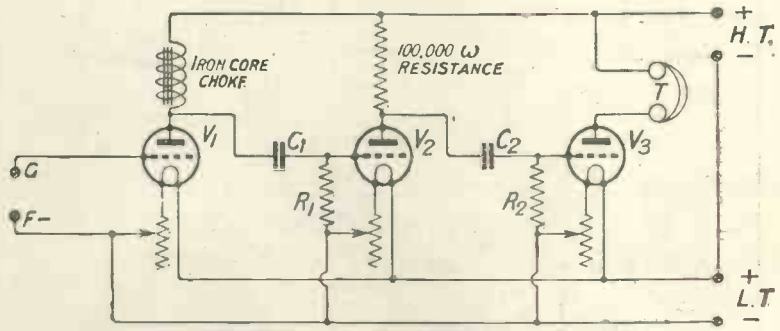
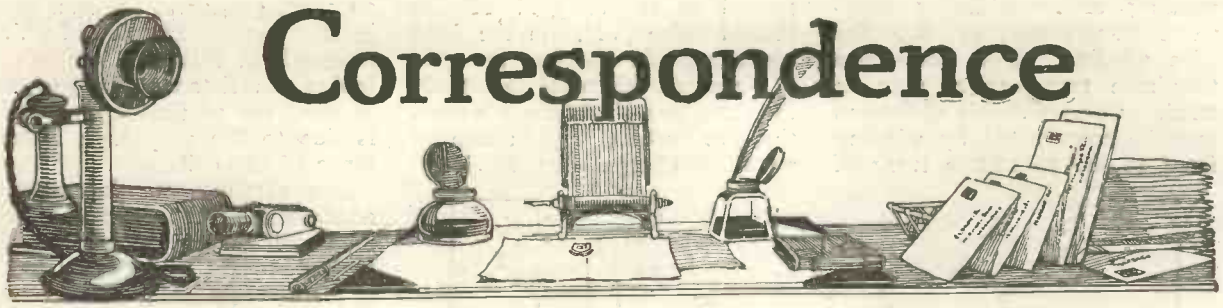


Fig. 4.—Illustrating the arrangement when using choke-capacity and resistance-capacity coupling for L.F. amplification.

Although both the choke-capacity and the resistance-capacity methods of coupling are illustrated in the one diagram, Fig. 4, it is to be understood that either method may be employed exclusively in any one amplifier.

NEXT WEEK.—Adding High-frequency Amplification to a Crystal Receiver.



FROTHING

SIR,—Regarding Mr. Holmes' letter in your issue of July 2, many owners of accumulators are doubtless troubled with spraying of the acid during charging, particularly so if the cells are not totally enclosed, which causes a great deal of surface leakage, particularly in H.T. accumulators of the order of 1 ampere hour, as well as from frothing, which appears to occur to a greater degree in celluloid containers.

At the same time, many will be somewhat chary of adding soap to the acid, after being so carefully warned to use nothing but distilled water.

In this connection I notice that the makers of Exide batteries have brought out a special anti-spray film oil for this specific purpose under the trade name of "Blancol," and I have ordered a small amount for my H.T. cells, as spraying in them has caused me a good deal of trouble.

If this were put up in very small phials at a cost of a few pence and advertised, I should expect a good demand would result.—Yours faithfully,

L. J. WORTHINGTON.

Leek.

The interior of the U.S. Shipping Board Station at Bush House, London, W.C. The frame aerial may be seen on the roof of Bush House from Kingsway.

ST100 AS AN AMPLIFIER

SIR,—May I give you particulars of what is, I believe, a new use for ST100?

The other night, whilst experimenting with a novel circuit of my own, I was getting Ecole Superieure comfortably in the 'phones with a frame aerial, but wanted him on the loud-speaker.

This is the procedure I adopted for using ST100 as a plain two-valve amplifier. It can be done by anyone in less than five minutes.

1. Connect like terminals for H.T. and L.T. of both sets together.
2. Remove 100,000 resistance.
3. Short reaction coil socket
4. Pull catwhisker away from crystal.
5. Take *one lead only* from the telephone terminal on experimental set connected to plate to crystal cup of ST100. (Leave other terminal dead.)
6. Connect L.S. to ST100.

I found this arrangement worked very well, but with a slight tendency to audio-frequency howling on the first valve of ST100, due no doubt to the two primaries being in series.

It can also be used as a single-valve amplifier on the last valve only by the simple expedient of taking the lead to the catwhisker instead of the crystal cup.

I must say in fairness to your excellent circuit that the only reason that I have had to put it to this use is that in my flat I am limited to a frame or a 14 foot indoor aerial.—Yours faithfully,

H. JOHNSTONE PRATT (Capt.).

Chelsea, S.W.

EXPERIMENTS WITH THE ST100

SIR,—Many readers must have wondered why Mr. Scott-Taggart did not give his famous ST100 circuit credit for long-distance work, while enthusiasts all over the country give evidence of reception of all stations.

In connection with this receiver some may have difficulty in getting accumulators charged, and may be glad to hear how to get results with only one valve burning.

The writer built ST100, a "Chinese copy" in every way of that described by Mr. Percy W. Harris in the March number of *Modern Wireless* in 1923, and while getting the local station too loud could not get any other station, so started to try how one valve could be used alone.

It may be said that ST100 is a splendid crystal receiver if the 'phones are coupled to the left hand (primary) terminals of the left hand transformer, so that when the accumulator is away being charged those within 20 miles of a broadcasting station need not miss their programmes. In the writer's case, critical adjustment of the "cat's whisker" is performed in these circumstances, *i.e.*, without H.T. or L.T. switched on.

If the 'phones are connected to the *right hand* (secondary) terminals of the right hand transformer and the *left hand* valve only in use, many users of ST100 may be amazed at the resultant reception, but the telephone condenser is not in the circuit to govern the reception, so a double-pole change-over-switch was located on the spare bit of panel to the right of the right hand transformer; the leads were cut at the telephone condenser on the side farthest from the telephone terminals. Two leads were then taken from the telephone condenser to the centre points of the D.P.C.O. switch, thus having the telephone condenser and the telephone terminals always in the circuit, and the disconnected leads were lengthened and connected to one end of the D.P.C.O. switch. Thus when the blades of the switch are in these contacts we have ST100 as per Mr. Harris. Two leads were then taken from the leads connected to the secondary terminals of the right hand transformer and connected to the other end of the D.P.C.O. switch.

With a 32 turn-coil in the aerial, and a 48 in the anode holder, all stations of Newcastle's wavelength and below are received; and, with the 48 coil in the aerial and an 88 coil in the anode, all above Newcastle's wavelength up to shipping wavelength are obtained, including posts and telegraphs, Paris and Berlin on one valve with a very poor out-door aerial which was put up in a hurry as a temporary measure when the first set was installed.

Many users of ST100 have said that they cannot cut out the local station. Set everything to give the local station at its very best (a good "whisker" setting is essential), and don't forget to vary the H.T. to give the maximum. Now turn the anode condenser about 20 degrees, at which setting the local station should "go out," and then find another station. (They come at about 20 degrees intervals on the aerial condenser with the above-mentioned coils, by means of the aerial condenser and the reaction coil.) The local station may still be heard. Now adjust the H.T. again and the reaction coil, and it will be found that the other station can be brought up at the expense of the local station until the latter is not heard at all. Berlin, for example, though near Aberdeen and Birmingham's wavelength, requires twice the H.T. that the local station requires to bring it up, and the writer has often found that a station which was frightfully incoherent is very amenable to four volts more or less of plate voltage.

Two more little refinements. It may be desirable to put a dull emitter valve in the (left hand) "solo" sockets. A couple of yards of 36 eureka wire wound on to an inch of wood (pencil) can be connected to one of the filament legs and the lead which originally went to it. This can be shorted easily if it is desired to try an "R" valve in its place, but when in circuit ensures that the D.E. cannot be overrun—a point not emphasised sufficiently by some makers; and, being a permanent resistance of 30 ohms, cannot be decreased accidentally. It is advisable to have a concealed switch if much comparison of "R" against D.E. valves is to be attempted.

The occasional use of an "R" valve in the other socket in the form of the original ST100, with both valves burning, will keep the accumulator in condition by giving it sufficient work to do.—Yours faithfully,

A. G. LOTINGA.

VALVE NOTES

SIR,—I am writing to inform you of the results I am getting from your dual circuit given in Valve Notes, Fig. 2, in your issue of May 14. This is the best dual I have yet tried. It is quite surprisingly selective, and gives good, clear loud-speaker reception on 5SC five miles away on an indifferent aerial. Good 'phone reception is also obtained from other stations, but as it is light up here till almost midnight, no real test for long-distance work has been attempted. I use dull emitter valves, Mullard D.F. Ora with 100v. high-tension and 6 volts grid bias as dual amplifier, and B.T.H. B5 as detector with 40 volts. Reaction control is very smooth and sensitive, and no buzzing is present. A stabilising leak is fitted, but not used. I have a milliammeter wired permanently on the panel, and it helps considerably in getting fine adjustment. The radio choke is a 250 Igranic removed from its plug and clamped under the panel. Again thanking you for this circuit, which in moderately experienced hands gives wonderful results—I am, yours faithfully,

E. FISHER.

Glasgow.

A SINGLE VALVE BROADCAST RECEIVER

SIR,—I thought it would be of interest to you to know what excellent results I have obtained with a circuit described by Mr. Redpath in the January 2 issue of *Wireless Weekly*.

I may say that my own set consists of this circuit with one or two refinements plus one stage of L.F. amplification.

I was so pleased with the results, the simplicity in working and the low cost of making up that I have assisted several friends in making sets from one to three valves with this form of detector, making up the combined AT1 and reactance, and winding same for them, and the results are splendid.

To continue with my own set, the refinements I refer to are:—Stator of ebonite; ball rotors, also of ebonite, making a very tight coupling; variable grid leak; grid bias.

With this set I can cover all B.B.C. stations, also *Berlin* "Vox Haus," *Paris* "Ecole Supérieure," *Brussels* "Radio Electrique," and *Madrid* "Radio Iberica," and I work a loud-speaker on London, 11 miles distant.

In order to be ready for the new station at Chelmsford I have now added basket coils to give the necessary extra windings to AT1 and reactance, and can get Paris "Radio" 1,780 metres all right.

I should be interested to hear if you have had the same favourable reports from other readers, as I think it is quite one of the best circuits going, and would certainly bear repeating in your Journal with any alterations and additions which might be thought to still further improve it.—Yours faithfully,

STANLEY M. FORWOOD.

Loughton.

Apparatus we have tested

Conducted by A. D. COWPER, M.Sc., Staff Editor.

Audio Choke Coils

Messrs. A. Roberts & Co. have sent for test and review samples of 750- and 1,000-ohm audio-choke coils, for use in choke-capacity-coupled L.F. amplification circuits, etc. These are small coils, about 3 in. long and $\frac{7}{8}$ in. diameter, mounted in metal cases, and with soldering-tags for connections at one end. The iron cores are therefore necessarily of small dimensions.

On test, the resistance was found to be about the figure quoted. Used in choke-capacity L.F. amplification, in actual reception of local broadcasting, the quality of speech and music in each case left much to be desired, being thin and somewhat tinny; the actual amplification measured (signal-voltage across the 4,000-ohm 'phones, time-average on fairly uniform transmission) being only about 1.5 for the 1,000-ohm choke, which gave the better result; this compared with around 7 with a really good L.F. transformer stage and with otherwise identical apparatus.

We cannot therefore recommend these extremely small choke-coils for this purpose.

Allison Loud-speaker

Messrs. Cromwell Engineering Co. have submitted their "Allison" loud-speaker for trial. This is of the medium large type, of conventional appearance, and is made with either an aluminium or oak horn. That submitted was of 2,000 ohms resistance.

A special point is made of the fact that the diaphragm is securely clamped all round its rim. The base of the receiver is filled in with solid paraffin wax, with favourable effects on the electrical insulation and acoustic resonance properties. The micrometer adjustment of the distance of the diaphragm from the magnet-poles is effected by means of a fine-threaded ring which locks at any point; this adjustment was found on trial to be made readily.

On trial in comparison with other large loud-speakers, on a set which was above suspicion as far as distortion was concerned, considerably less of that unpleasant hollow or trumpet-like sound associated with large loud-speakers in many people's minds and ears, was noticed with this loud-speaker. A large volume of sound was easily handled by the instrument without signs of distress

Microstat Filament Resistance

Messrs. Wates Bros. have sent samples of the "Microstat" filament resistance for use with both dull-emitter and bright-emitter valves. This is of the single-hole-fixing variety, being contained in a small brass case 1 in. diam. by about 1 in. overall depth, and requiring a 5/16 in. hole in the panel. A standard ebonite knob provides the external control.

On dissecting one of these, it was noted that the variation in resistance was obtained by variable screw-pressure on thin carbon powder, an ingenious spring cushion arrangement being provided to avoid packing. On measurement, the resistance was found to be variable between wide limits, the highest effective being around 200 ohms, and the minimum below one ohm. The variation of resistance with a given movement of the controlling knob was rather sudden in the higher ranges; in actual trial with R. and L.S. valves taking a fairly high filament current the control was found to be sufficiently fine. There would be some tendency when using the .06 type of dull-emitter with an accumulator, to turn the filaments on rather far at first, unless the knob was carefully manipulated. In extended use in a power-amplifier the writer obtained very satisfactory service with these filament resistances, handling 1.5 ampere or more with a single resistance.

A Correction

With reference to the report on the coil former introduced by Messrs. Watmel Wireless Co., in Vol. 4, No. 7, p. 224, we learn with interest that the makers are now putting in an extra row of holes in the former, so as to make it suitable for winding smaller coils, as was suggested in the report.

"Apex" Cat's Whisker

Messrs. Apex Electrical Supply Co. have sent for trial samples of their "Apex" cat's whisker, described as "platinum." At the modest price asked for these it was scarcely to be expected that these contained much of the metal named; on chemical analysis of the material little platinum was found.

However, in actual reception of local broadcasting the whisker was found to be very effective, giving results up to the usual standard with various samples of galena crystal on actual measurement of resulting signal-strength, and having the right physical character.

NEW ADDRESSES.

Peto-Scott, Ltd., have now removed to 77, City Road, E.C. This firm is also opening a new shop at 62, High Holborn, W.C.

Information Department

SUPPLIED BY RADIO PRESS SERVICE DEPT., LTD.

H. R. W. (BIRMINGHAM) asks how many valves he must expect to use to obtain good reception of the American broadcasting stations.

This is a much more difficult matter than is apparent from our correspondent's question, since all such receptions are dependent upon good conditions, and it is not possible for the average experimenter of only moderate resources to obtain reception of one or more of the American broadcasting stations upon *all* occasions. At this time of the year, for example, there is little chance of success with any kind of set such as experimenters are likely to use, and during the more favourable winter conditions it is desirable to use a receiver containing two high-frequency valves, and, if possible, one low-frequency amplifier to give a good chance of success.

T.R.A. (SOUTHSEA) states that the arrival of summer conditions has greatly reduced his reception from distant stations, and he is wondering whether he could improve matters by fitting what he has heard described as a "Regenerative Unit" to his set.

Since you are already using reaction upon the aerial, we do not see that any alteration in the reaction arrangements is likely to give you improved results. The unit to which you refer is for the purpose of using reaction upon the tuned intervalve circuit, which is no doubt a valuable addition to sets which did not previously employ any form of reaction. In your case, however, you are no doubt already obtaining the fullest benefits from reaction, and to substitute the tuned-anode method would probably be a step in the wrong direction. One of the principal

advantages of tuned-anode reaction is that it minimises to some extent the chance of radiation when the set oscillates, provided that the general design of the set is suitable.

C. P. T. (BRADFORD) asks whether it is really possible to rejuvenate crystals which have lost their sensitiveness in use.

Various processes have been recommended and used with varying success in bygone years, but in view of the present reasonable prices of quite satisfactory crystals, it hardly seems worth the trouble to attempt to restore the sensitiveness of one which has been in use for some time. If our correspondent is merely interested from the experimental point of view, he might try washing the crystal with absolute alcohol, or carbon bisulphide, or very cautious heating. In the case of most crystals, of course, the mere chipping off of the surface to expose a fresh one will have the desired effect, but this can hardly be described as rejuvenating the crystal.

J. G. (BRENTFORD) inquires whether it is possible to determine the adjustments of a receiving set for any particular wavelength without actual trial.

As the adjustments of the aerial circuit (that is to say, the setting of the aerial condenser or slider on the aerial tuning inductance) will depend almost entirely upon the aerial to which the set is connected, it is obviously impossible to determine this except by receipt of actual signals from either a transmitting station or a wavemeter provided with a buzzer to enable it to transmit feeble signals on a definite wavelength. The closed or secondary circuit of an inductively-coupled receiver is only subject to a slight variation due to alteration of the coupling between the aerial and secondary coils. Accordingly this circuit may be calibrated beforehand (by the makers for instance), and the adjustments for different wavelengths, indicated by figures engraved upon the instrument, or set out in a "Table of adjustments" supplied with the set. Provided that a wavemeter is obtainable, the owner of an inductively-coupled receiving set will always find it an interesting and useful piece of work to calibrate the secondary circuit and draw up a table of adjustments.

P. S. O. (SHEFFIELD) states that he is using a crystal set and a two-valve low-frequency amplifier for loud speaker work upon the local relay station, but is very much troubled by persistent howling in the low-frequency circuits. He submits a diagram and asks for an opinion.

As our correspondent is not using an earth connection from the batteries of the low-frequency amplifier, it is not surprising that he has trouble from instability, since this very often occurs with a crystal receiver and amplifier used in this way. Take a connection from earth to the low-tension battery negative, and the trouble will almost certainly disappear.

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IN adding a first stage in a straight circuit, remember that any distortion at the first stage of amplification is magnified by each succeeding stage—take extra care, therefore, that you have purity at the first stage. The LISSEN type T.1 Transformer, was the first made and designed specially to meet the peculiar requirements of a first stage transformer. It was made with a low ratio, and a high impedance value, so that the impedance should match the impedance of the valve circuit before it. There is more Wire in the Lissen T.1 Transformer than in any other Transformer sold. The Price of the LISSEN T.1 should be £2 in comparison with the coils used in other Transformers. The coil of the LISSEN T.1 Transformer would amplify by itself without any iron core at all. If you contemplate buying an expensive Transformer, be sure there is none to equal the LISSEN T.1—use it always behind the detector valve, and throughout, when superlative amplification is desired. And always for Power Work also. **30/-**

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In adding a second stage of audio frequency, it is not necessary that the transformer should have such a high impedance, and the LISSEN T.2 Transformer can be used. **25/-**


T 2

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A POPULAR TRANSFORMER—Because of the skilful balance of its design, the LISSEN T.3 Transformer compares with other Transformers sold at nearly twice the price. **16/6**

In buying a LISSEN Transformer you can be sure you are getting the best Transformer value.

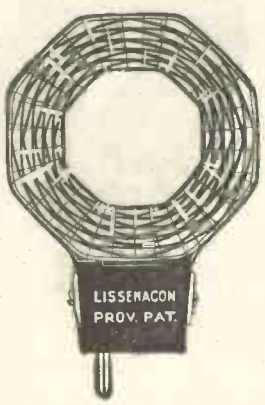
T 3

Coils that are responsive to faint signals

GALVANOMETERS are largely used to detect electrical currents. There is for instance, the type known as the linesman's galvanometer, and there is the fine mirror spot-light galvanometer which costs quite a lot of money. Both are the same in so far as they are used to detect electrical currents, but there is a vast difference in the sensitivity of the two types of instruments. The spot-light mirror galvanometer will detect currents where no deflection of the needle at all could be obtained with the linesman's instrument.

Now LISSENAGON coils are to other coils what the fine spot-light galvanometer is to the linesman's instrument—they are responsive to faint signals in the same way as the spot-light galvanometer is to minute electrical currents.

The analogy can be strikingly proved by alternatively plugging in LISSENAGON coils on distant signals and then plugging in other coils. Distant stations that will be distinct on LISSENAGON coils often cannot be heard at all as soon as the other coils have been substituted. In the design and making of LISSENAGON coils provision has been made for the fact that the low wavelength coils have to deal with enormously higher frequencies than high wavelength coils. Each LISSENAGON coil has been designed to be strongly resonant to a certain pre-determined band of frequencies. The appropriate LISSENAGON coil for a given wavelength is more resonant to the frequency corresponding to that wavelength than any other make of coil, and will also more effectively bar out all frequencies except that to which it is definitely tuned—in other words, LISSENAGON coils are highly selective, and the circuits in which they are used can be tuned much more sharply than the same circuits when other coils are used. This gives LISSENAGON coils an immense advantage on distant Telephony. And while LISSENAGON coils are more efficient than any other coils, they are still interchangeable with them.



LISSENAGON COILS TUNE SO SHARPLY AND SO STRONGLY BECAUSE THEY TUNE WITHOUT ENERGY LOSS.

Hold a LISSENAGON coil up to the light.

LISSENAGON TUNING CHART. Note the Intermediate Coils, 30, 40, and 60.

	TABLE I. Wavelength range when used as Primary Coils with Standard P.M.G. Aerial and .001 mfd. condenser in parallel.		TABLE II. Wavelength range when used as Secondary Coils with .001 mfd. condenser in parallel.		
No. of Coil.	Minimum Wave-length.	Maximum Wave-length.	Minimum Wave-length.	Maximum Wave-length.	PRICE.
25	185	350	100	325	4/10
30	235	440	130	425	4/10
35	285	530	160	490	4/10
40	360	675	200	635	4/10
50	480	850	250	800	5/-
60	500	950	295	900	5/4
75	600	1,300	360	1,100	5/4
100	820	1,700	500	1,550	6/6
150	965	2,300	700	2,150	7/7
200	1,885	3,200	925	3,000	8/5
250	2,300	3,800	1,100	3,600	8/9
300	2,500	4,600	1,400	4,300	9/2

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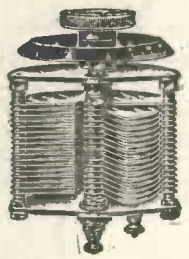

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·00075	5/11	2⅝ in.
·0005	4/11	2 in.
·0003	4/6	1⅜ in.
·0002	4/-	1½ in.
·0001	3/6	1 in.
·00005 (vernier)	2/6	

EBONITE DIAL 8d. extra.

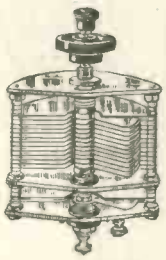
POST 6d. SET.

ALL PARTS NICKELLED. One hole fixing. Narrowest spacing. Aluminium end plates. Accurate Constant Capacity. Rigid Construction. Low Loss. Electrically and Mechanically Perfect. *Many unsolicited Testimonials.*

NEW MODEL with 3 Plate Vernier at bottom. Specification as ordinary, but the Vernier allows absolutely the finest tuning possible. Very sharp and defined. They do not need varied long and technical words to recommend them. Satisfied users are the best recommendation. Assembled for panel mounting, and for a limited period. I will include *FREE* an *EBONITE* DIAL to retail customers only.

POST 6d. PER SET PLEASE.

Height	Cap.	Price
4 in.	·001	8/11
2¾ in.	·0005	6/11
2¼ in.	·0003	6/6



Complete with 2 Knobs and Dial.

POST FREE COLUMNS (except where marked).

Gauze Valve Windows	7d.
Double 'Phone Cords, 72in.	1/11
Porcelain S.P.D.T. Switch	1/11
Ditto, D.P.D.T. Switch	2/6
Battery Clips .. doz.	10d.
Ebonite Valve Holders	1/-
Variometer 250/650	2/6
Lead-in Wire .. 10 yds.	1/6
Twin Flex .. 12yds.	1/11
2 colour Flex .. 6 yds.	1/3
100 ft. 7/22 Aerial Wire with four insulators	3/9
Nugraving Titles	7½d.
Chatterton's Compound	8d.
"R.I." Choke Coil	10/-
Watmel Var. Grid Leak	2/6
Watmel Anode Resistance	3/6
Nickel Panel Switches, D.P.D.T.	1/5
Ditto, S.P.D.T.	1/2

BASKET COILS.

6 Waxed 200/3600	1/11
1 New Station	10d.
1 Waxed 1600	8d.
1 Waxed 1780	9d.
1 Waxless 1600	10d.
5 Waxless 200/2000	2/3
2 Waxless ST 100	1/3
2 for Unidyne Cir.	1/6
Shaw's Hertzite	1/-
Gecosite (GEC)	1/3
Tungstalite 1/- &	1/6

BRASS PARTS, ETC.

W.O. Pillar, large doz.	1/3
'Phone 4 B.A. doz.	1/1
'Phone 2 B.A. .. 6 for	1/1
Med. Pillar 4 B.A. doz.	1/1
Valve Sockets, plain ..	10d.
Ditto, with Shoulder ..	1/1
(Above with Nut and Washer.)	
Single Coil Plug on Stand	1/3
Ditto Swivel movement	1/6
Plug and Socket 6 pairs	10d.
Screw Spade Terminals doz.	1/-
Pin Screw Terminals doz.	10d.
Spade Tags .. doz.	5d.
Empire Tape ½ in. 12 yds.	9d.
Insulating Sleeving 6 yds.	2/-
Ebonite Coil Plugs 2 for	1/6
Best quality ditto 2 for	1/10
Ebonite Knobs 1½ in. 2 B.A.	6d.
Moulded Knobs 1½ in. 2 for	8d.
Knobs ⅝ in. 4 B.A. 2 for	8d.
Ditto 1 in. 2 B.A. 2 for	8d.
H.F. Transformers Plug-in type 250/700	3/11
Ebonite ex handles 6 in.	9d.
Ebonite Bushes 2 or 4 B.A. doz.	1/-
D.C.C., I.R.C. Bell Wire 10 yds.	1/-

LISSEN—

Variable Grid Leak	2/6
Anode Resistance	2/6
Lissen Minor ..	3/6
Lissenstat	7/6
Do. Universal ..	10/6
2-way Switch ..	2/9
Series Parallel ..	3/9
T1 Transformers	30/-
T2 25/-; T3	16/6
Lissen Coils and all parts stocked.	

IGRANIC—

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

DUBILIER CONDENSERS.

Type 600A.

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

GOSWELL ENGINEERING CO.—

Patent Valve Holder 1/6
Cam operated Vernier, Two-way Coil Stand, Vernier 9/-

VALVES.

Cossor P.1, P.2	12/6
Mullard Ora ..	12/6
Ediswan ..	12/6
Marconi R. and R.5	12/6
A.R.D.E. Ediswan	21/-
D.E.R.	21/-
D.E.3	30/-
All Valves stocked Post 6d. each.	

N. & K. HEADPHONES

GENUINE STAMPED

4,000 ohms ..	12/9
6,000 ohms ..	13/3
Genuine N. & K. Post 6d. pair.	

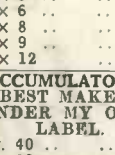
EBONITE ⅛ in.

Cut to Size at ½d. sq. in.
Stock sizes.

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

ACCUMULATORS.
BEST MAKES.
UNDER MY OWN LABEL.

4 v. 40	17/6
4 v. 60	19/6
4 v. 80	23/6
6 v. 60	28/-
6 v. 80	35/-



Ebonite Valve Holder, cut from solid rod, hand-turned, 8 nuts and washers .. 1/3

HEADPHONES.

4,000 ohms.

B.B.C. Sterling	25/-
B.B.C., B.T.H.	25/-
B.B.C. Premier	16/6
Brunet Type D	14/6
Brunet De Luxe	18/11
Brunet, Single, 4,000	8/-
8,000 Brunet, Donble for Crystal Sets	19/11

Post 6d. pair.

ERICSSON E.V. (Continental) Ebonite Earcaps (small).

4,000 ohms .. 12/-
Post 6d. pair.
Single, 120 ohms. 5/6
Single, 2,000 ohms 6/6
Post 3d. each.
Dr. Nesper adjustable leather Headbands .. 13/-
Post 6d. pair.

VARIOMETERS.

Ebonite 200/650	4/6
Ebonite Ball Rotor	7/6
Impregnated Board	3/6

EBONITE COIL STANDS.

2-way, ex handles	4/6
3-way, ex handles	5/6
2-way, good value	3/9
3-way, good value Also at 4/3, 4/6, 5/11	4/11
2-way for Basket Coils	5/6
Universal ..	5/9
3-way, 1/6 each extra.	
Franco: 2-way ..	12/6
3-way ..	17/6
Cam Vernier: 2-way .. 8/6 &	9/6

L.F. TRANSFORMERS.

Radio Instruments	25/-
Igranic, Shrouded	21/-
Powquip, Shrouded	18/-
Formo, Shrouded	16/6
General Radio ..	14/11
Brunet, Shronded	11/9
Formo, Open ..	11/9
Powquip, 2–1 or 4–1	14/6
Raymond ..	10/-
Eureka Concert Grand ..	30/-
Ditto, 2nd Stage	22/6
Silvertown ..	21/-
Woodhall ..	23/9

EDISON BELL FIXED CONDENSERS.

.0001 to .0005 ..	1/3
.002 to .006 ..	2/-
.001	1/3
Twin Detector ..	5/9
Raymond—Fixed .001 to .0003	10d.
.002 to .004 ..	1/-
.006	1/3
.01, .02	1/6
.05	3/6
T.C.C. 1 mfd. ..	4/-
T.C.C. 2 mfd. ..	4/6

Post 3d. each.

WEST END DEPOT FOR

Polar; Jackson Bros.; R. I.; Burndept; Goswell Eng. Co.; Grafton Electric; Silvertown; Igranic; Lissen; Radio Press Envelopes; Dubilier; Edison Bell; Woodhall Goods, etc.

CALLER'S COLUMN. NO POST ORDERS.

Wound Coils (1600) ..	1/6
Tapped Coils (1600)	1/6
Filament Dials ..	2½d.
Ebonite 4½d., with knob	5½d.
Copper Foil, foot ..	2½d.
Washers, 2 and 4 B.A.	1d.
Nuts, 2 B.A., 2 doz.	3½d.
Nuts, 4, 5, 6 B.A. 2 doz.	3d.
Filostat (D.E. or R. Valves)	1/9
Microstat (D.E. or R. Valve)	2/6
Allen Var. grid leak	1/6
Ditto Anode Res. ..	1/6
Good Fixed Condensers	8d.
Dutch Valves, Tubular	4/9
Dutch "R" type	5/-
Phillips "R" ..	7/6
French Metal ..	6/6
Porcelain Switches, S.P.D.T. ..	1/3
Ditto Switches, D.P.D.T.	1/11
Insulated Pliers, pair	1/-
Screwed Rod, 2 B.A., foot	2½d.
Ditto, 4 B.A., foot	2d.
Boxes 8 x 6 x 5 deep	2/6
Knobs, 1½ in. 2 B.A.	1½d.
Best quality ditto ..	3d.
1 in. 2 B.A. ..	2d.
⅝ in. 4 B.A. ..	2d.
Real Ebonite Dials	1/-
Set of Spanners, etc.	1/3
Best Grid Leak and Condenser	2/2
Gri Leaks, 2 meg.	1/1
Easi-Fix Crystal cups	1d.
Vario. Crystal Sets	7/11
Ebonite Variometer	3/11

TERMINALS.

(With Nut and Washer).

Large W.O. or Pillar	1d.
Medium phone ..	1d.
Phone 2 B.A. ..	1d.
Small Pillar, 4 for	3d.
Pin screw terms, 2 for	1½d.
Spade Screw terms, 4 for	3d.
Spade Tags .. 5 a	1d.
Valve Sockets 2 for	1½d.
Valve Pins .. 3 a	1d.
Stop pins .. 4 a	1d.
Plug and socket pair	1d.
Spade Tags 4 for	1d.
Brass Plug and Socket, pair	1d.
Wander Plugs, pair	2½d.

Valve Holders, Ebonite	8d.
Basket Coil Adapters	8½d.
Ditto, extra quality	1/3
Plugs and Cips ..	6½d.
Shaped Coil Plugs ..	8½d.
Edison Bell	1/-
Ebonite Coil Plugs ..	4d.
Ditto, extra quality 6d., 7d.,	8d.
72 in. 'Phone Cords	1/5
Panel Switches, nickel S.P.D.T.	10½d.
Ditto, D.P.D.T. ..	1/4
Switch Arm (best) with 12 studs, nuts and washers ..	10½d.
Studs, complete, doz.	4½d.
Pointers .. 2 a	1d.
100,000 ohm res. and clips	1/3
Unit Coil Plug ..	1/1
Nugraving Titles ..	7½d.
Myers Valves ..	12/6
Adhesive Tape, roll	3d.
30v. H.T. Batt. ..	4/6
60v. H.T. Batt. ..	7/6
H.F. Transformers 250/700	3/6
Single Phones, 120 ohms.	5/-
Ditto 4,000..	7/-
Button Brass ..	3/9
Button Aluminium ..	4/9
Stand for Phone ..	2/3
Coil-Stands, 2-way	2/6
Ditto, ext. handles ..	3/3
Ditto, 3-way ..	4/9
Electron Aerial, 100ft.	1/4
Copper Aerial, 100ft.	1/10
Extra Heavy, 100ft.	2/3
Egg Insulators ..	1d.
Rubber Lead-in, 10yds.	1/3
English 4.5 Batteries	4d.
Clips .. .. 2 a	1d.
Sleeving 4d., 3 yds.	10d.
16 g. Sq. Tinned Copper, 18 ft. ..	6d.
Twin Flex, 4 yds.	6d.
Burndept Detector	5/-
Variometers, 250/650	1/6
Raymond Transformer	9/11
Mic-Met Detector ..	6/-
Many good ones 10d. &	1/2
Nickel or Brass, best	1/6
(All above glass enclosed.)	
Hertzite	8d.
Tungstalite .. 1/- &	9d.
Gecosite 1/3 Neutron	1/6
Whiskers, silver or gold	2d.
Spearpoint	2d.
Filament Rheostats	1/3
Ormond Rheostat ..	1/9

Right Opposite **DALY'S** Gallery Door

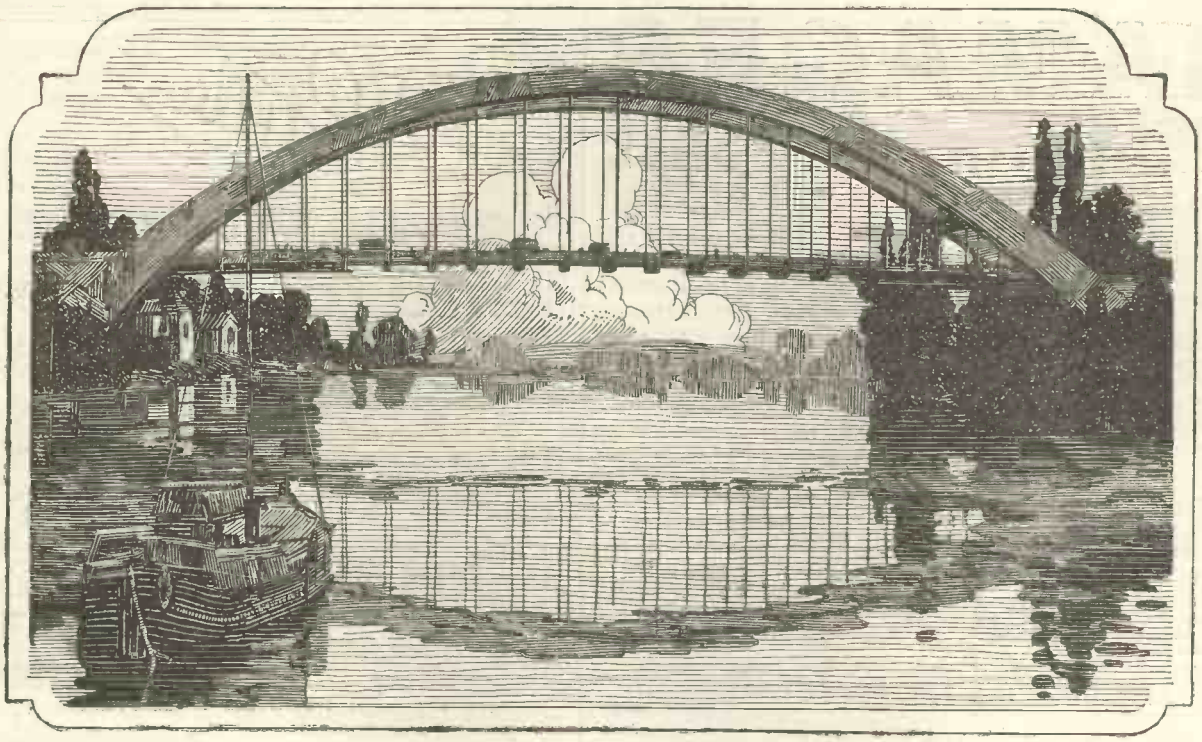
K. RAYMOND
27, LISLE STREET, W.C.2

'Phone: Gerrard 4637.

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

HOURS OF BUSINESS:

Daily - - 9 to 7.45
Sundays 10 a.m. to 1 p.m.



The wonderful Bridge at St. Pierre-du-Vauvray.

THE wonderful concrete bridge at St. Pierre-du-Vauvray, crossing the Seine, is the longest bridge of its kind in the world. How is its tremendous mass—entirely without centre pillars—prevented from collapsing? The early Romans—although not the first bridge builders—knew the answer to this problem. *The secret is in the arch.*

Now this is a point of great interest to all Valve users. All metals when heated expand, and the filament of a Valve is no exception. In Valves with long straight filaments this expansion must be counteracted, otherwise it would cause the filament to sag, and, touching the Grid, would put the Valve out of action.

Therefore, a spring of some kind is usually incorporated—or else the supporting electrodes are sprung apart. Sooner or later, however, this constant stretching and contracting causes a fracture and the Valve is useless.

The Cossor filament, on the other hand, is arched like a bridge, thus it can support its own weight at all times. It never sags, neither is it easily fractured.

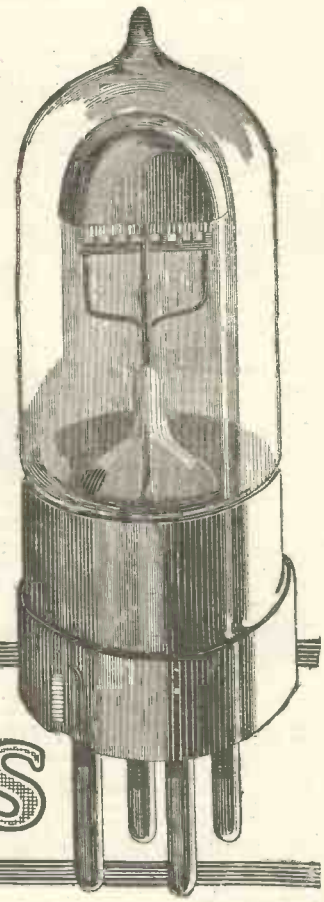
No matter how many times the filament is lit, the constant expansion and contraction will in no way affect it. *The secret of its long life, too, is in the arch.*

Every Cossor user knows that his Valve can be depended upon to give him longer service, greater range, and increased volume at no greater cost than the price of an ordinary Valve with half the life.

PRICES

P.1 (For Detector and L.F. use) .. 12/6 P.2 (with Red Top for H.F. use) 12/6

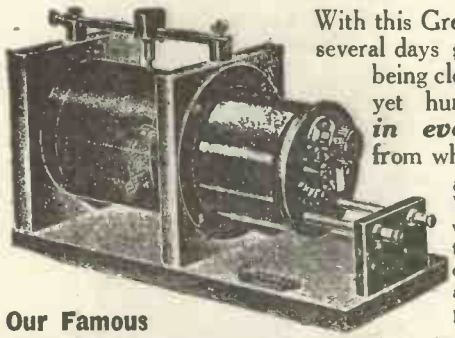
From all Dealers.



Cossor Valves

Advertisement of A. C. COSSOR, Ltd., Highbury Grove, N.5. *Gilbert Ad.* 1060

GAMAGES
GREAT Wireless SALE



With this Great Clearance already several days gone, stocks are fast being cleared. But there are yet hundreds of Bargains ***in every department*** from which to select. Here are a few offers for the Wireless Enthusiast—all well worth ordering from this announcement direct on our Moneyback guarantee. Sale Catalogue post free on application.

Our Famous

LOOSE COUPLERS

A loose coupled Receiving Inductance or Transformer is without question a most sensitive and selective Tuner and is estimated to give 10 per cent. better results than the ordinary "Tight" type. During the sale, Gamages are offering a limited number of these, slightly shop soiled, at greatly reduced prices. Loose coils easily rewound. If a variable condenser be used in shunt or series with the inductance, atmospherics can be partly cut out and signals increased. Usual price 27/6. SALE PRICE **20/-**

COIL HOLDERS

This is the Ideal Coil-Holder for Honeycomb and Burndept Coils. Made in best ebonite with all brass parts finished dull nickel. For two Coils. Post 6d. Usual price 6/6. SALE PRICE **4/-**
For Three Coils. Post 6d. Usual price 8/6. SALE PRICE **6/-**
This has a perfect movement which can be tightened when using large coils.

FULLER'S BLOCK ACCUMULATORS

offered at Greatly Reduced Prices during the Sale.

2 volt. 40 amp. Post 1/-. SALE PRICE **9/-**
4 volt. 40 amp. Post 1/-. SALE PRICE **18/-**
6 volt. 40 amp. Post 1/6. SALE PRICE **27/-**

Order by post with every confidence — you will not be disappointed.

Sale Offer of the Famous

SUPER PHONE PANEL

A beautifully finished component with lacquered terminals. TO TAKE 4 PAIRS OF 'PHONES. Size 5 in. × 2 in. × 1¼ in. high. Usually sold at 3/6 but offered during the Sale at .. .. **2/9** Post 4d.

SERIES PARALLEL SWITCHES
Remarkable Sale Offer.
An instrument every experimenter should possess.
SALE PRICE **5/-** Post extra.

SALE OFFER

FAMOUS CRYSTAL DETECTORS

Famous Dust-proof Crystal Detector, supplied complete with a piece of Gamages' famous "Permanite" Crystal. Transparent Cover to protect Crystal from dust. Usual price 3/9 SALE PRICE **3/3** Post 4d.

Crystal Detector, fitted with our renowned "Permanite" Crystal. Lacquered Brass. mounted on ebonite, ball joint and "cat's-whisker." To secure at prices now ruling, order immediately. SALE PRICE **2/2** Post 4d.

GAMAGES, HOLBORN, LONDON, E.C.1.
Also at Benetfinks, Cheapside, E.C.2.

Stella

"gives you more and costs you LESS"

True economy this—you pay less for wireless which is more perfect when you insist on these Stella specialties.

STELLA PHONES.

Tested and Guaranteed to give perfect reproduction without distortion. Light and comfortable to wear. Equal to phones costing much more.

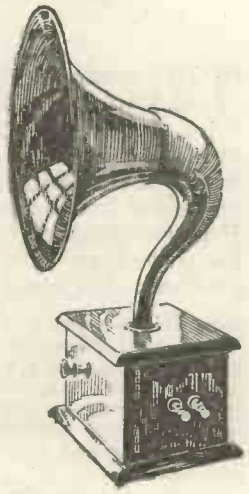
4,000 OHMS Stamped B.B.C. .. Per Pair **17/6**

WEMBLEY PHONES.

These have the same diaphragm as the Stella and give the same faultless reproduction. They are lighter and are made that only the earpieces, and not the headband, touch the head at the sides.

4,000 OHMS, Stamped B.B.C. .. Per Pair **14/6**

BIG STELLA LOUD SPEAKER.



For every Loud Speaker used in the home, in public hall or outdoors, Big Stella gives clearest and most perfect results at a price which will prove to you the folly of purchasing the costly instruments now on the market.

BIG STELLA carr. paid **70/-**

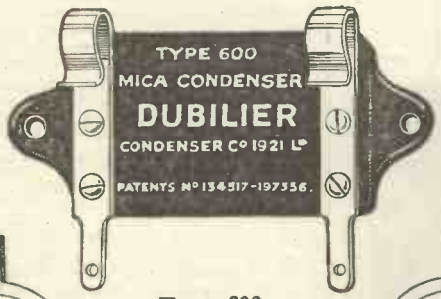
LITTLE STELLA.

A smaller model giving equally wonderful reception carr. paid **35/-**

As Exhibited at Wembley. Avenue 11. Bays 8 & 9.

Buy at Wembley, or from any good Wireless Dealer. Substitutes are inferior—do not accept. If unobtainable write direct to

STELLA WORKS,
31-37, Wybert Street, LONDON, N.W.1.
Telephone: Museum 8390.



Type 600

Confidence.

When you buy a fixed condenser of any unknown make for your set, you buy on trust.

You hope that it really will be of the capacity stated; you hope that it will remain constant and not produce mysterious faults by leaking or altering its capacity.

Not having an electrical laboratory at your disposal, you cannot prove the matter either way. So you hope for the best.

.....

How much wiser to buy a condenser in which you CAN have confidence. There may be an extra outlay of a few pence, but the soundest possible insurance against condenser faults in your receiver is to

"Specify Dubilier."

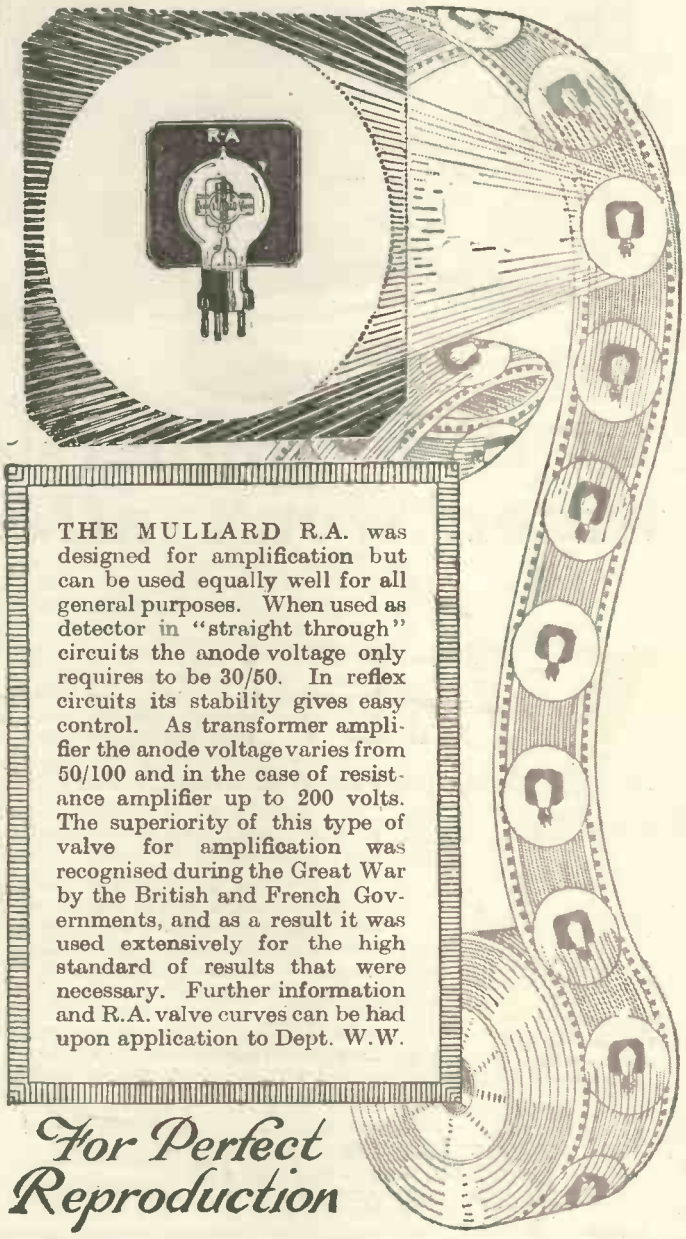
The Dubilier Condenser Co. (1921) *Ltd.*
Goldhawk Road, Shepherd's Bush,
*London, W.*12.

DUBILIER
CONDENSER CO (1921) LTD

E.P.S.59.

A Valve for Every Wireless Circuit

THE R.A.



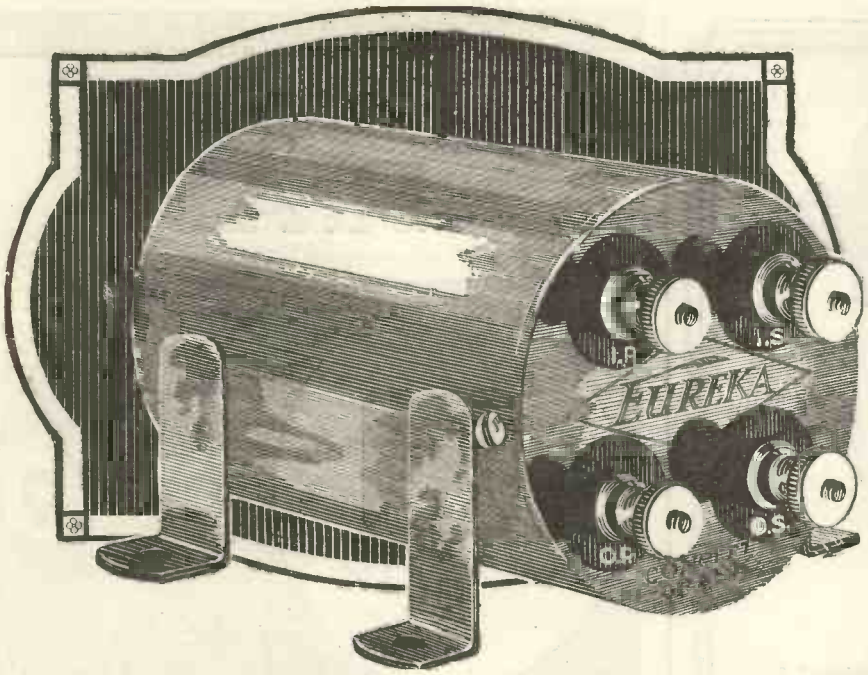
THE MULLARD R.A. was designed for amplification but can be used equally well for all general purposes. When used as detector in "straight through" circuits the anode voltage only requires to be 30/50. In reflex circuits its stability gives easy control. As transformer amplifier the anode voltage varies from 50/100 and in the case of resistance amplifier up to 200 volts. The superiority of this type of valve for amplification was recognised during the Great War by the British and French Governments, and as a result it was used extensively for the high standard of results that were necessary. Further information and R.A. valve curves can be had upon application to Dept. W.W.

For Perfect Reproduction

Mullard
THE · MASTER · VALVE

*Advt.—The Mullard Radio Valve Co., Ltd., (W.W.), Nightingale Works, Nightingale Lane, Balham, S.W.*12.

BRITISH EMPIRE EXHIBITION, PALACE OF ENGINEERING, Avenue 14—Bay 13, (160).



14 days' immersion in water won't affect it!

IT is safe to say that few other Transformers could live up to half the stringent tests which every Eureka has to pass before being issued.

For instance, each one is hermetically sealed within its coppered steel case and guaranteed to be absolutely impervious to all atmospheric influences. If you want to try out an interesting test you can immerse one in water for a fortnight, take it out and wipe it dry and your Eureka will still function perfectly—our guarantee stands at the back of this test.

The insulation on every Eureka is so perfect that on Faraday House tests the tremendous pressure of 2,000 volts was required to break it down.

Thus you can be sure that the Eureka you may buy to-morrow will be giving you faithful service years after other cheaper Transformers have broken down through inferior insulation. In the Eureka we make sure that the insulation is as perfect as modern electrical engineering methods can make it and then we seal it up for good. That's why when a man contemplates spending a few pounds on parts for a new Set intended to give him and his friends real pleasure for a very long time to come he should eliminate trouble by fitting a Eureka Concert Grand.

Sold by all Dealers and manufactured only by
PORTABLE UTILITIES CO. LTD.,
7 & 8, Fisher Street, LONDON, W.C.1.
Scottish Agents: FULLER, BLACKIE & RUSSELL, Ltd., 30, Gordon Street, Glasgow.

Made in two types
Concert Grand ... 30/-
Eureka No. 2 ... 22/6
(For second stage).

EUREKA
Low frequency Transformer

Gilbert Ad. 1073

WIRELESS WEEKLY SMALL ADVERTISEMENTS.

STUDENTS, successfully completing our 12 months' course on Wireless, are definitely guaranteed a position within one month of completion. Salary £150 to £500 per annum. (No Postal Tuition.) Prospectus free.—Wireless College, Bournemouth.

TELEPHONE RECEIVERS and Loud Speakers Rewound, 2,000 ohms, 3/6.—A. Roberts & Co., 42, Bedford Hill, Balham, S.W.12.

HEADPHONE REPAIRS.—Rewound, remagnetised, readjusted. Lowest prices quoted on receipt of telephones. Delivery three days. Est. 26 years.—Varley Magnet Co., London, S.E.18.

AGENTS WANTED.—WIRELESS VALVE REPAIR BUSINESS. Deal with the actual repairers. Lowest trade terms. All types repaired. A hard vacuum guaranteed. Also old valves bought for cash, 6d. each.—M. & G., 60, Churchfield Road, Acton, W.3. Telephone: Chiswick 2681.

THE WIRELESS BOOM. Traders should purchase their stocks from reliable establishments. We are Factors and Manufacturers, established 1896, and supply Component Parts and full stocks. Orders should be accompanied with Cash, any sent in excess returned with the goods. The Newtonia Wireless Factory, 13-15, Whitcomb Street, London, W.C.2. BANKERS: The Westminster Bank, Streatham Branch.

RADIO Sets and Components, bought, sold, and exchanged. All makes of components post free over 10s.—Nicholson, 9, St. Peter's Place, Fleetwood.

EL-BE UTILITIES

The "MIKROTUNE" MAKES TUNING SIMPLE & CERTAIN

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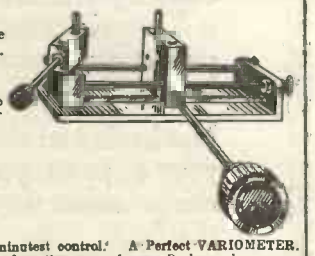

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