The Wireless Constructor

6D MONTHLY

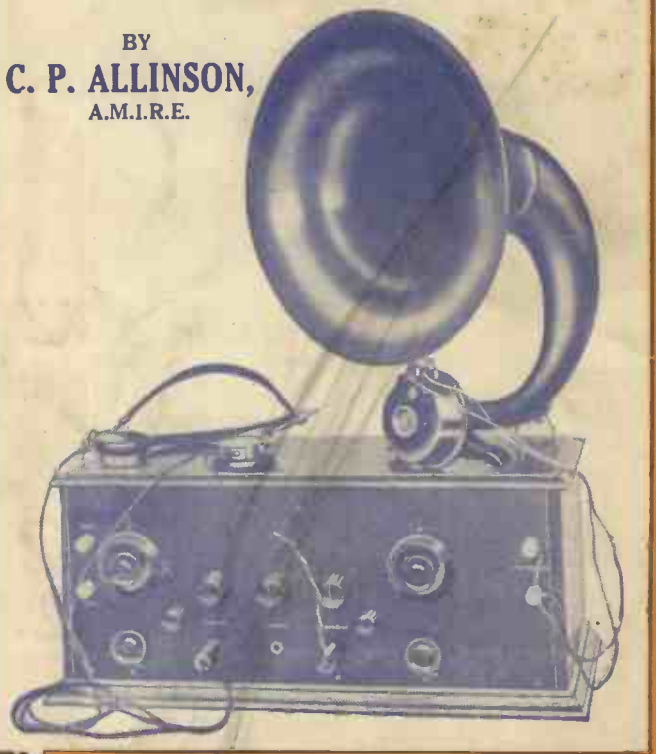
Edited by PERCY W. HARRIS, M.I.R.E.

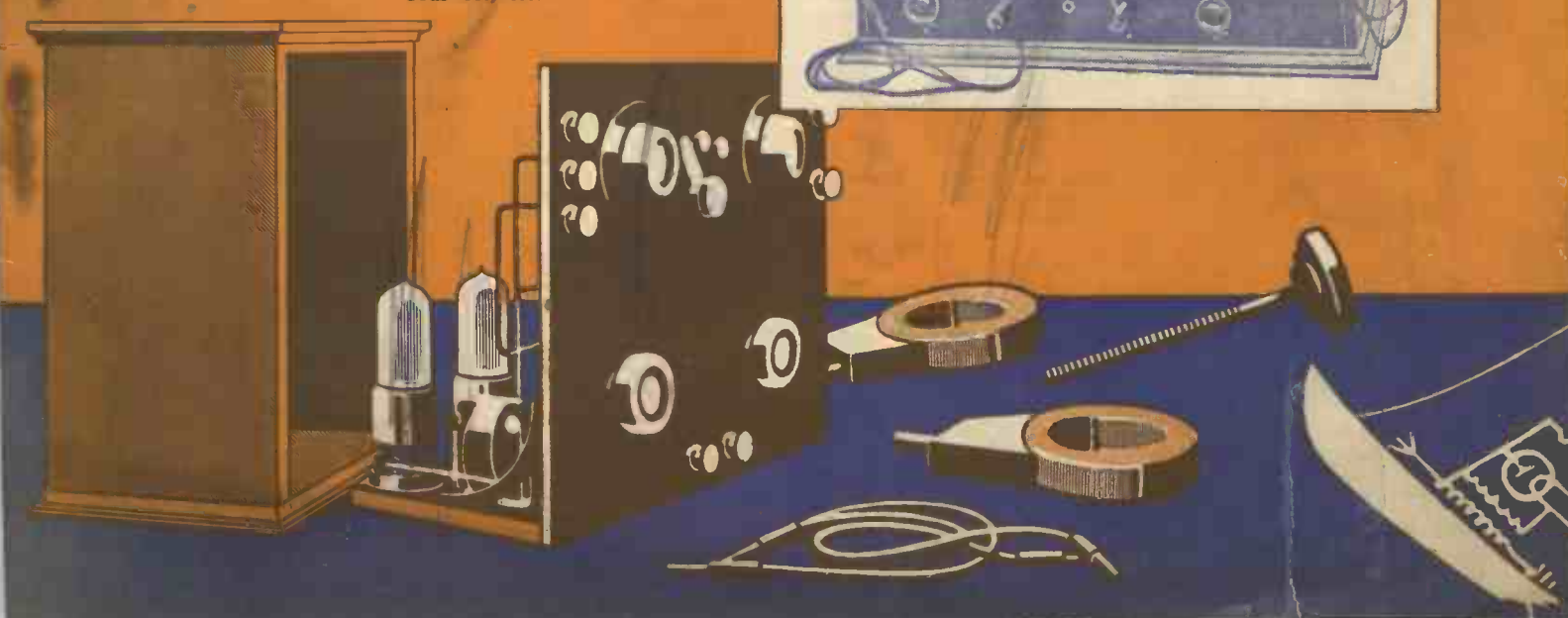
Vol. II MAY, 1926 No. 7

Special Features:

A 3-Valve Duplex Receiver

BY
C. P. ALLINSON,
A.M.I.R.E.





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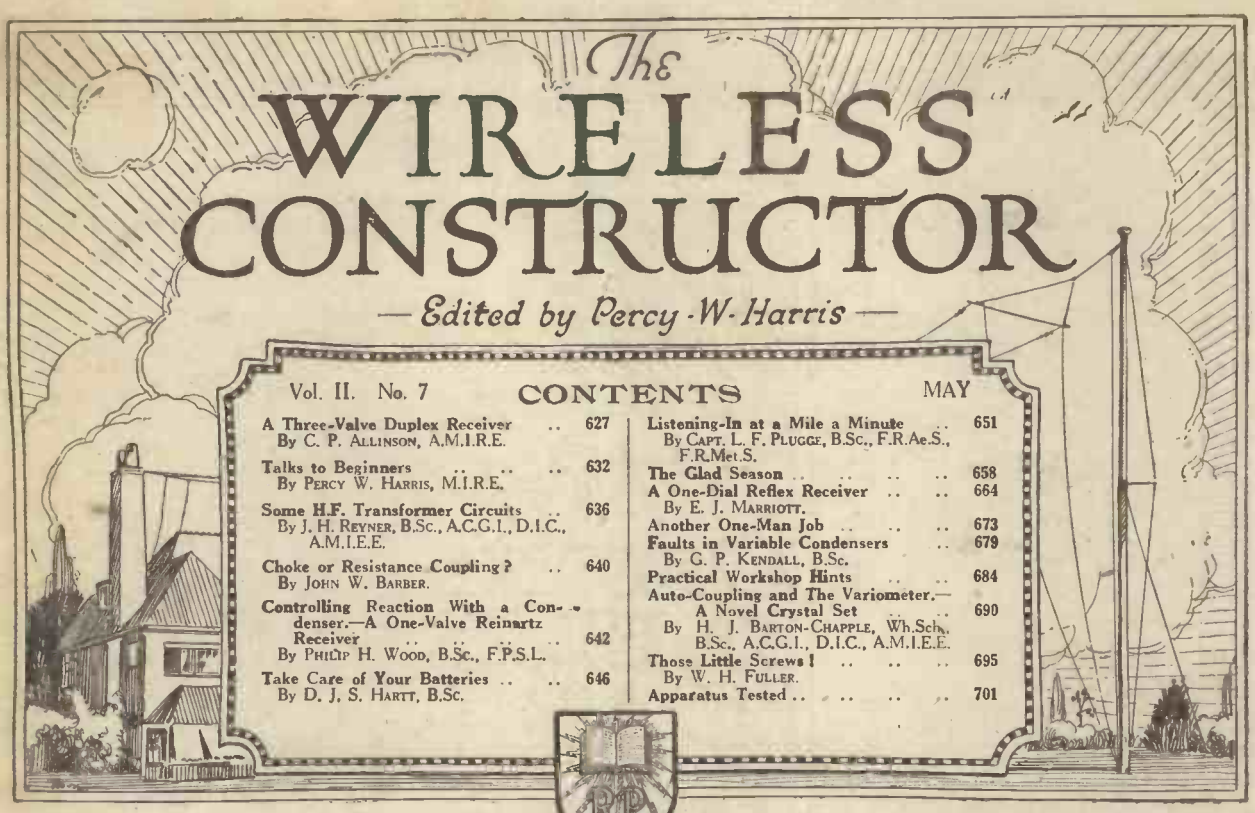

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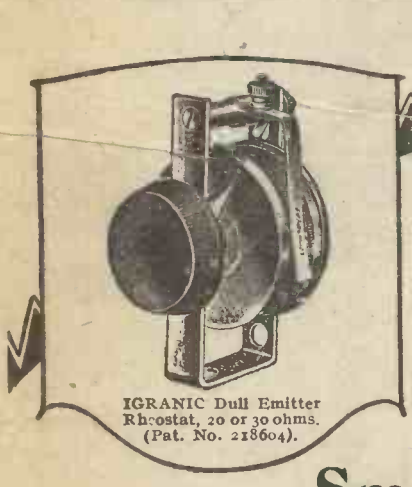
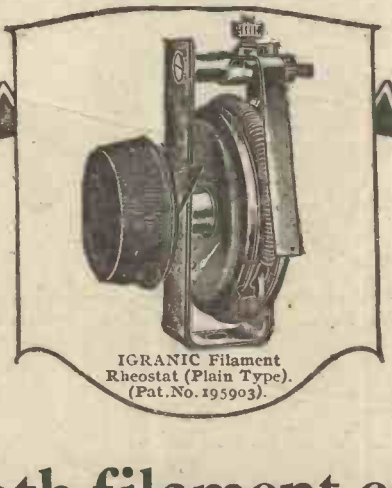
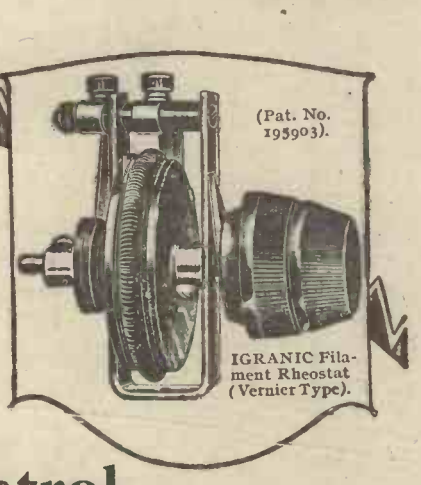

IGRANIC Dull Emitter Rheostat, 20 or 30 ohms. (Pat. No. 218604).


IGRANIC Filament Rheostat (Plain Type). (Pat. No. 195903).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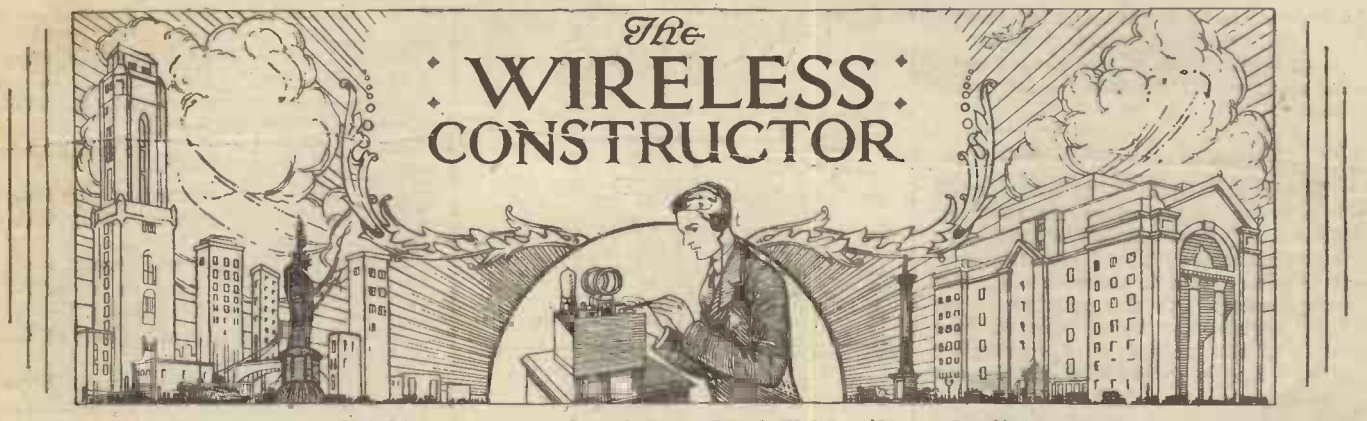


Published by Radio Press, Ltd., Bush House, Strand, W.C.2. 'Phone: City 9911.

A THREE-VALVE DUPLEX RECEIVER

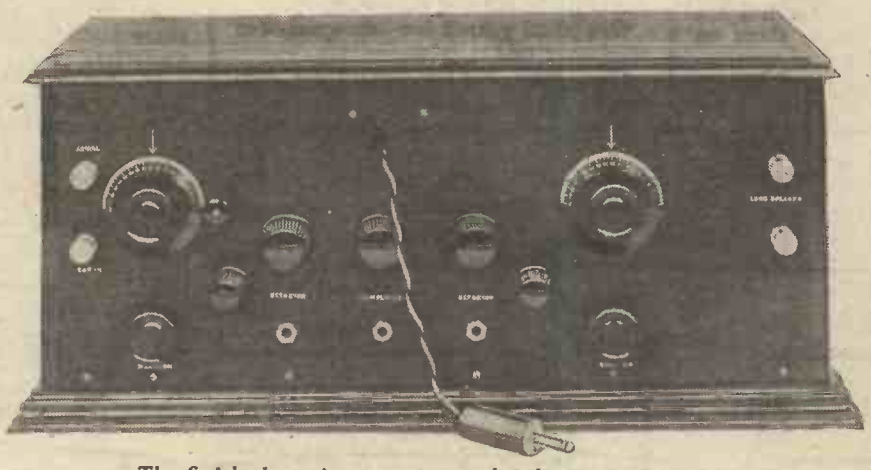
By

C. P. ALLINSON, A.M.I.R.E.

This set allows you to receive your local station and 5XX simultaneously, separate detectors being provided for each, while an L.F. amplifier can be coupled to either.

"I WISH it were possible to receive 2LO and 5XX at the same time on my aerial," a friend said to me recently. "The other night there was an item I particularly wanted to listen to from 5XX which was transmitted at the same time as another one my sister was keen to hear from 2LO."

There are probably many other listeners who have said or thought the same thing, and the receiver to be described in the following article provides a means not only of doing this but also of enabling any short-wave broadcast station to be received off the same aerial and batteries at the same time as a long-wave transmission. Thus, Brussels may be received on one pair of 'phones and Radio Paris on another, or one of the main B.B.C. transmissions may be listened to while 5XX is being reproduced on the loud-speaker. Tuning in stations on either the long- or short-wave side does not interfere with reception on the other side, and thus the listener is enabled to make his or her aerial do double duty.



The finished receiver presents a handsome appearance.

Principles Applied

The method employed is to utilise a principle well-known in alternating current work, as well as wireless, for filtering out frequencies. Thus it is possible to design a filter to pass all frequencies above a certain value, or below it as may be required, such filters being known as "high-pass" or "low-pass" filters.

Filter System

For the benefit of those interested in this question the basic principles of these filters are shown at (*a*) and (*b*) respectively in Fig. 1. At (*a*) the condensers C_1, C_2 and C_3 are of a suitable value so as to allow the desired high frequencies to pass, their impedance to the low frequencies being high, while the chokes or inductances L_1, L_2 and L_3 have a value such that they will not allow the high frequencies to pass, but will practically short-circuit the low frequencies. In this manner, if an alternating current which consists of two frequencies, one high and one low, is fed to the input, only the high frequency will be present at the output terminals.

At (*b*), however, the reverse takes place. The inductances L_1 and L_2 will not allow the high frequencies to pass, but will let through the low ones, while the condensers C_1, C_2 and C_3 prevent the low-frequency currents from passing, but not the high.

The first circuit to be tried was founded on these principles, and after various simplifications had been effected the receiver shown in the photographs was built.

External Appearance of Receiver

It will be seen that the completed receiver has been planned with due regard for its appearance, this being well balanced, while the controls are situated so as to allow of easy operation. All coils are contained within the cabinet, the only accessories external to the set being the usual batteries and loud-speaker or 'phones.

Three valves are employed, two being detectors for the low and high wave-lengths respectively, while the third is a low-frequency amplifier, which by the use of plugs and jacks may be inserted after either of the two detector valves at will. Thus the local station may be received on the loud-speaker in one room while various long-wave stations are being received on the headphones in another, or *vice versa*.

The theoretical circuit diagram is shown in Fig. 2. C_3 is a small variable condenser, which once adjusted may remain set, acting as a form of C.A.T. condenser. At the same time it presents a very high impedance or

resistance to long-wave signals, though passing the shorter waves freely. L_3 is an inductance which chokes back the short waves but lets the long ones through.

Optional Amplification

The circuit L_1 C_1 is suitably tuned to the short-wave broadcast stations, while L_2 C_2 responds to the long-wave transmissions. The low-frequency amplifying valve is shown at V_3, the plug connected to the primary of an L.F. transformer being inserted into either of the jacks J_1 or J_2 to amplify either the long- or the short-wave signals at will.

The jack J_3 is connected in the plate circuit of V_3 and has two terminals connected in parallel with it, so that the 'phones or loud-speaker may be connected to either at will.

Panel Layout

Returning to the views of the set, the left-hand condenser seen on the front of the panel is the short-wave tuning condenser C_1, that on the right being C_2 for the reception of 5XX, etc. The small variable condenser C_3 is a baseboard mounting neutrodyne condenser, and is fixed behind the panel on the wooden baseboard. The two outside jacks belong to their adjacent circuits, the centre one being the amplifier output, the same arrangement holding good for the filament resistances. The two knobs at the bottom of the panel on each side control the reaction coils L_4 and L_5. The two terminals on the left are for aerial and earth leads, those on the right being for the loud-speaker. All other terminals are carried on a special strip at the back of the baseboard for connecting the batteries. A

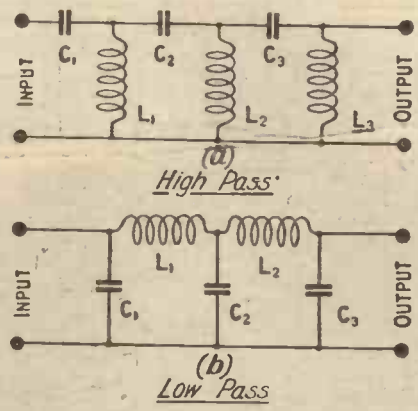


Fig. 1.—Two filter systems. (a) Passes high frequency currents but stops those of low frequency, while (b) does the reverse.

hole is cut in the back of the cabinet to allow this terminal strip to project.

Apparatus Necessary

Below will be found a list of the components required for constructing this receiver, and although there is no actual need to use the components specified they should be replaced only with such as are known to be of good make if the best possible results are to be obtained.

One ebonite panel, matt finish, 20 in. × 8 in. × ¼ in. (Paragon Rubber Co., Ltd.).

One cabinet with loose baseboard for panel given above (W. H. Agar).

One .0005 geared low-loss square-law condenser and

One .0005 low-loss square-law condenser (Jackson Bros.).

Two Lotus two-coil holders with 6 in. handles (Garnett, Whiteley & Co., Ltd.).

Three 30-ohm Yesly filament resistances (Engineering Supplies, Ltd.).

Three Clearertone valve holders (Benjamin Electric, Ltd.).

One Perfection L.F. transformer (The Formo Co.).

One baseboard mounting neutrodyne condenser (Burne-Jones & Co., Ltd.).

Two .0005 μF fixed condensers, and

Two .0003 μF fixed condensers (Dubilier Condenser Co., Ltd.).

Two variable grid leaks (Bretwood, Ltd.).

One clip-in condenser and mounting, value .001 to .006 μF (L. McMichael, Ltd.).

Four large lacquered brass terminals and

One No. 1 terminal panel (Burne-Jones & Co., Ltd.).

Three single-circuit telephone jacks (Igranic Electric, Ltd.).

Two telephone plugs (Igranic Electric, Ltd.).

One fixed coil holder.

Quantity of Glazite and double flex for connecting up.

One set Radio Press panel transfers.

Constructional Notes

The panel should be drilled for mounting the various components, as shown in Fig. 3. A ⅜-in. drill will be required for the three filament resistances and the spindles of the variable condensers; the vernier adjustment for C_1 requires a ¼-in. hole, as do the two variable grid-leaks, while the three jacks require holes 7/16 in. in diameter.

If only a ⅜-in. drill is handy the holes for the jacks may be drilled this size first and then enlarged as neces-

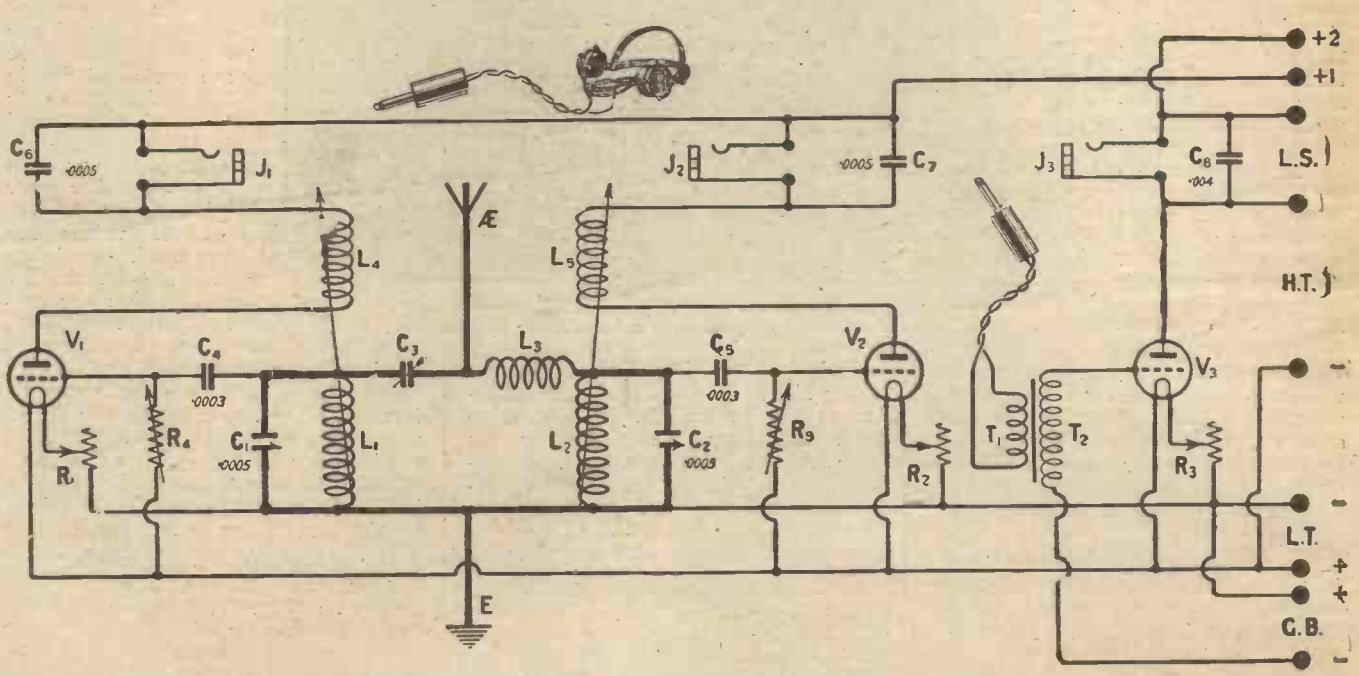
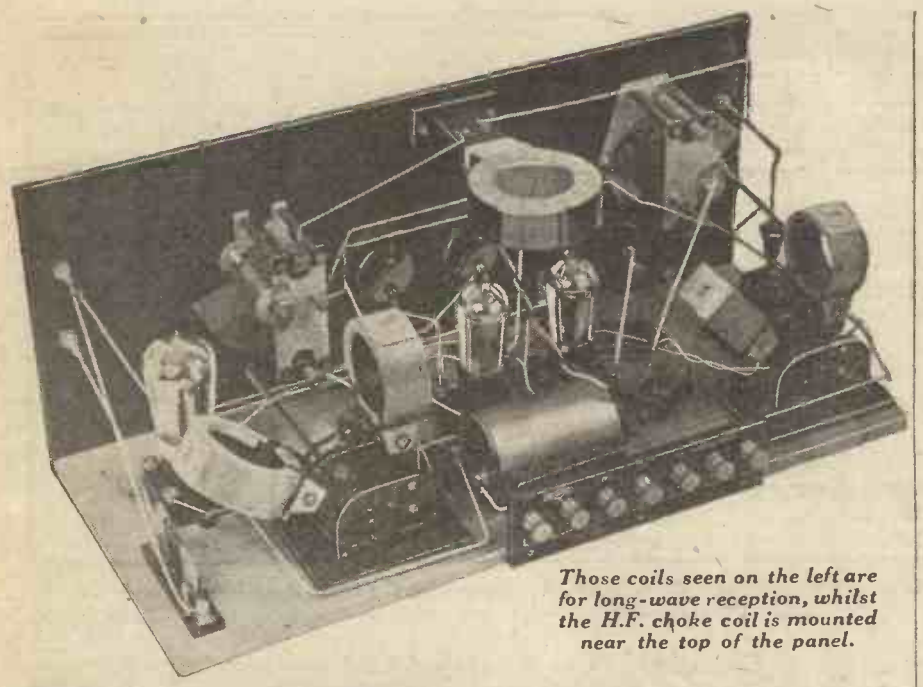


Fig. 2.—The circuit used. The amplifier plug may be used in either Jack 1 or Jack 2, Jack 3 being used for the loud-speaker.



Those coils seen on the left are for long-wave reception, whilst the H.F. choke coil is mounted near the top of the panel.

sary with the tang of a large file, using this as a reamer by twisting it backwards and forwards.

The panel layout, shown in Fig. 3, will give the necessary dimensions for this part of the work, but, of course, if components other than those specified are used it will probably be necessary to alter the layout slightly. It is not advisable to do this, however, unless the coustructor has had a fair amount of experience.

Use of Panel Transfers

Before actually mounting the components on the panel it is as well to fix the panel transfers, which serve not only to enhance the appearance of the set by giving it a professional appearance, but also to indicate the exact functions of the controls. The transfers may be fixed either by the use of a hot pad of cloth which is pressed down on the transfer, or else by means of methylated spirits. After the backing paper has been removed, the surface of the transfer is just moistened with the spirit and affixed to the panel. After it has dried it is wetted with a little water, and after a minute or so it will be found that the thin tissue paper will come off quite easily, leaving the transfer itself in position on the panel.

Having done this, mount the components on the panel and fix this to the baseboard. The components which are mounted hereon may now be put into place, and for this purpose the back of panel wiring diagram shown in Fig. 4 will prove of assistance, since it represents a scale drawing of the interior of the set.

The only component which should be left to be mounted later is the L.F. transformer.

Checking the Connections

The wiring of the set should now be commenced, and it will be found convenient to consult Fig. 4 again as a guide to the correct placing of the various leads. The L.T. circuits should be wired up first, and the wiring diagram may be used to check off the various connections as they are made, by drawing a coloured ink or pencil line over each connection as it is completed.

Lengths of double flex are used for the connections going to the reaction coils and also for connecting the plug to the primary of the L.F. transformer. Having completed all the connections except those going to this transformer (remembering to leave room for it to go in), this may be placed in position and the wiring finished off.

Transformer Leads

The flexible leads going to the primary of the L.F. transformer may conveniently be fitted with spade tags at one end and with pin tags at the end which is connected to the plug. The correct connections are marked, but with other transformers it may be necessary to reverse them and see which is the correct arrangement; of the secondary terminals O.S. of course goes to grid.

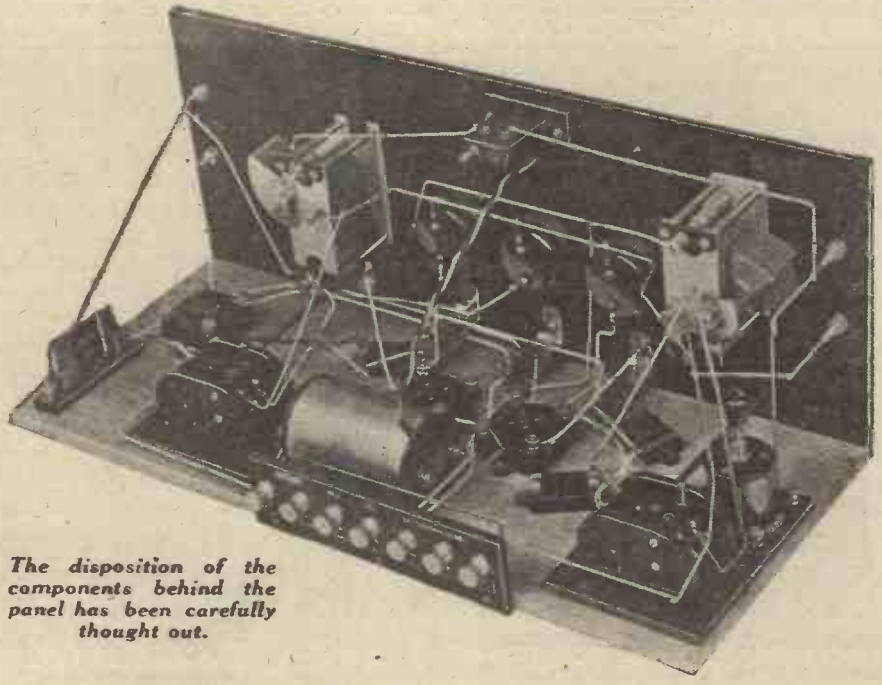
The wiring should next be checked over and the set then given its preliminary test. To do this first connect the L.T. battery only. If bright-emitter valves are being used a six-volt battery will be desirable since three valves may be in use at once. This battery will also do for use with ¼ amp. 5-volt dull emitters. For .06 valves a four-volt accumulator will be the right one, or a three-volt dry battery. If it is intended to use a dry battery, it should be of sufficient capacity to give the current necessary to run three valves at once.

Battery Connections

Having connected the battery, see that the three filament resistances are in the "off" position, and then insert the valves and see that they are correctly controlled by the rheostats. Next connect the H.T. battery and strap the two H.T. plus terminals together at first, applying a small voltage by just touching the wander plug to the six-volt tapping. In this case, should the H.T. battery be connected across the filaments owing to any error in the wiring no damage will be done. Everything being found to be correct, the set may now be tested on the aerial.

Coils and H.T. Values

Looking at the set from the front, the left-hand coil holder will be for



The disposition of the components behind the panel has been carefully thought out.

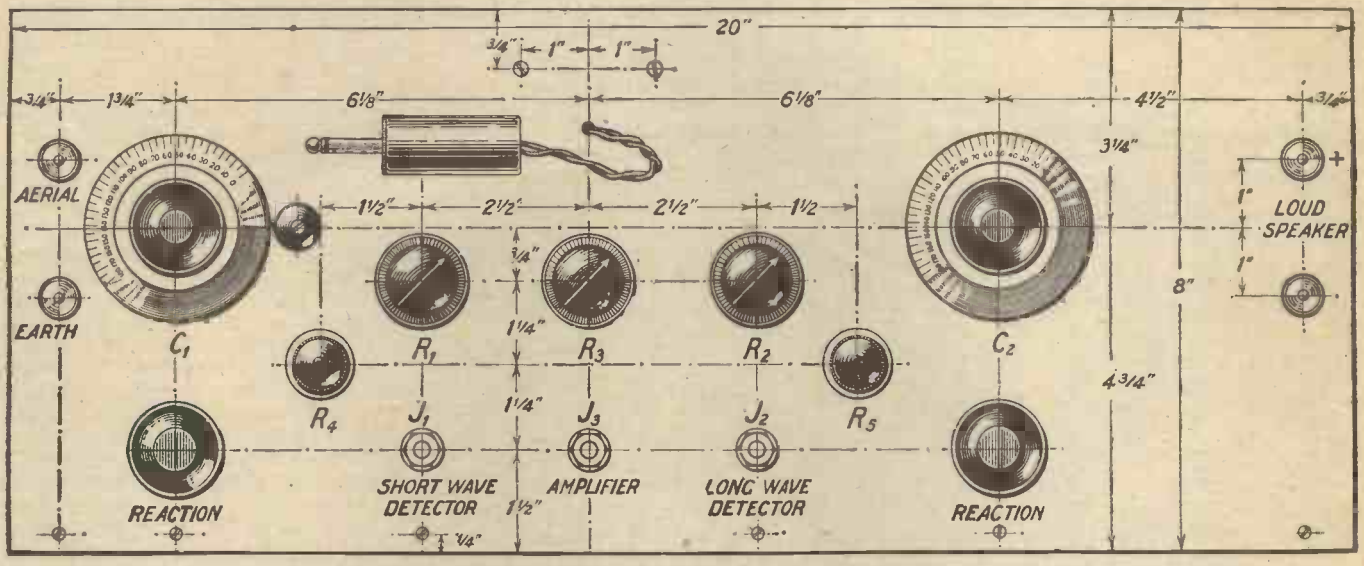


Fig. 3.—Follow this diagram carefully when marking out your panel. Blueprint C 1039A may be obtained from the publishers.

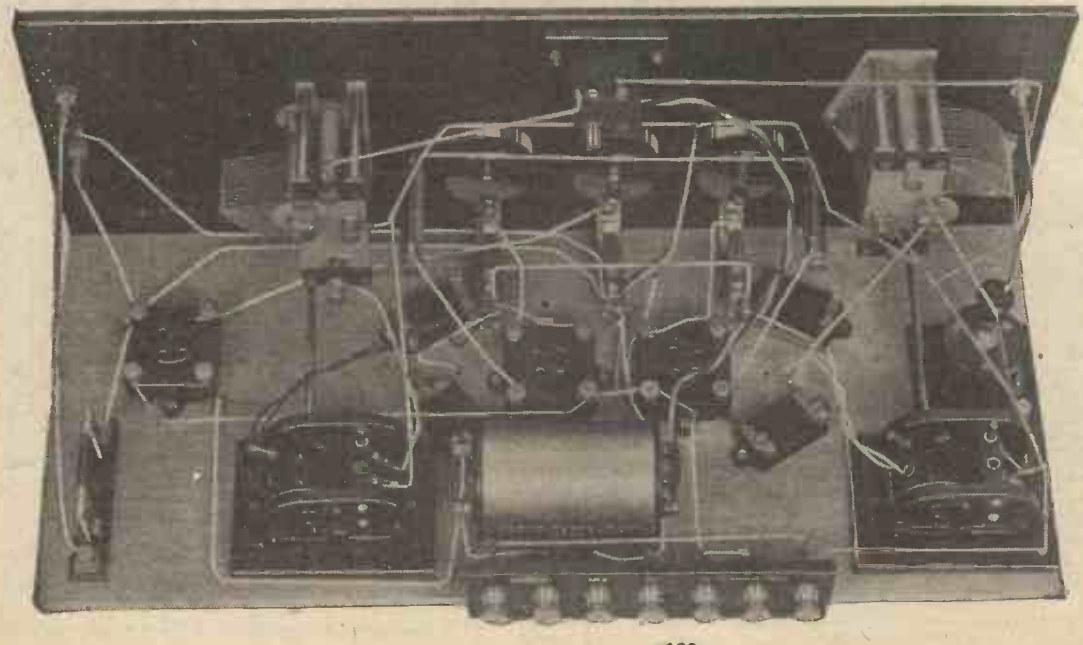
the short-wave broadcast coils, the correct sizes being a No. 50 in the fixed holder and a No. 35 or 50 in the moving one. Since this latter is the reaction coil, the smallest coil that will give reaction over the whole waveband covered by the tuning condenser should be used. The fixed coil holder mounted on the centre of the panel should have a No. 100 coil plugged into it and the other two-coil holder will have a No. 150 in the fixed and a No. 200 or 250 in the moving block for reaction. In some cases a No. 75 or 100 coil will be found large enough to give reaction, and should therefore be employed. Connect the correct values of H.T. to the two terminals. H.T.1 may be 40-60 volts, H.T.2 about 100 to 120. The grid bias battery should also be connected, the best value being found by experiment.

Operation

With the reaction coils well away from the fixed ones, connect the aerial and earth leads. Screw the neutrodyne condenser C_3 right down, and with the 'phones plugged into No. 1 jack the local short-wave broadcast station may be tuned in. If it is at a fair distance it will probably require a little reaction to bring it in at good strength. Having tuned this in, connect the loud-speaker to the terminals marked or plug it into the amplifier jack (jack No. 3), and plug the amplifier plug instead of the 'phones into jack No. 1.

The local station should now be received at fair loud-speaker strength if within a distance of 10 to 15 miles. These figures represent the average loud-speaker range for the reception of a main station on two valves, but under favourable conditions they may be considerably exceeded. With the loud-speaker on, the grid bias battery may be adjusted to give the most faithful reproduction, a nine-volt battery tapped every 1½ volts being suitable for this purpose. It is connected to terminals GB— and GB+.

The loud-speaker may now be replaced by the 'phones, and with the judicious use of reaction other stations may be searched for. Having tuned in a distant transmission, the aerial series condenser (i.e., the neutrodyne condenser C_3) may be adjusted to give maximum signal strength; this will not necessarily be the "all-in" position; on the writer's aerial, in fact, it was found to be when the spindle was screwed out three or four turns. This will depend, however, on the aerial-earth system employed, and this con-



This photograph should prove helpful when wiring up the receiver.

denser should therefore be set to suit the particular conditions obtaining.

Two Stations at Once !

While this is being done another listener can be employed in tuning in 5XX or Radio Paris on the other valve. The telephones used by him will be plugged into jack No. 2, and it will be found that the tuning on the long-wave side is independent of that on the short, and vice versa.

If desired, the long-wave transmission may be put on the loud-speaker following a stage of low-frequency amplification, and the distant or local short-wave transmissions listened to on the headphones, provided, of course, that the long-wave station is within loud-speaker range. For this the amplifier plug is inserted in jack No. 2, the output being taken from the loud-speaker terminals or jack No. 3 as desired. It should be remembered that these terminals are in parallel with the jack contacts, and that therefore if a pair of telephones is plugged in when the loud-speaker is connected to the terminals a reduction in signal strength will result.

On the short-wave side it will be found that the small series condenser not only renders the condenser setting nearly independent of the aerial on which it is working, but also helps to give quite a good measure of selectivity. At thirteen miles from 2LO the tuning on this station was found to be quite sharp.

Some Results Obtained

When the receiver was connected to a small aerial about 20 ft. long within 2 miles of 2LO, this station was received at good loud-speaker strength using two valves, while at the same time 5XX, Radio Paris, Persbureau Vaz Dias and the Eiffel Tower have been received on a pair of telephones at good strength without interfering with or being interfered with by the other part of the receiver. Conversely, it has been possible to put 5XX on the loud-speaker with two valves and listen to several of the short-wave stations such as Brussels, Hanover, Bournemouth, Hamburg, Newcastle, Madrid, Munster, Birmingham and others.

Although if the short-wave side should inadvertently be allowed to oscillate, it will not affect the long-wave side, the converse is not true, since long-wave harmonics will be generated and picked up directly on the short-wave side, should the former be allowed to go into oscillation. This, however, is due to the coupling between the coils, and since these are a good distance apart it will not be very noticeable, but it *will* be an incentive to comply with the well-known and oft reiterated request of "Please, please don't oscillate."

This receiver was tested at Elstree with good results.

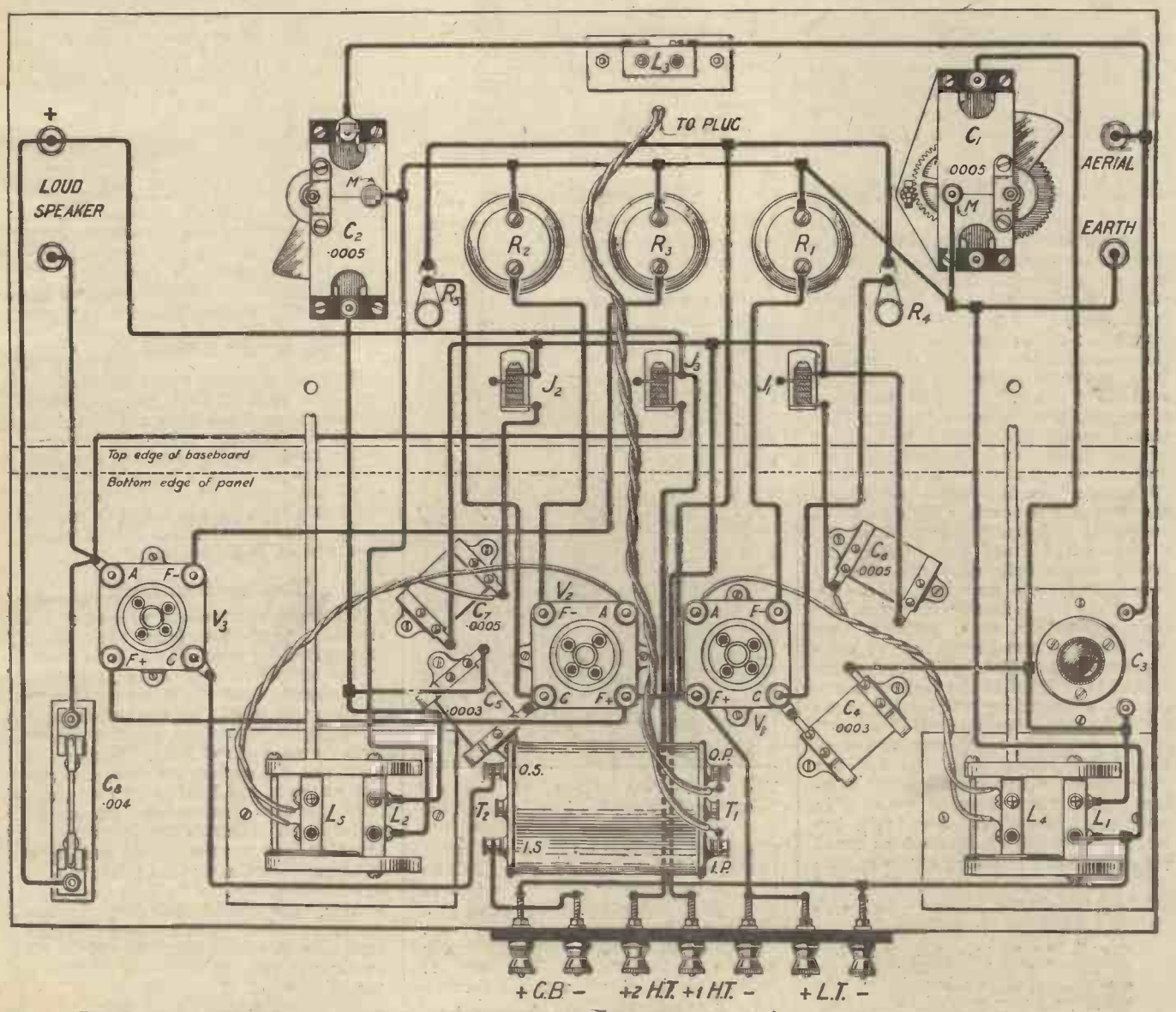
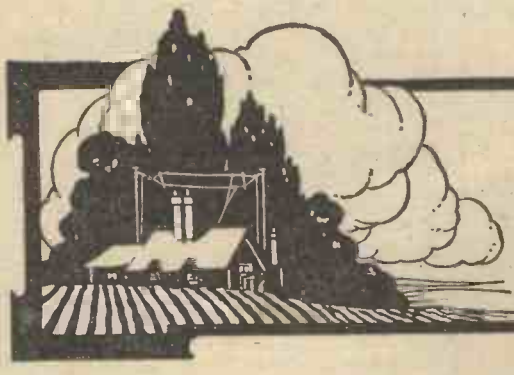


Fig. 4.—Used in conjunction with the photographs this diagram will provide a complete guide to the internal connections. Blueprint C 1039B.



TALKS TO BEGINNERS

By

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

NOTE.—This is the second of a series of talks to the beginner, the first of which was published in our last issue.

II.—MAKING A START.

IN my last article I gave you a brief account of how the music and speech in a broadcasting studio are made to vary, or "modulate," electric currents, and how these currents, in their turn, influence others which flow in the transmitting aerial. You will remember that we reached the point where the high-frequency or oscillatory currents in the transmitting aerial affected the surrounding ether and caused waves to be radiated in every direction.

The Medium in Which the Waves Travel

I want in this article to tell you a little more about these waves, and to suggest to you (I cannot hope to explain) how they carry out the work we want them to do. The first thing I would like to impress upon you is that the waves do not occur in the air, but in a great all-pervading medium we call the "ether." The air is something which, so to speak, "clings" to this planet. Its density is greatest at sea level, and it becomes more tenuous as we rise until, some 40 or 50 miles above the earth surface (if we were able to reach so high a point), we should find practically no air at all.

Out in the great Beyond, away in space, where only stars and planets reign in stately grandeur, there is, so far as our scientific investigations show us, no air, save, perhaps, here and there an atmosphere around some distant star. Yet, while our atmosphere is confined to the regions immediately surrounding our globe, space is filled with this medium "ether" which, according to the theory generally held, fills not only space, but everything, everywhere. The wireless valve, which may be glowing in your room while you read this, has had extracted from its bulb as much air as modern machinery will take out; yet in the pumping process the ether remains as before. It is, we may say, nature's background.

How Light Reaches Us

To the best of our knowledge, the sensation we know as light is caused by vibrations or waves in this all-pervading ether. Giant and mysterious disturbances in the sun set the ether vibrating, and from that dazzling mass is radiated in every direction a continuous stream of waves which, when they reach us here on earth, produce in our eyes the sensation of light, and on our bodies the feeling of heat. Furthermore, the sun's rays—or, expressed in the way we are now considering, the light vibrations from the sun—produce chemical actions, in addition to the sensations of light and heat.

In Every Direction

In explaining wireless waves, the analogy of a stone thrown into water is often used. Personally, I do not often use the analogy, as the wave forms produced in water are liable to confuse us when considering waves in the ether. For example, when you throw a stone into a pond, you see ripples or waves spreading out on the surface of the water. We have no surface of the ether to think about—we are inside it. Any vibration in the ether, or, for that matter, in the air, spreads out in every direction from the source, up and down, sideways, right, left, and everywhere.

The radio equipment of the s.s "Chantier," the floating base of the U.S. Navy Polar Expedition.

If I were to stand in the middle of a great desert, with nothing around for miles, and were suddenly to shout, the vibrations of my vocal chords would create sudden compressions of the air, and these compressions would spread out as a wave, and would be followed by other waves, all passing through the air at a constant speed. If we could *see* the wave front, it would appear to us like a great half-bubble, of which I should be the centre, and this would spread up and around me in ever-increasing size, weakening in its intensity as it grew, until by the time it had reached a few miles distant it would be so weak as not to affect even the most sensitive ear.

Have You Noticed This?

The speed of sound waves in the air is not high, and, in fact, you may have noticed, when watching a cricket match from a distance, that the sound waves from the bat striking the ball will reach your ear a perceptible time after the vision of the bat striking the ball affects your eye. This means to say that sound waves travel much slower than light waves.

The Speed of Light

Light waves travel at an almost incredible speed—the figure has been ascertained by science to be somewhere in the neighbourhood of 186,000 miles per second! All light waves travel at the same speed, but the waves from violet light follow one another closer than do those of red light. This means that the separation between successive waves of red light is greater than that between successive waves of violet light. Put in another way, we say that the wavelength of red light is longer than the wavelength of violet light. If you were to look into the matter, you would find that in the spectrum the wavelength of light gradually increases from the violet end to the red end, and, in fact, between the limits of the spectrum, if a scientist is given a wavelength measurement (that is to say, the

separation between successive waves), he will be able to tell you the colour.

Another way of expressing these facts is to say that different wavelengths have different effects upon our eyes. There are waves shorter than the violet which are not visible to the eye, but have other effects. These are known as "ultra-violet" light waves, and they have certain effects which are distinctly measurable. For example, some of them affect the photographic plates, although they cannot be seen by the eye. Away down much lower on the scale than these violet rays you will find X rays, about which, of course, you already know something.

The Heat Rays

At the other end of the scale, or spectrum, beyond the red, are rays known as the "infra-red." I have mentioned that the red rays are longer in wavelength than the violet, and similarly the infra-red are still longer than the visible red. Beyond the red in this direction we come to heat rays. The wavelength of the vibrations which give us the sensation of light and visible spectrum is but a tiny fraction of an inch.

Now, a long way ahead of the infra-red heat rays we come to another series of rays or waves, known as wireless waves. They are not visible to the eye, but they travel with exactly the same speed as the visible light waves, namely, 186,000 odd miles per second, and obey many of the laws followed by visible light. It is only in recent years that we have discovered how to produce these waves artificially, and, as I indicated in the first article, high-frequency electric currents in an aerial will produce them.

Light We Cannot See

A wireless broadcasting station is therefore something in the nature of a lighthouse for invisible light. We cannot see its rays, but a receiving aerial will act as a kind of magic eye for us. When these electric waves fall upon any metallic conductor, they set up feeble electric currents in it of the same frequency as that which has generated them at the transmitting station. Any wire if given a sudden electric shock will vibrate electrically, just as a tuning fork, if struck, will give sound vibrations. If, now, the frequency of vibration of an aerial wire is arranged to be the same as the frequency of the transmitting aerial, then the waves will have an additive effect and will build up by resonance quite an appreciable current, just as correctly timed impulses on a child's swing will work up quite a big swing after a little time.

Adding "Length" to Your Aerial

Longer aerials have a period of vibration lower than that of short aerials. If our receiving aerial is "out of tune" with a transmitting station, we can make it electrically longer by adding wire to it in the form of coils (this is what a tuning coil is for), and if it needs shortening electrically we can give a shortening effect with a condenser.

A combination of a condenser and a coil enables us to adjust our receiving aerial over a wide range of frequencies, so that we can "tune" the aerial, as we say, to the frequency we want to receive and thus get a building-up effect. Any wavelength falling on the aerial which differs from that to which the aerial is tuned will not build up so strong a current, and in this way we get a certain degree of "selectivity," as it is called. By this we mean that we can adjust our aerial to get the maximum response from one wavelength.

A Motoring Analogy

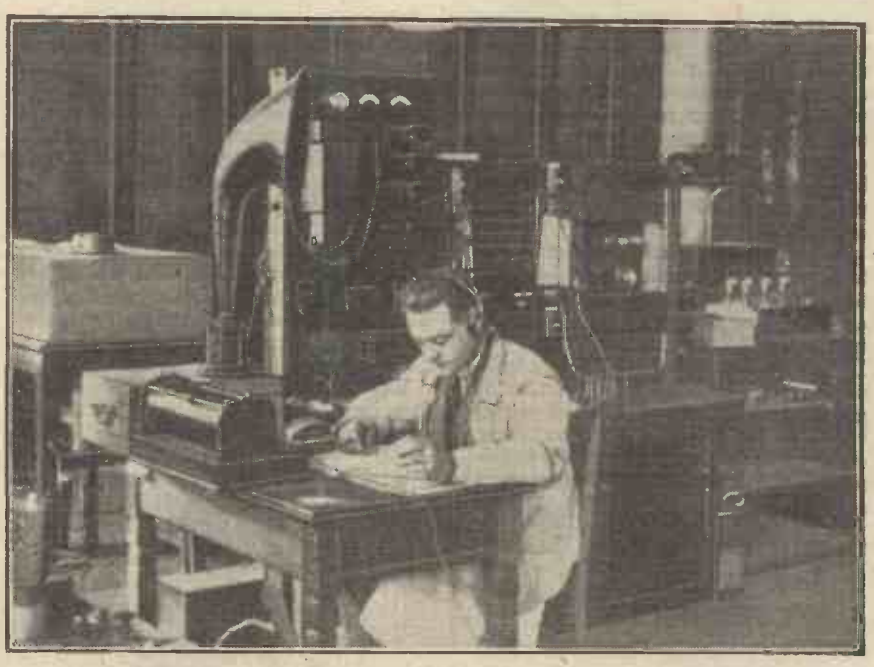
Now I want you to bear in mind the relation between wavelength and frequency. Remember that the waves are all travelling through the air at the same rate. Think of a number of motor cars on a main road all doing 20 miles an hour and all separated by a 20th of a mile. Imagine you are standing behind a gate watching the cars go by. If they are separated by a 20th of a mile and are doing 20 miles per hour, then 20 cars will pass you in the hour, and one car will pass the gate every three minutes; we can say, if you like, there is a wavelength of 20th of a mile, and the frequency is three minutes.

Now double the number of cars and have them separated by a 40th of a mile, yet all cars maintaining the same 20 miles speed as before. You will have half the wavelength, but now a car will pass you every 1½ minutes, so that while you have halved the wavelength, you have doubled the frequency. Similarly, each wave falling upon a receiving aerial will set up a little current, and the shorter the wavelength the greater the frequency of the little currents. In actual practice a 300-metre wavelength (such as is used by some relay stations) sets up in the receiving aerial a current of a frequency of 1,000,000 per second. A 600-metre wavelength, such as is used by ships for signalling their messages to one another, will set up currents of a frequency of half a million. As the figures are so large in wireless frequencies, we often speak of kilocycles for convenience. "Kilo" means 1,000, so that a 1,000,000 frequency is often spoken of as 1,000 kilocycles.

How it Applies to Your Receiver

Now let us come back and see how all this affects your own receiving set. You have, perhaps, as a receiving aerial a length of wire taken out of the window to a pole in the garden. The house end of the wire is connected to your tuner, and an earth wire goes from the tuner out of the window to a buried plate. Miles away a great radio "lighthouse" is sending out a stream of invisible light of a wavelength of, perhaps, 360 metres. The distance between the successive waves remains constant all the time, although the strength of the waves is being varied according to the sound falling upon the microphone.

Your receiving aerial is struck by the waves in passing, and each wave sets up a little current and, so to speak, sets your receiving aerial, with its tuner and earth wire, into electrical vibration. You have previously adjusted this vibration period by means of your tuner to have just the



The switchboard and controls of the Ecole Superieure Station, Paris, whose transmissions are often heard in the southern counties.

Talks to Beginners

(continued)

frequency with which the waves fall upon the aerial. You will thus have a vibrating or oscillatory current in your receiving aerial which rises and falls in strength in accordance with the sound waves which are falling upon the microphone in the studio. If you turn your tuning controls you can alter the electrical vibration period (or make the aerial longer or shorter), so that it gets out of tune and you will not get the same building-up effect. For this reason the strength of your signals goes down as you turn the knobs backward and forward from the turning point.

Interfering Signals

While your local broadcasting station is sending out items to amuse you, and you have arranged your aerial to respond to the frequency set up by the waves, other wireless stations are also sending, but as you are not in tune, you get very little building-up effect and very little response. If, however, you have some station very near to you with very strong waves, these may force your receiving aerial into oscillation or vibration, and interfere with the signals you want to receive. These forced vibrations are rather difficult to get rid of, and are the cause of the interference you sometimes experience when you happen to be near the sea shore and the strong waves from the ships spoil your reception.

In my next article I will try to indicate what happens to these wonderful electric currents set up in your aerial by the broadcasting station and how you adapt them to operate other sensitive apparatus known as telephones or loud-speaker.

A YOUTHFUL CONSTRUCTOR

SIR,—I wish to congratulate Mr. Clark on the "Midget" Single Valve Receiver as described in the May issue of THE WIRELESS CONSTRUCTOR. I am only 11 years old, but I am a wireless enthusiast. I built the receiver one evening, and my father helped me with the soldering. It is the first set I have made, and it is one of the best I have heard. I have taken THE WIRELESS CONSTRUCTOR regularly ever since it came out, and think it is a fine paper.

Yours faithfully,
PETER MILNE.

Scarborough.

A Remarkable Five-Valve Receiver
See the April
"MODERN WIRELESS"

A THREE-VALVE NEUTRODYNE RECEIVER

SIR,—Please find enclosed a photograph of the Three-Valve Loose Coupled Neutrodyne Receiver designed by Mr. Percy W. Harris, M.I.R.E., and described in the November, 1924, issue of THE WIRELESS CONSTRUCTOR.

I have made my set in a rather different style to the one published, and in some cases I have used different components.

The set is excellent for its clarity, volume, and selectivity. Several people I meet complain of interference by Continental stations when it has not been noticed by myself at all.

The best aerial I can erect is very poor—at no place is it more than 8 feet from the house, yet the results are extremely good.

Daventry and Bournemouth come in at full loud-speaker strength; London, Radiola, Konigswusterhausen and two other Continental stations I get at medium strength.

On the 'phones practically every Continental station comes in. The arrangement of Clix enables me to use two valves or change the leads to the L.F. Transformer (primary).

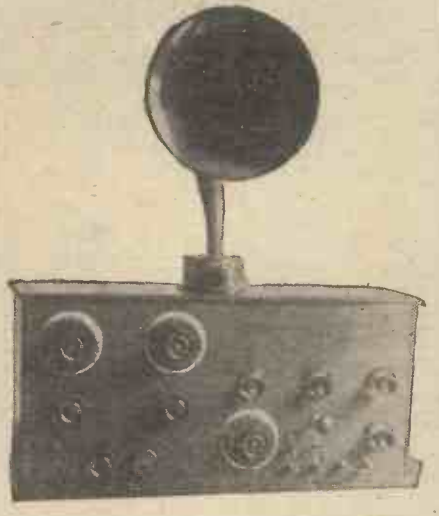
I use a Marconi D.E.R., H.F. and 2 Cosmos short-path valves.

THE WIRELESS CONSTRUCTOR is a fine book, and keeps well up to its name, and I look forward to it every month.

Wishing you every success.

Yours faithfully,
G. EARWOOD.

Southampton.



The three-valve loose-coupled neutrodyne receiver constructed by Mr. Earwood, who is very pleased with the results he obtains with it.

NEWS FROM EGYPT

SIR,—I notice that very little correspondence has been published in your columns regarding the Anglo-American Six, and am rather surprised at this, as this set has been giving me very good results.

I have definitely identified by call sign and regularly receive most of the following B.B.C. stations—Cardiff, London, Bournemouth, Newcastle and Birmingham; while numerous Continental stations have been received, but in the absence of a wavemeter I am unable to state definitely what stations they actually are, with the exception of Rome, Union Radio Madrid, and Radio Toulouse, which have been heard to give their calls.

My latest bag was Dublin, on the night of March 4, when, I have heard, some of the B.B.C. stations closed down owing to a severe electrical storm. There was no possibility of mistake in this station, as his call sign was heard a number of times.

With the exception of a little trouble with the last valve, which was eventually traced to a dirty contact on the last jack, the set has given no anxiety at all, although a little patience is required to neutralise the valves.

The first evening the set was completed 6BM was picked up at good strength.

The L.F. amplifying valves are seldom used, as the H.F. side of the set gives very comfortable signal strength on two pairs of 'phones, and, as a matter of fact, clearer reception is obtained without L.F. amplification.

Valves in general use are Marconi R's, in the H.F. and detector sockets, working on 40 and 36 volts respectively.

The set, when the X's are favourable, certainly bears out Mr. Harris's remarks regarding purity, and seems to be a whale for distance.

I find I get better results using Mr. Kendall's X coils (35 turns) than with those of other types.

I previously worked a Transatlantic V, but I certainly get better reception on the first four valves of the A.A.6 than with the five valves of the Transatlantic V.

Yours faithfully,
T. A. SHEPHERD.

Cairo.

CARTOONIGRAFS!
See "WIRELESS,"
the One-Word Weekly.

HE CERTAINLY *WAS* SURPRISED!

SOME HIGH-FREQUENCY TRANSFORMER CIRCUITS

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

During the summer months an efficient H.F. stage becomes a very desirable feature for the reception of distant stations.

IT is becoming accepted that the use of a single stage of high-frequency amplification often makes all the difference between a satisfactory DX set and the reverse. Although a well-designed single-valve detector will bring in a large number of distant stations, particularly if the reaction adjustment is of a smooth working variety (such as with some of the circuits given by Dr. Robinson in the last issue of THE WIRELESS CONSTRUCTOR), yet satisfactory reception with such circuits requires no small amount of skill in the operation, and there is always the danger that the receiver may inadvertently be allowed to oscillate, with the result that interference is caused to one's neighbours.

The Summer Months

If a stage of high-frequency amplification is provided, however, the receiver does not have to be so critically adjusted in order to obtain good results, so that one obtains greater facility in operation with less risk of causing interference. There are many arrangements which are very well worth trying by those enthusiasts who desire to achieve long-distance reception, and particularly now that the summer months are at hand it is all the more essential to employ some degree of high-frequency amplification.

As is well known, the distant stations are not received nearly as well during the daylight hours because the wireless waves travel better during darkness. With the lengthening days practically all reception must be carried out during the hours of daylight. In such circumstances the use of a high-frequency stage will prove of very considerable advantage, and the circuits given in this article may be guaranteed to provide interesting material for experiment during the next few months.

A Straightforward Arrangement

The first circuit is very simple and quite straightforward in its operation. We have a tuned circuit L_1 C_1 in the grid circuit of the valve V_1. The top end of this circuit is taken to the grid, but the filament side is tapped not to the lower end of the circuit, but to the middle point of the coil L_1. This arrangement is adopted in order to allow of the valve capacity being neutralised, as will be seen shortly. The anode circuit of the valve contains the high-frequency transformer L_2 L_3, the primary being tuned by the condenser C_2. The grid circuit of the second valve contains the condenser C_3,

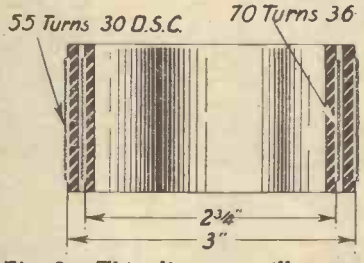


Fig. 2.—This diagram will prove helpful to constructors who prefer to make their own H.F. Transformers.

shunted by a suitable leak R_2 in order that the valve V_2 may act as a detector.

Stability with Simplicity

As has previously been stated, the first valve V_1 is neutralised. In the earlier days, when special coils and windings had to be employed for neutralising purposes, it was possible that the complications involved rendered such advantages as were obtained somewhat at a discount. Nowadays, however, when the necessary stability can be obtained by very simple means, there can be little doubt as to whether such an arrangement is worth while.

In this case the anode of the valve V_1 is connected through a small neutralising condenser to the bottom end of the tuned circuit L_1 C_1. By this means any energy which is transferred through the internal capacity of the valve V_1 from the anode circuit to the grid circuit is neutralised by the energy transferred through the neutrodyne condenser. Since the filament is connected to the middle point of this coil it will be obvious that any energy transferred through the neutrodyne condenser must be in the opposite direction to any feed-back to the valve itself.

Effect of a Centre-Tapped Coil

This arrangement therefore requires a centre-tapped coil in the grid circuit, and it is one which gives very

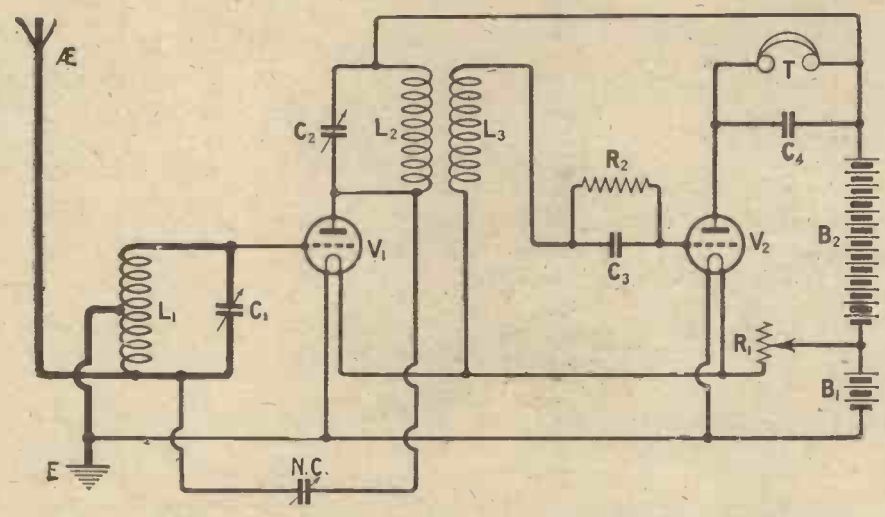


Fig. 1.—With this arrangement a smooth reaction control can be obtained by means of the neutrodyne condenser N.C.

satisfactory results. The neutrodyne condenser may be used, if necessary, as a reaction control. There is one definite position at which the valve is completely stabilised, and if the condenser is varied on either side of this position the circuit commences to oscillate. It is usually found that by moving the condenser to one side or the other a smooth control of oscillation may be obtained which gives a very satisfactory reaction adjustment.

It might be thought that since a centre-tapped coil is employed in the grid circuit only half the effective voltage of the tuned circuit L_1 C_1 is actually applied across the grid and filament of the valve V_1. While this is true to a certain extent, other effects take place which render the loss of signal strength caused by this arrangement comparatively small, and this circuit is one which can be thoroughly recommended. The aerial itself, as will be seen, is tapped to the bottom end of the coil L_1, so obtaining a form of tight-coupled aerial.

The H.F. Transformer

The high-frequency transformer may take a variety of forms. In the first place one can employ the various types of plug-in transformer on the market, such as are made by a variety of manufacturers. Although at first sight these coils appear to be inefficient, it should not be assumed that this is necessarily the case. The recent researches carried out at the Elstree Laboratories indicate that fine wire coils are by no means as inefficient as one would suppose at first sight, and, in addition, the fact that the coils are more or less hank-wound enables the requisite inductance to be obtained with a comparatively short length of wire, so that it is quite possible to obtain good results with a plug-in transformer of this type.

Using Plug-In Coils

An alternative arrangement is to use plug-in coils for the transformer. The coil L_2 should be a 50 or 75 coil, depending on the size of the condenser C_2, while the coil L_3 should be slightly larger. The actual value of the coil L_3 may best be determined by experiment, as it will be found to depend to some extent upon the valve in use. In this connection the Transadapta, manufactured by Messrs. Gambrell Bros., is particularly useful, since it enables two coils to be plugged into two sockets side by side, and a small switch in the base enables the direction of one of the coils to be reversed relative to the other. For any experimental work, therefore, this device is very useful.

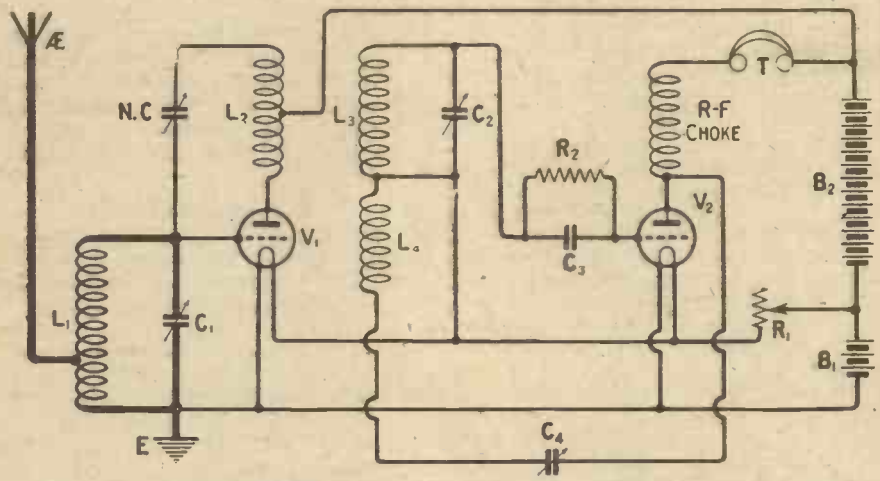


Fig. 3. — Reinartz reaction on the detector valve is provided for in this circuit, a high degree of selectivity being obtained.

Home Construction

Those readers who prefer to make their own transformers can construct quite an efficient type by winding 55 turns of 30-gauge D.S.C. wire on a 3-in. former for the primary (tuned with a .0005 condenser), and 70 to 80 turns of any suitable gauge of wire, such as 36, on a slightly smaller former placed inside the primary. In order to obtain a fairly tight coupling, of course, the secondary former should be only slightly smaller in diameter than the primary. Fig. 2 illustrates the construction.

Another type of circuit which gives very satisfactory results is that shown in Fig. 3. Here the tuned circuit L_1 C_1 is connected directly across the grid and filament of the valve V_1, without any centre-tapping arrangement. The H.F. transformer in the anode circuit is of a slightly different pattern in that the primary winding is untuned. The secondary winding L_3 is tuned in the usual manner, and connected across the grid and filament of the valve V_2. The necessary condenser and leak are inserted in the grid lead of this valve in order to produce the required rectification.

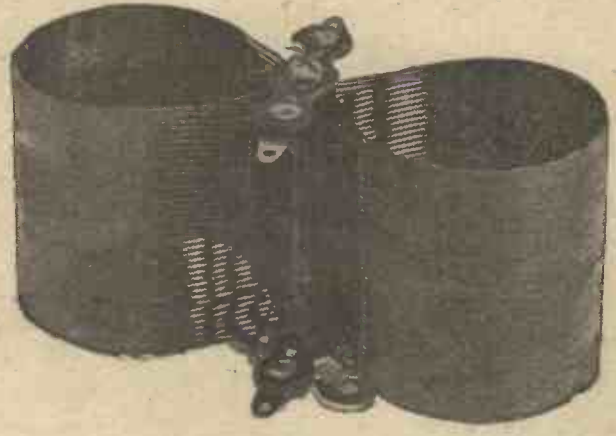
Reaction on the Last Valve

Now in order to operate this type of circuit satisfactorily the coil L_2 should be somewhat small and reaction must be provided upon the detector valve. For this reason the coil L_4 is shown coupled to L_3 and the reaction is controlled by the condenser C_3, the arrangement being similar to "Reinartz" reaction. The high-frequency choke in the anode circuit may be omitted in some cases, whether it is necessary or not depending upon the self-capacity and other constants of the telephones.

A Non-Radiating Arrangement

This circuit again is neutralised, the necessary voltages in this case being obtained by centre tapping the primary winding of the transformer L_2. The anode of the valve V_1 goes to one end of the coil, and the neutrodyne condenser is connected to the other end. In this case, therefore, as before, we have a feed-back of energy through the neutrodyne condenser equal and opposite to that through the valve itself, and by suitable adjustment of the neutrodyne condenser the arrangement may be maintained in a perfectly stable condition.

Since definite reaction is provided on the last stage in this receiver, it is not necessary to employ the neutrodyne condenser on the valve V_1 to produce any reaction effects, and in many ways this is a much better arrangement. If the valve



The Bodine "Twin Eight" R.F. transformer is designed to have a small external field.

V_1 is correctly neutralised, then even if the valve V_2 is permitted to oscillate no radiation will take place from the aerial circuit.

Sizes of Coils

The coil L_2 of this transformer may be a 50 or 60 coil having a centre tapping as shown. The coil L_3 should be a 50 or 75, depending upon the size

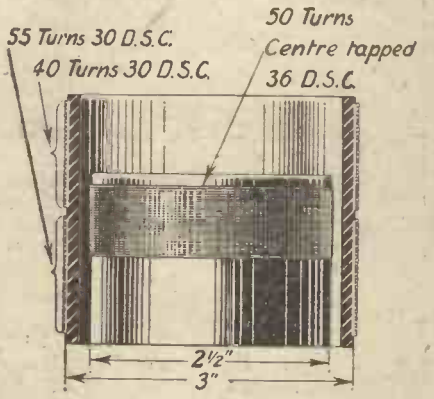


Fig. 4.—Constructional details of an H.F. transformer suitable for the circuit given in Fig. 3 on the previous page.

of the condenser C_2. All that is necessary in this case is that the coil shall tune over the whole of the broadcast band. The coil L_4 again depends upon the size of the reaction condenser C_3, but a 50 coil or even a little smaller will usually be found satisfactory.

As in the previous case, this whole transformer may be made up by the constructor himself should he so desire, and the details given in Fig. 4 will be of interest in this connection.

A Third Circuit

A third type of circuit which may be employed and which does not require neutrodyning is that shown in Fig. 5. In this case the high-tension supply to the valve V_1 is obtained through a high-frequency choke L_3, while the high-frequency currents pass through the condenser C_2 on to the coil L_4, which is tapped fairly close to the filament end. The coil L_4 is tuned by the condenser C_3 and the voltages produced are applied across the grid and filament of the valve V_2, which is arranged to act as a detector in the normal manner.

The grid circuit of the valve V_1 may be of any suitable kind. In this particular case a tight-coupled aerial coil has been shown. The aerial is connected to the coil L_1, this coil being coupled to the coil L_2, which is tuned by the condenser C_1 and connected across the grid and filament of the valve. As has been pointed out in *Wireless Weekly* by Mr. G. P. Kendall, the coil L_1 should preferably be made with tappings, in order to allow for the constants of different aerials at varying frequencies. An adjustment which may be right for the lower part of the broadcast band would not necessarily be correct for the upper portion, and another tapping would give better results.

Coil Tappings

The coil L_3 may be any suitable type of high-frequency choke, or may be made up by winding 200 turns on a 1-in. former with 36 D.S.C. wire. The coil L_4 should be such that it will tune satisfactorily with the condenser C_3 over the whole of the band required, and should be tapped at from 1/10th to 1/5th the way up.

A Lissen "X" coil or a similar type of tapped coil may be employed, in which case the 50 or 75 coil would be suitable. A swinging reaction coil L_5 has been provided in order to bring the detector valve to the point of oscillation.

A Selective Circuit

If desired, of course, a fixed reaction coil may be employed, and a capacity controlled arrangement may be adopted somewhat as shown in

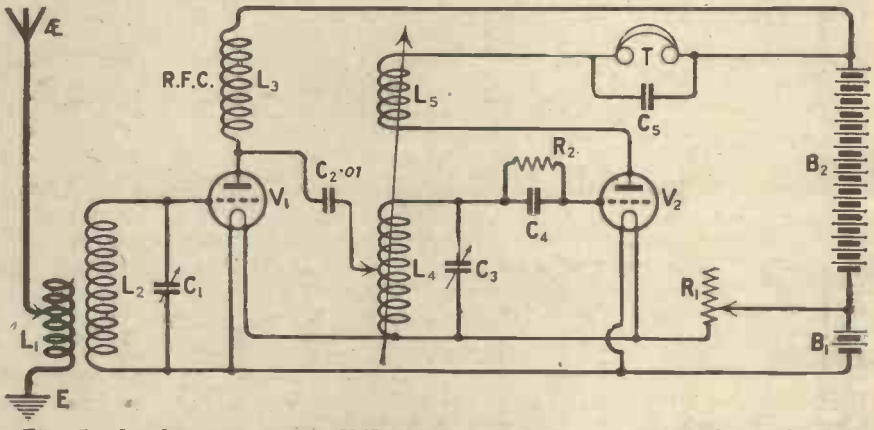


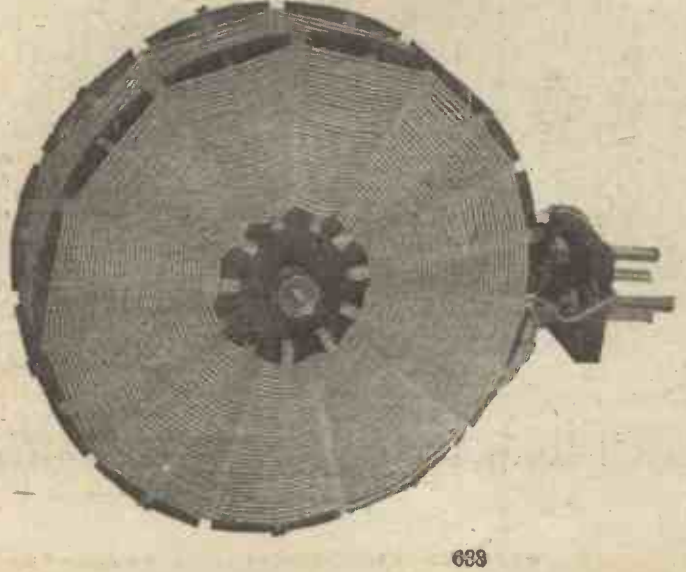
Fig. 5.—In this circuit the H.T. is applied to V_1 via an R.F.C., whilst for best results the aerial coil L_1 should be tapped.

Fig. 3. Alternatively, the coil L_4 may be home wound, in which case 55 turns on a 3-in. former wound with 30 D.S.C. wire will be quite satisfactory. Tappings should be taken every few turns up to, say, 20 turns.

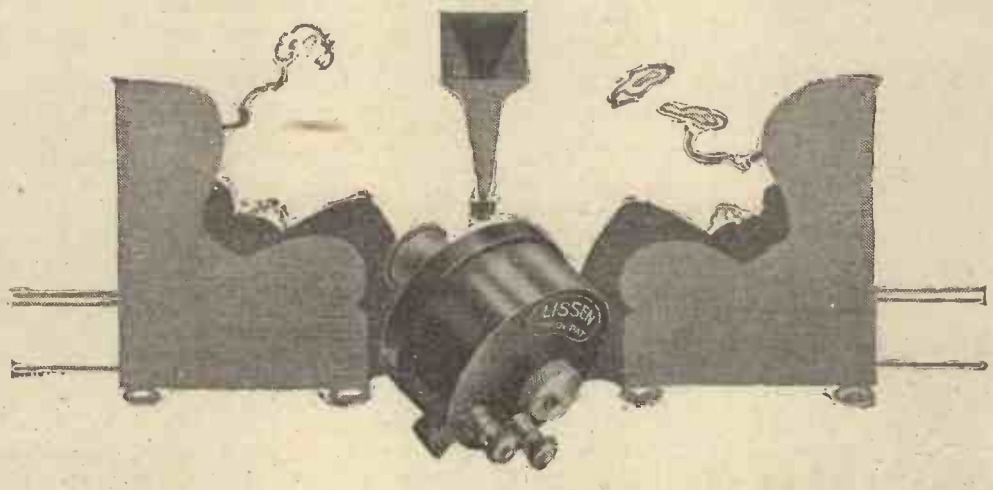
This last type of circuit is one which can be made exceedingly selective, and by suitable adjustment the reaction control can be made smooth and easy. It does not possess the same advantages as the Fig. 3 circuit, however, for if the circuit L_4 C_3 begins to oscillate then a certain amount of the oscillations will find their way back to the aerial circuit.

Experiments Worth While

These are just a few of the circuits which may be tried by the experimenter, and most of the ideas shown in one circuit can be applied equally well to any of the other types of circuits, so that there are various possible rearrangements of the circuits given. A little experiment with high-frequency valves, when proper precautions are taken as detailed in this article, will amply repay any time which is spent, and the satisfactory results which can be obtained without any critical adjustment are extremely pleasing.



A very effective H.F. transformer can be made with two basket coils.



There are magnets in the Lissenola which will last a life-time

No better loud speaker ever was made than the one you can make with your own hands with the "Lissenola"—it will challenge comparison with the most expensive loud speaker you can find, no matter what the price. The magnets used in its sound reproducing mechanism are forged out of steel containing new alloys. But the alloys themselves are not sufficient—the magnets have to go through critical heat treatment before they are finished. There must be no over-heating and no under-heating. So important is this heat treatment that the pyrometers used to record temperature must be calibrated every morning. The same care marks every stage through which the "Lissenola" passes before it finally reaches your hands—a fine piece of sound reproducing mechanism.

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L.11

CHOKE OR RESISTANCE COUPLING?

Some notes on the resistance-capacity and choke-capacity methods of coupling note-magnifying valves.

By JOHN W. BARBER

WHEN designing a receiver for his own use, the home constructor is faced with the problem of note-magnifying valves and the method by which they shall be coupled together, and to the detector valve or crystal. There are, as readers will know, three principal methods in general use, namely, the low-frequency transformer, the resistance-capacity method, and the reactance-capacity, or choke, system.

The Three Systems Compared

Of these three, the transformer is possibly the most popular, but either of the remaining methods can give considerably greater purity of reproduction than some of the less expensive makes of transformer. It will be assumed that the average listener prefers purity of tone to just mere volume, hence only the resistance and choke methods of low-frequency amplification will be considered in the present notes, and an endeavour will be made to present to the reader an unbiassed statement of the advantages and disadvantages of both.

Similarities

The two systems under discussion are very similar in the arrangement of the circuits employed, as will be seen upon reference to the diagrams, Fig. 1 being a resistance-coupled amplifier circuit following a detector valve, while Fig. 2 shows the circuit diagram of "The Quality Four," a receiver described in the February issue of *Modern Wireless* by the present author. This receiver consists of a high-frequency amplifier, detector, and two stages of choke-coupled low-frequency amplification, jack switching being employed in order that the note magnifiers may be eliminated at will. It will be seen, upon comparing these two circuits, that the anode of the detector valve is joined, through a reaction coil in the case of Fig. 1, to a condenser, the other side of which goes to the grid of the next valve, and to a grid leak.

The high-tension feed to the valve is made in one case through a high resistance, of the order of 100,000 ohms or more, and in the other through a choke coil, which should have a high inductance, in general not less than 50 henries.

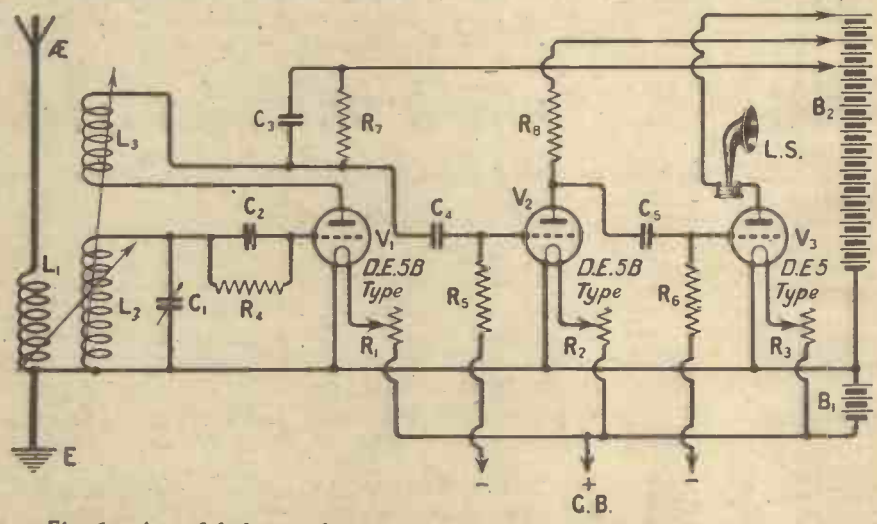
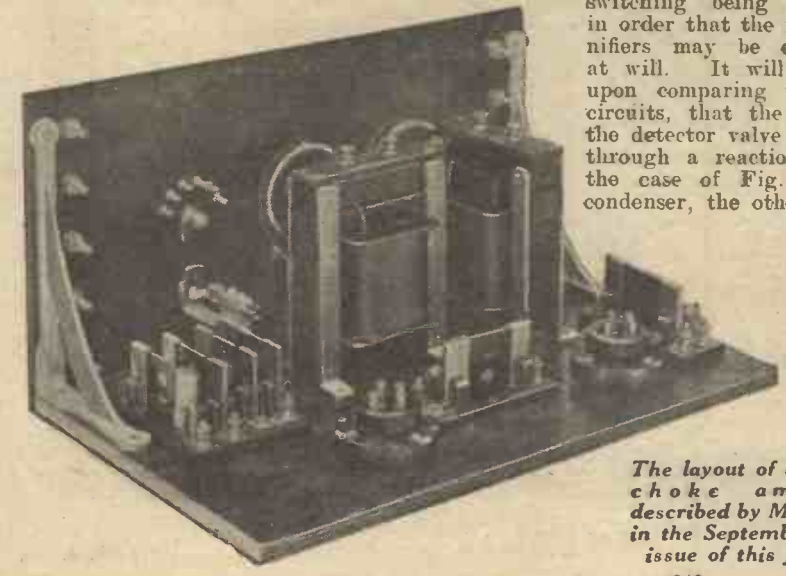


Fig. 1.—A useful three valve circuit, consisting of a detector valve with reaction followed by two stages of resistance-coupled amplification.

The H.T. Battery Problem

Now the resistance of the choke coil to direct currents, such as that taken from the high-tension battery, will not be very considerable, whereas that of the resistance will, of course, be very high. Now the voltage "lost," due to drop in this resistance will be very considerable: for example, when using a special resistance amplifying valve and an anode resistance of 150,000 ohms, as much as 40 volts may be "lost" under quite normal working conditions, and this will have to be allowed for by a corresponding increase in the voltage of the high-tension battery.

As far as the home constructor is concerned, this fact constitutes the principal deterrent to the more extensive employment of resistance amplifiers.



The layout of a 2-stage choke amplifier described by Mr. Barber in the September, 1925, issue of this journal.

Choke Amplification

The choke amplifier, on the other hand, does not call for such a large high-tension battery, as the voltage drop across the choke coil will be quite small, and thus there is little loss to be compensated for.

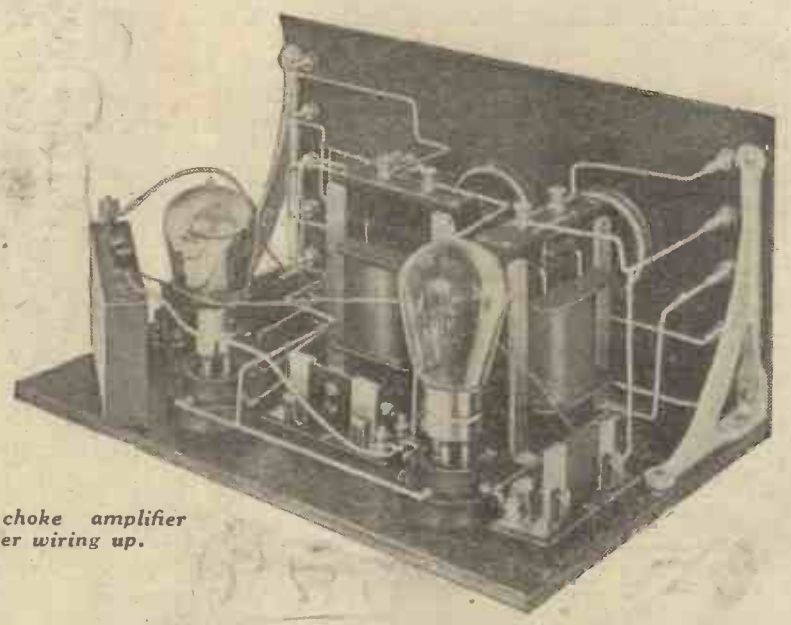
Noisy Resistances

Until quite recently, wire-wound high resistances of small size were not obtainable, and the existing type of graphite resistance, after a little use, could become exceedingly noisy, as all who have used such resistances will know. This constituted a very considerable drawback, and many resistance amplifiers were discarded for this very cause. Nowadays, however, several excellent types of wire-wound anode resistance are available, and these may reasonably be expected to be quiet in operation.

Possibilities of Distortion

The choke-coupled amplifier suffers from none of these disadvantages, as a choke coil must, naturally, be wire wound, but a very serious defect may arise in the event of the choke not having sufficient impedance, by which is meant resistance to varying currents of the kind obtaining in a low-frequency amplifier. The impedance depends, among other things, on the inductance of the choke, which in its turn depends upon the number of turns of wire put on the coil.

A choke can very easily be rendered useless by putting on too little wire, in which case the impedance of the choke coil to all frequencies is reduced, with a consequent reduction in quality of reproduction, owing to the lower frequencies being lost. If, therefore, your reproduction is thin and squeaky, and you have no reason to suspect your loud-speaker, you may find that the substitution of another choke with more turns will improve matters.



The choke amplifier after wiring up.

Unwanted H.F. Amplification

Either type of amplifier may give trouble due to amplification at radio frequency, but this can usually be overcome by joining a condenser across the first resistance or choke. Such a condenser is shown at C_3 in Fig. 1, and need not be larger than .0005 in general. In the case of the choke amplifier, the provision of such a condenser will very often be found to have a lowering effect upon the tone produced, and if this is undesirable, the size of the condenser corresponding to C_3 should be reduced until it is just of sufficient capacity to perform its function without any deleterious effect upon the reproduction.

Considerations Governing Your Choice

Which method, then, are we going to employ? As regards volume, there is little to choose between the two. Provided that suitable valves are used, and the same valves are, as a rule, suited equally to both systems, sufficient volume will be obtained for all ordinary purposes from two, or at the most, three, stages. The writer has received, upon "The Quality Four," a very large number of distant stations upon the loud-speaker, there being only two note-magnifying stages employed.

For those of us who are unable to keep a 150-volt high-tension accumulator at hand, the resistance amplifier seems a little difficult, and the writer, personally, adheres to the choke amplifier, if only for that reason. Each case must, of course, be judged upon its merits, and in cases where the H.T. problem is not pressing there seems little to choose between the two systems.

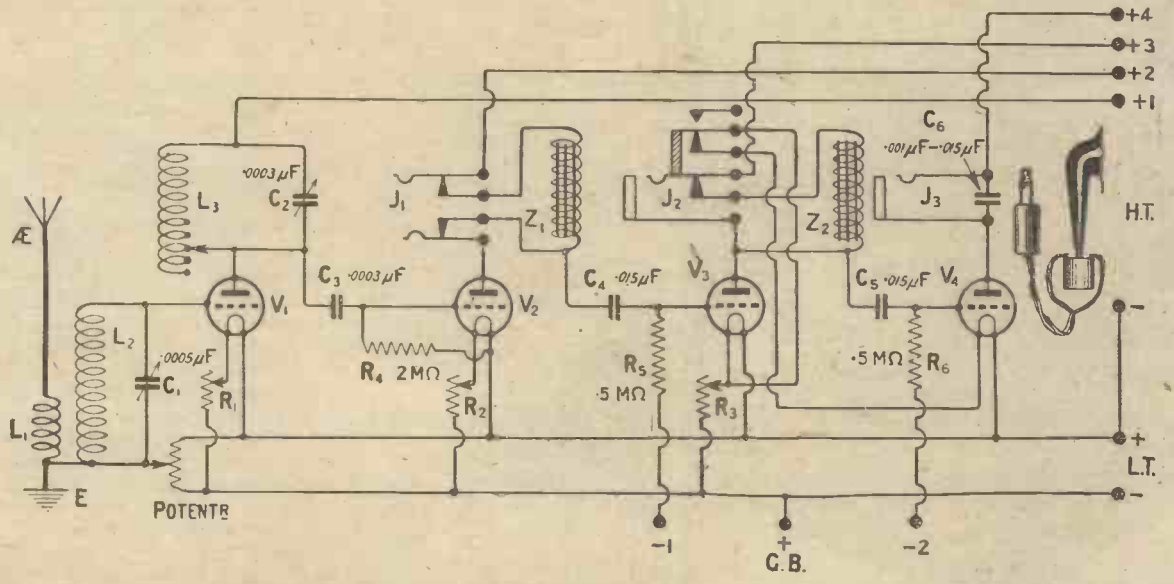


Fig. 2.—The circuit of "The Quality Four," which consists of H.F., detector, and two choke-coupled L.F. amplifiers.

CONTROLLING REACTION WITH A CONDENSER

By PHILIP H. WOOD, B.Sc.(Hons.), F.P.S.L.

This single-valve receiver employs the ever-popular Reinartz circuit and plug-in coils.

IN this country the need for selectivity in a receiver intended for local reception is not yet as marked as it is in the United States of America, where there may be a dozen or more broadcasting stations within the confines of a single large town. No two British main stations are close enough together to interfere with one another as far as local reception is concerned—only the long-distance enthusiast needs to cut out his local station in order to receive another.

When Selectivity is Necessary

At the same time, however, many listeners are subject to other forms of interference caused by shipping and nearby spark stations, and in such cases a selective receiver becomes a necessity.

When this receiver was designed this point was borne in mind, and selectivity with good sensitivity for comparatively local work was aimed at.

The Reinartz Arrangement Used

The theoretical circuit incorporated in the receiver is shown in Fig. 1, and it will be seen that it is a Reinartz arrangement. It embodies, however, an interesting modification suggested by Mr. Percy W. Harris, consisting in the use of a single tapped plug-in coil in place of the separate aerial and grid coils characteristic of Reinartz receivers.

The coil in question, L_1, is a standard Lissen "X" coil, the tapped turns of which form the aerial inductance, while the remaining and larger portion of the coil forms the grid inductance, and is tuned by the variable condenser C_1. The resulting semi-aperiodic coupling, combined with the fact that very few turns are included in the aerial-earth circuit, gives the receiver a fair degree of selectivity.

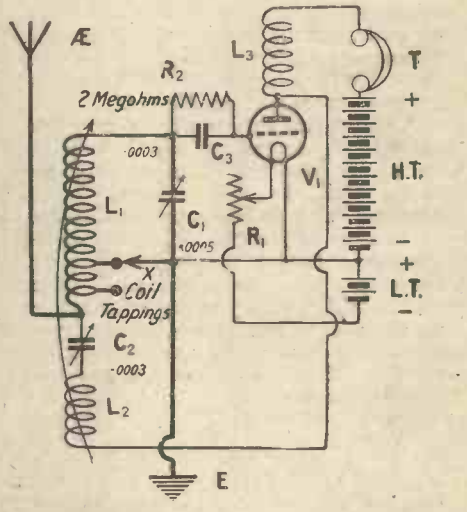
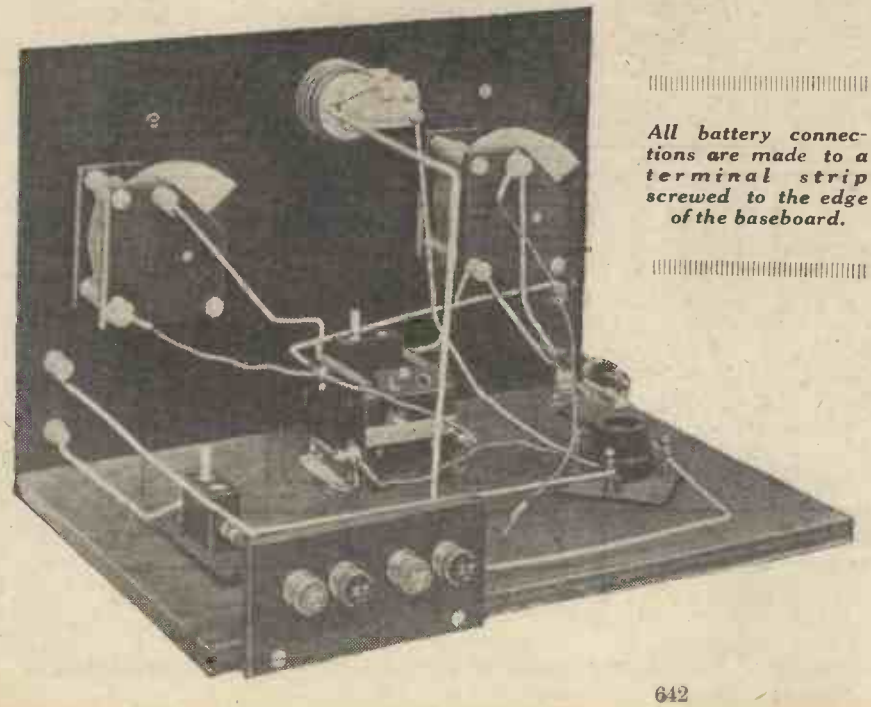


Fig. 1.—L1 is a tapped coil which serves as both aerial and grid inductances, while L3 is a high-frequency choke coil.



All battery connections are made to a terminal strip screwed to the edge of the baseboard.

Condenser-Controlled Reaction

The remainder of the circuit follows the usual Reinartz scheme. Between the anode of the valve V_1 and the telephones is a choke coil L_3, which may conveniently be an ordinary plug-in coil of one of the larger sizes, whose function is to ensure that the high-frequency currents are not by-passed by the telephones. This coil should obviously have a low self-capacity, or the object in view will be defeated.

As it is, the high-frequency currents take the path through the reaction

coil L_2, and the reaction condenser C_2 in series with it, this coil and condenser being connected between the anode of the valve and the aerial. L_2 is mounted in the moving block of a two-coil holder, and can be coupled to the fixed coil L_1. Thus dual control of reaction is possible—by varying the magnetic coupling between L_1 and L_2 by means of the coil holder, and by varying the capacity of the condenser C_2. Condenser control of reaction is one of the characteristics of the Reinartz circuit.

Some Notes on Components

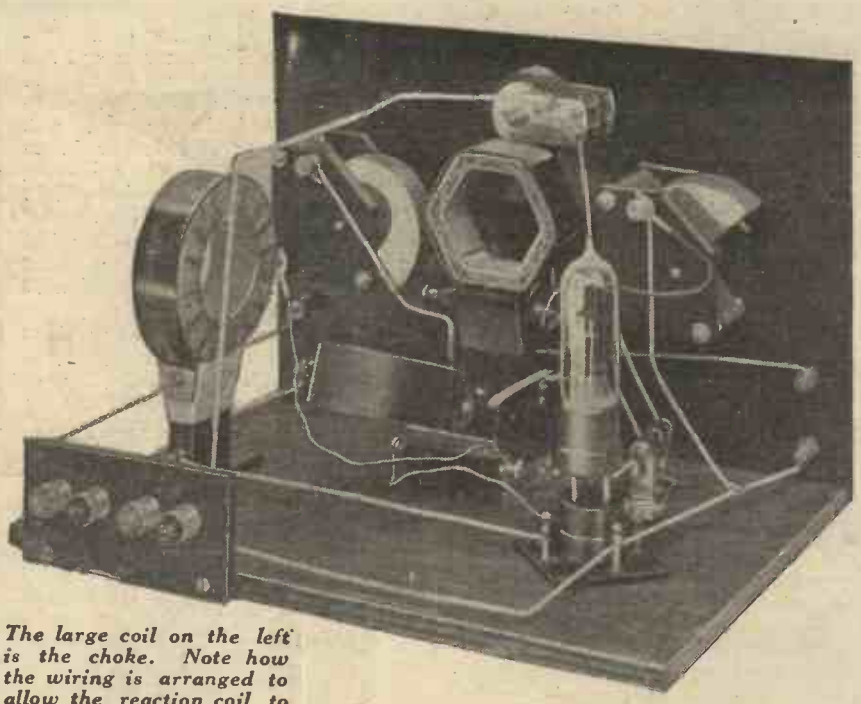
Materials and components required for the construction of this receiver are listed below, but, although the actual brands of goods employed in the original set are given, other reputable components should prove equally satisfactory.

An anti-vibration valve holder is almost a necessity if a dull emitter valve is to be used, while the resistance of the rheostat depends on both the valve and the battery voltage you intend to employ. A vernier movement will be found desirable on both variable condensers, since the degree of selectivity of the set renders the grid-circuit tuning fairly sharp, while if the most is to be made of the type of coupling employed fine control of reaction is necessary.

What You Will Require

Here is the list of components, together with the makers' names:—

"Cameo" cabinet, with panel 12 in. by 8 in., with baseboard 12 in. by 9 in. (Carrington Manufacturing Co.).



The large coil on the left is the choke. Note how the wiring is arranged to allow the reaction coil to swing freely.

One .0005 "Polar" cam-vernier variable condenser (Radio Communication Co., Ltd.).

One .0003 "Polar" cam-vernier variable condenser (Radio Communication Co., Ltd.).

One "Crescent" two-coil holder (W. J. Henderson & Co., Ltd.).

Two "Decko" dial indicators, raised type (A. F. Bulgin & Co.).

One .0003 "Freshman" fixed condenser (Igranic Electric Co., Ltd.).

One 2-megohm grid leak (Igranic Electric Co., Ltd.).

One "Efesca" vernistat, 30 ohms (Falk, Stadelmann & Co., Ltd.).

One anti-microphonic anti-capacity valve holder (Norman Radio, Ltd.).

One board-mounting single-coil holder (Peto-Scott Co., Ltd.).

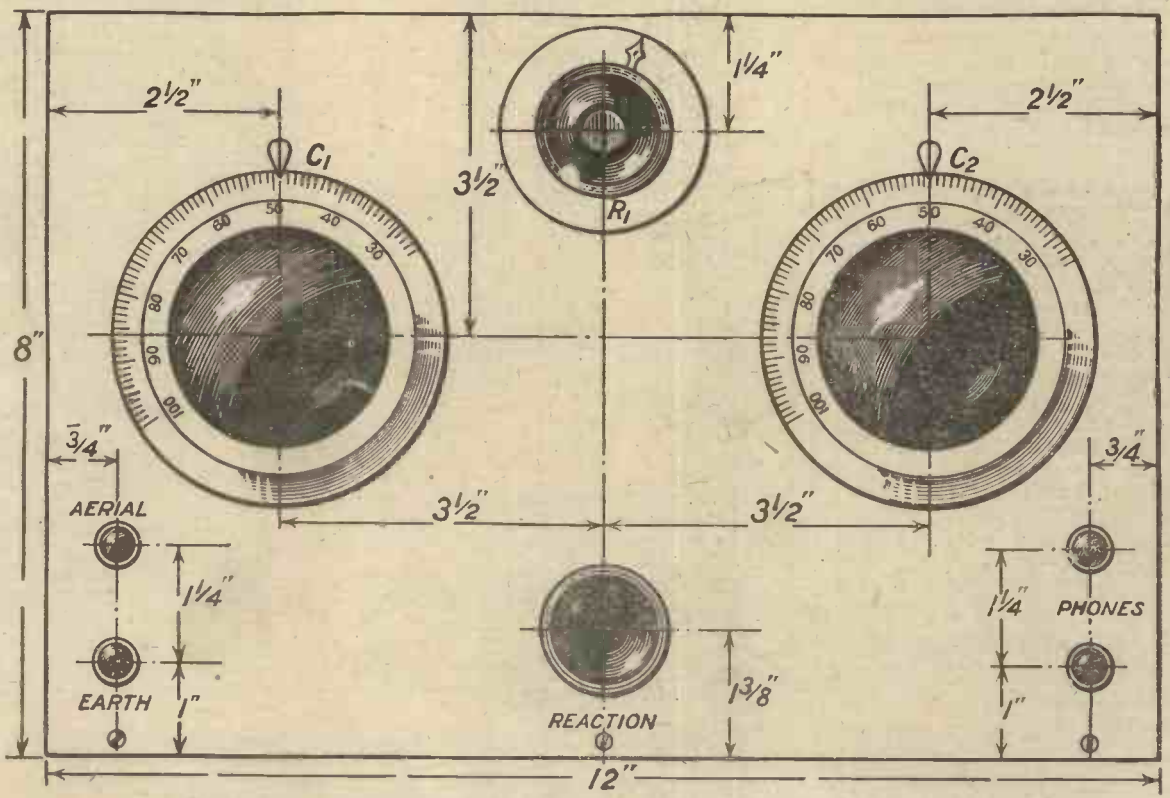


Fig. 2.—The panel layout is symmetrical and all drilling dimensions are given here. Blueprint C 1041A.

Eight Belling-Lee indicating terminals (Belling & Lee, Ltd.) (aerial, earth, 'phones +, 'phones −, L.T. +, L.T. −, H.T. +, H.T. −).

Ebonite strip for terminals, 4 in. by 2 in. by ¼ in.

Glazite, flex, spade tags.

Lissenagon "X" coils (see text) (Lissen, Ltd.).

Drilling the Panel

Drilling dimensions are shown in Fig. 2, and a symmetrical layout characterises the panel. The aerial and earth terminals are on the left, and the telephone terminals on the right. The upper of the latter is the positive terminal, and is wired to H.T. +. The position of the hole for the coil holder depends on the thickness of the baseboard, and in the case of the particular coil holder used had to be exactly 1 in. above the top surface of the latter.

The rheostat is placed near the top of the panel to avoid fouling the coil in the fixed block of the coil holder, and will require a ⅜ in. hole. Dial indicators are used in the original set, and their pointers overlap the dial edges slightly to facilitate reading, but this will not be possible unless the raised type are used. The left hand dial is that of the .0005 grid-tuning condenser C_1, the .0003 condenser C_2, whose dial is seen on the right, being used as reaction control.

Fitting the Panel

When the panel has been drilled and the components mounted upon it, slide the baseboard into the cabinet and fit the panel to the front. Holes for the fixing screws should previously have been drilled near the lower edge of the panel, and if the latter is screwed to the baseboard while in position in the cabinet, a good fit will result.

Terminal Strip

The ebonite strip for the battery terminals is fixed to the back of the baseboard by means of wood screws. Four 2 B.A. clearance holes about an inch apart are required for the terminals, and two counter-sunk holes for the fixing screws, while the back of the cabinet is cut away to allow the terminals to protrude. As in the case of the panel, the strip is best fixed in position with the baseboard in the cabinet, so that there shall be no mistake about its position.

Wiring the Receiver

With the panel fitted the baseboard components may be placed in position and the wiring commenced. The single coil holder for the choke coil L_3 is placed on the left of the baseboard, looking from the back, and the valve holder on the right in a similar position.

The wiring will present little difficulty if Fig. 3 is followed. It will be noticed that the grid leak R_2 is fastened directly to the grid condenser, at one end by a screw and nut and at the other by means of the grid terminal of the valve holder. The coil holder should be brought well away from the panel to allow L_1 to clear the rheostat R_1, while leaving sufficient room for the reaction coil to swing freely inside the cabinet.

This point must be borne in mind when making connections, so that space is left for the easy insertion of the coils.

It will be noticed that connections to the reaction coil L_2 are made by means of flexible leads fitted with spade tags, so that they can be easily reversed if necessary. A flexible lead is also used for connection to the tapping point of the "X" coil.

Testing Out

When the wiring has been completed and checked, the battery circuits should be tried out and a general-purpose valve inserted in the valve holder. Insert a No. 60 or 75 "X" coil in the fixed block of the coil holder and a No. 30 plug-in coil in the moving block. Connect the flexible lead from the condenser C_1 (*i.e.*, from earth) to the *larger* tapping of the "X" coil, which will be 10 turns in the case of a No. 60 and 13 turns in the case of a No. 75. Use a No. 150 or 200 coil for the choke L_3, and complete the battery, aerial and other connections.

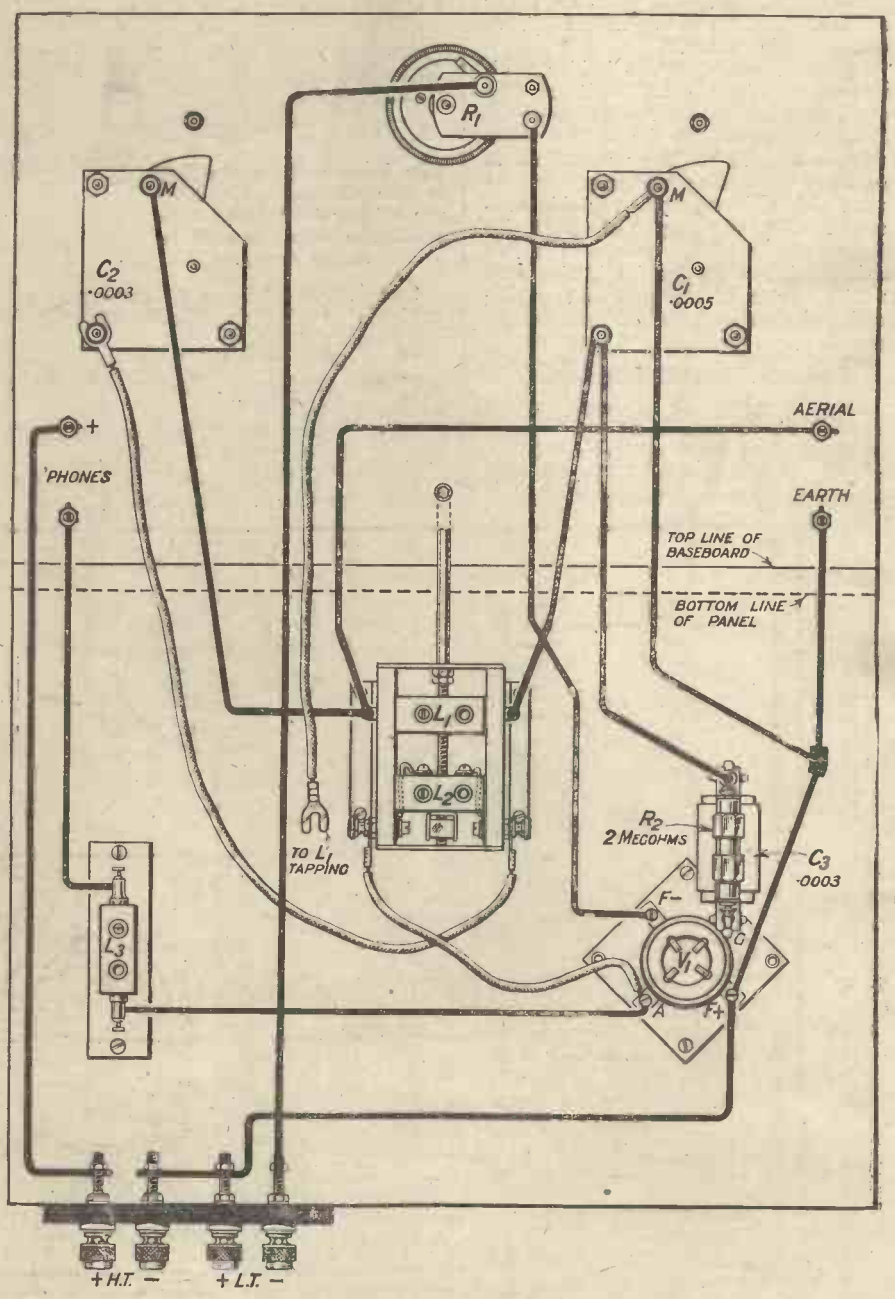
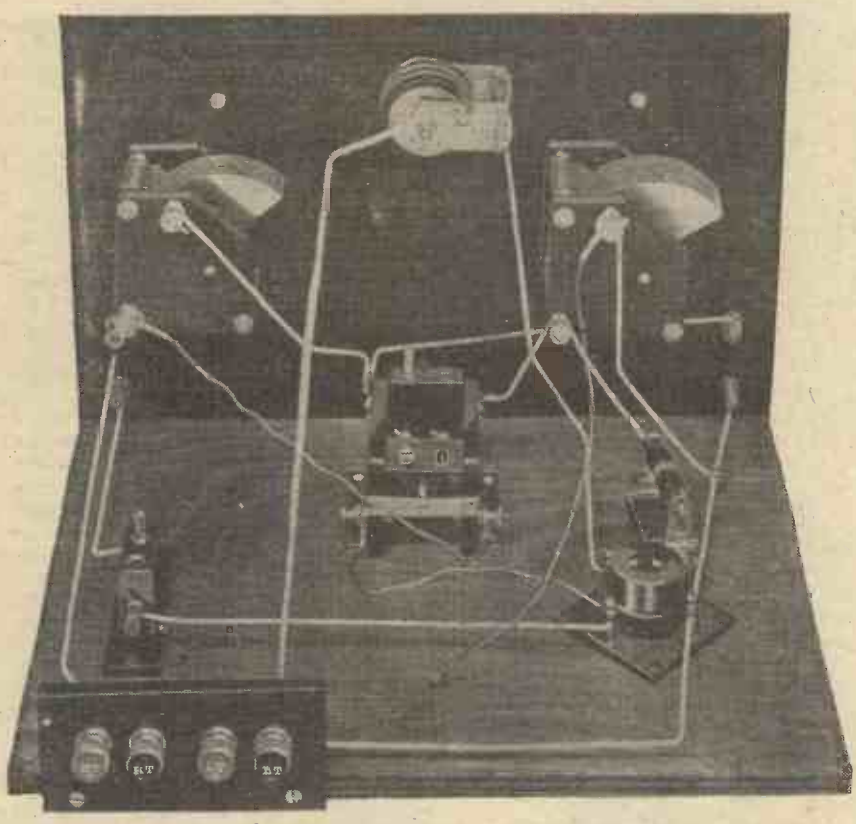


Fig. 3.—The wiring is quite straightforward and this diagram forms a complete guide. Blueprint C 1041B.



This photograph shows that the components are well spaced. Note how the grid leak is fixed in position.

Preliminary Adjustments

Swing L_1 and L_2 as far apart as possible and turn the reaction condenser C_2 to the minimum capacity position. Turn on the valve and apply about 30 volts H.T. On turning the knob of the grid condenser C_1 *slowly* the local station will be heard at fair strength and can be tuned in accurately by means of the fine motion of the condenser.

For the benefit of those who have not used these "cam-vernier" condensers before, it should be explained that at any position of the plates an ingenious device allows a vernier motion to be imparted over about five scale divisions using the ordinary knob. Ten minutes' practice will suffice to "get the hang of it," and the usefulness of having two degrees of adjustment with only one knob will be appreciated.

Reaction Control

To return to the operation of the set. With the local station tuned in on C_1, turn the reaction condenser C_2 towards the maximum, when signals will probably greatly increase in strength. Stop immediately the set shows any tendency towards oscillation, and in any case do not go beyond, say, the half-way mark on the dial.

If the set does not oscillate with the condenser C_2 adjusted as described bring the reaction coil closer to L_1 until the set just oscillates, this operation being carried out during a silent period, of course, to avoid interference to neighbours. Leaving the reaction coil in the position found, subsequent reaction control can be carried out with the condenser C_2 within wide limits, although the coil coupling may have to be altered occasionally. The reaction connections shown in the wiring diagram will usually be found correct, but the flexible leads may have to be reversed in some cases.

Coils to Use

For the ordinary broadcast band a No. 60 or 75 Lissen "X" coil should be used for L_1, the smaller tapping of the two provided on each coil being employed for the greatest degree of selectivity. The No. 75 coil, having the larger tapping, will probably be found easier to work with, but the wavelength of one's local station will be a deciding factor. A No. 35 plug-in coil will probably be found ample for reaction, with a No. 200 coil as the choke.

When receiving 5XX, a No. 250 "X" coil should be employed, the 50-turn tapping being used. A small reaction coil will in all probability still suffice—a No. 50 was used in the original set and proved ample.

Valves

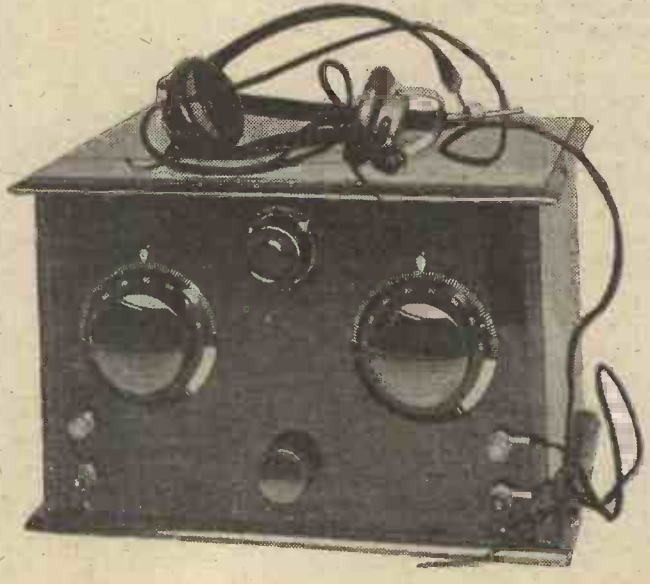
General-purpose valves will give quite good results in this receiver, but a high-impedance valve of the type used for resistance-coupled amplifiers proved to be best. Thus, while an Osram D.E.3 and a Fama bright-emitter gave satisfaction on the local transmission, a Marconi D.E.3B, which is a resistance amplifying valve, was decidedly better for distance work.

Tests Carried Out

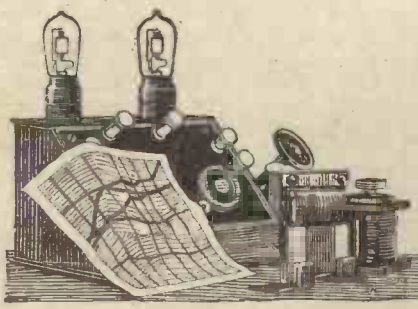
Tested 8½ miles from 2LO, London's transmission came in at excellent strength; in fact, a Brown H3 loud-speaker could be made to give fair signals, although "loud-speaker strength" could not be claimed. 5IT, 5NO, Ecole Superieure, and several other Continentals were also heard. On the higher wavelengths 5XX came in well, and good signals were obtained from Radio-Paris. Incidentally, there was not a trace of 5XX with the latter's signals.

Tuning was reasonably sharp, and even Birmingham, usually so easy to tune in, could be missed through hasty turning of the grid-circuit tuning condenser. The H.T. voltage used varied between 18 and 50, about 30 volts being suitable for general work. The set gave quite good results on 2LO's transmission without aerial and earth, and should prove useful to those having poor aerial systems.

(*Continued on page* 672.)



A handsome appearance characterises the finished receiver.



TAKE CARE OF YOUR L.T. BATTERIES

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

The observance of the few simple rules and the hints given below will enable you to get the utmost from your accumulator, which, very often, is the most neglected item in the wireless equipment.

NOT the least important items in your wireless equipment, assuming you are the possessor of a valve receiver, are the high-tension and the low-tension batteries, but it is quite a common thing to find that these accessories are often the most neglected and badly-treated parts of the equipment. It is thus not surprising that one hears of many cases of unsatisfactory service being obtained, which are usually attributable to want of thought and attention to a few precautions and neglect in observing certain simple rules.

The Accumulator

Let us consider first of all the low-tension accumulator, which often comes in for a good deal of unjust criticism from those who fail to see that it is treated properly. If you start well by purchasing an accumulator of good make, there is no reason why you should experience any trouble during the long period of useful life of the battery. In the first place, the majority of accumulators for wireless purposes have celluloid containers, and it is wise to provide a crate or carrying case to safeguard against damage to the container, with consequent risk of troublesome leakage of the electrolyte.

Stopping a Leak

If you have the misfortune to damage your accumulator in this way, and the leak is small, it may be repaired in the following manner:—Having carefully located the position of the leak, drain the electrolyte from the accumulator. Next dissolve some scrap celluloid in a small quantity of amyl acetate or acetone (this may be obtained from your local chemist for a few pence), until it forms a solution of stiff consistency. If the leak is only minute, a small portion of this solution smeared over it and allowed to dry thoroughly will effectively stop it.

In Serious Cases

Should the leak be more serious, however, a suitable-sized patch of celluloid should be applied over it, having first smeared the patch and the part of the case around the leak with the above solution. The patch should be well pressed on and allowed to dry thoroughly. One should be careful not to use too much of this solution, or there will be a risk of the solution "eating" into the case.

Corroded Terminals

One has only to visit a charging station in order to realise how many people neglect their accumulators. An inspection of the accumulators sent in for charging will often show that quite 50 per cent. have badly-corroded terminals, and are in a dirty condition. Cases are not unknown where it has been impossible to unscrew the terminals owing to excessive corrosion, and efforts to loosen them have resulted in their parting company with the accumulator!

This corrosion could quite easily have been avoided if all the metal parts of the terminals and the shank of the screws had been kept well greased with vaseline. The top of the container should be kept free from acid and dirt, for if this is allowed to remain, quite a serious leakage of current may take place between the terminals.

Obtaining Satisfactory Service

If you have facilities for charging accumulators yourself, there are a number of points to which attention should be paid in order to secure the maximum life and most satisfactory service. Adhere strictly to the maker's instructions for the first and subsequent charges. The necessary particulars are given in all good makes on a label affixed to the side of the accumulator. These details should include the specific gravity of the acid with which the accumulator should be first filled, the charging rate for the first charge, the normal charging rate, and the specific gravity of the acid when fully charged. Other particulars usually given are the maximum safe rate of discharge and voltage on load (*i.e.*, when the accumulator is supplying current) below which the cells should not be discharged.

Given due attention and proper treatment there is no reason why an accumulator should not have quite a long useful life.

Do not exceed the charging rates specified, for this will tend to cause disintegration of the active material in the plates and shorten the life of the battery.

"Topping Up"

Now whether you charge the accumulator yourself or send it to a charging station, you should periodically test the specific gravity of the acid, and inspect it from time to time

How the Wuncell defies old age

OLD friends, they say, are best. The longer one uses the Wuncell Dull Emitter, the more one appreciates its many sterling qualities—its supreme sensitiveness — its outstanding ability to produce a wonderful mellowness of tone—its complete freedom from microphonic noises—and, above all, its unvarying high standard of performance.

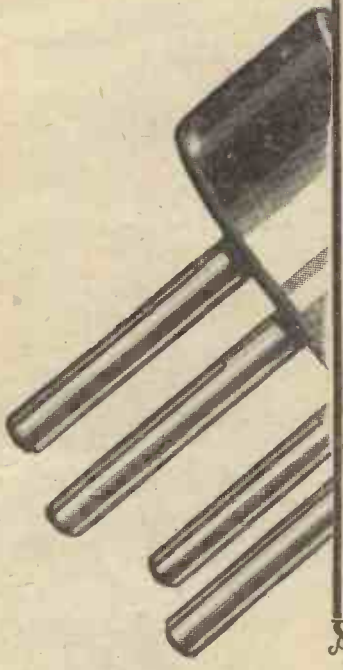
Owing to its unique filament, found in no other valve, the Wuncell is essentially a long-life valve. It is one you can choose with complete confidence, knowing that it will give you a long period of faithful unremitting service. A Dull Emitter, in fact, worthy of the reputation enjoyed by Cossor throughout this country and abroad.

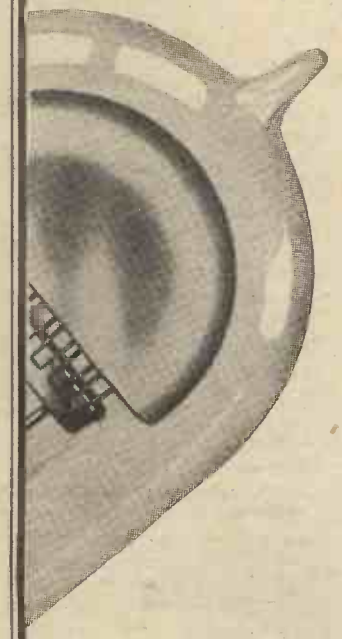
Wuncell superiority is due to two great fundamental features. The first is its triple-coated filament. This filament, instead of being whittled down to the point of fragility in an effort to ensure low current consumption, is built up *layer upon layer* until it is practically as stout as that used in any bright emitter. Yet so prolific is it in electrons that at a temperature of barely 800°—less than the embers of a dying match—the Wuncell is operating at its best. Compare this with the many types of so-called dull emitters which function only when their filaments are at white heat. Because of this special process of manufacture the Wuncell filament is exceptionally sturdy and able to withstand scornfully all the rigours of everyday use.

But the Wuncell filament is only one feature. It would be of little advantage producing a perfect torrent of electrons at a low temperature if the ordinary type of Grid and Anode were employed. In any valve the only electrons of any importance are those reaching the Grid and the Anode. If the ends of the Anode are open a considerable proportion of the electron stream must escape only to be wasted.

For this reason, therefore, the Wuncell utilises standard Cossor construction. Its arched filament functions within a hood-shaped Grid and Anode. Practically every electron given off by its barely-glowing filament is usefully employed.

This greater efficiency—coupled with its triple-coated filament—is responsible for a volume and purity of tone which has yet to be equalled. It is small wonder, therefore, that wireless enthusiasts, disappointed with the fragility and uncertainty of ordinary filaments, have turned eagerly to the Wuncell—the one Dull Emitter which admittedly defies old age.





Types and Prices:

*W.1. For Detector and L.F. use, 1·8 Volts. Consumption ·3 amps. - - - 14/-

*W.2. (With red top) for H.F. use, 1·8 Volts. Consumption ·4 amps. - - - 14/-

W.3. The Loud Speaker Valve, 1·8 Volts. Consumption ·5 amps. - - - 18/6

*Also in special base with resistance to suit 2-, 4- or 6-volt Accumulator - 16/-

Cossor Valves

Issued by A. C. Cossor Ltd., Highbury Grove, London, N.5

to see that the acid level is maintained at about a quarter of an inch above the tops of the plates. Loss may be caused by the spilling or splashing of acid during charging, or the level may be lowered through gradual evaporation of the water in the acid. Any alteration of the acid level should be made after the battery has been fully charged, when the acid should be adjusted to the specific gravity given by the makers. Any loss through spilling should be made up by the addition of pure acid of the correct specific gravity, and loss by evaporation by adding distilled water.

A good hydrometer is invaluable for obtaining a check on the condition of your accumulator, and one of the suction type suitable for battery testing may be purchased for four or five shillings. It will be found that as the accumulator becomes discharged the specific gravity of the acid gets lower, so that a test of the "gravity" at any time will give an indication as to the state of the battery.

Sulphating

Never let your accumulator remain in an undischarged condition for any length of time, or you will run the serious risk of sulphating taking place, which may irretrievably damage the battery. Slight cases of sulphating may be cured by giving the battery a long charge at about half normal charging rate, discharging it, and then recharging at normal rate. In any case, it is always advisable to charge an accumulator just before the voltage on load falls to the minimum given by the makers.

Using a hydrometer will give an indication of the condition of your L.T. battery.

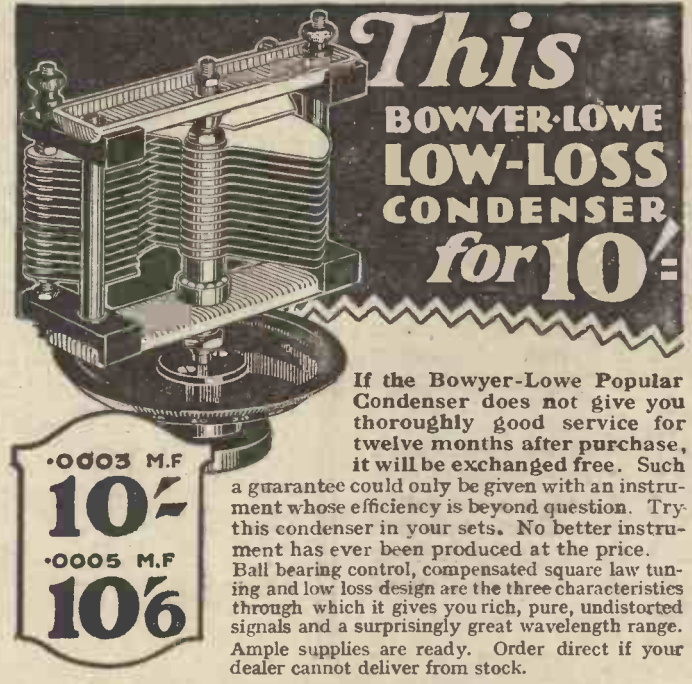
Your High-Tension Battery

With regard to the high-tension battery, a lot of trouble may be spared if you consider before purchasing what current your set will take from it. It is important to see that the total load is within a safe limit for the size of the H.T. battery. It is not wise to take more than about 5 milliamperes over long periods from the ordinary small type of H.T. battery, and if your set demands more than this, a battery employing the large type of cells or an H.T. accumulator should be employed.

One may seriously harm high-tension batteries as well as accumulators by accidentally short-circuiting them, and for this reason straggling battery leads should be avoided, and care taken to see that they are always disconnected from the battery end first when switching off the set.

Testing the Voltage

A periodical test of the total voltage of the H.T. battery and of the voltages between successive tappings should be made with a high-resistance voltmeter to trace defective cells, and if any are found, they should be shorted by making a permanent connection between the tapping points concerned, and thus a further period of useful life for the battery obtained.



This BOWYER-LOWE LOW-LOSS CONDENSER for 10/-

·0003 M.F 10/-

·0005 M.F 10/6

If the Bowyer-Lowe Popular Condenser does not give you thoroughly good service for twelve months after purchase, it will be exchanged free. Such a guarantee could only be given with an instrument whose efficiency is beyond question. Try this condenser in your sets. No better instrument has ever been produced at the price.

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Appreciative letters from readers who have made "Constructor" sets.

The A.A. Six in Brussels

SIR,—I really must tell you how delighted I am with the results obtained with the Anglo-American Six here in Brussels. Mind you, there have been times, oft repeated, when I have felt like throwing the whole thing downstairs and kicking it out of the front door, but this all came from my ignorance and failure to work the instrument properly. It took me three evenings to build this set, but it took me three——, well, I'm really ashamed to say how long it took me to find how to neutrodyne and tune properly. Anyway, I've got it now all right.

SHORT WAVES.—Tuning in parallel. Aerial about 100 yards single wire. Coil, 75 Lissenagon. McMichael Neutrodyne Units for the B.B. range. Tuning-in direct on loud-speaker (without 'phones):—Barcelona, Milan, San Sebastian, Cardiff, Petit Parisien, London, Madrid EAJ7, Manchester, Schenectady U.S.A., Oslo, Bournemouth, Madrid EAJ6, Hamburg, Dublin, Newcastle, Munster, Breslau, Glasgow, Rome, Berne, Belfast, Toulouse, Birmingham, Munich, Aberdeen, Zurich, Vienna, Prague. Not forgetting Radio-Belgique, Brussels. As a matter of fact, I do forget him very often, as I cut him out with my wave-trap and never hear a whisper from him, although he is only about a mile away.

Parallel tuning again.

LONG WAVES.—Using a 120 Igranic Coil and McMichael H.F. Transformers, I receive the following at extra loud-speaker strength:—Hilversum, Moscow, Berlin, Daventry, Radio-Paris, and Eiffel Tower.

For the above-mentioned stations (long-wave) I find that I can obtain adequate loud-speaker strength *without the first two H.F. valves*, which I simply turn off. The tuning is then very sharp and quite loud enough. For our local station—Radio-Belgique, 265 metres—I use only the detector and two L.F. valves when working the loud-speaker, and find the volume quite sufficient.

You will notice that I use parallel tuning for everything. As a matter of fact, I find that I can obtain best results in this way.

VALVES USED.—H.F. and Detector, Cossor Wuncells; Low Frequency, D.F.A.4 and a D.E.5.

I have calibrated my receiver for all the stations mentioned above, and with just a little patience can generally manage to pick out the one I want, provided, of course, that conditions are favourable.

I think this set deserves to be far more popular than it is at present. As far as selectivity, strength and purity are concerned, it is all that could be desired. It brings in the distant stations at remarkable strength.

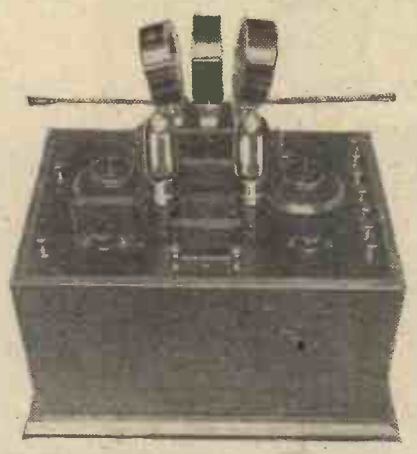
All thanks to Mr. Harris for this splendid set.

Yours faithfully,
FRANK R. HAWKINS.

Brussels.

A Resistoflex User

SIR,—It may interest you to know of the excellent results I am obtaining from a "Resistoflex" Two-Valve Receiver as described by John Scott-Taggart, F.Inst.P., A.M.I.E.E., in



Mr. Meeson's two-valve "Resistoflex" receiver.

Nos. 1 and 2 of THE WIRELESS CONSTRUCTOR, of which I enclose a photograph.

On an 80-ft. outdoor aerial badly screened by houses and trees and situated about half a mile from 2LS, I obtain moderate loud-speaker strength, while on the headphones all the main British stations and the following Continental ones can be received at good strength:—Radio Toulouse, Hamburg, Munster, Frankfort, Madrid, San Sebastian, and a number of others that I have not been able to identify. On a 100-ft. indoor aerial I also receive the above-mentioned stations with no noticeable difference in volume, the coils used in both cases being a No. 50 in the aerial socket and a No. 75 in both the anode and grid sockets. I have not yet tested the set on Daventry, and would be greatly obliged if you would kindly advise me as to the most suitable sizes of coils to use for receiving the same.

Wishing to obtain greater volume, I have constructed the "Unit Choke Amplifier" as described by John W. Barber in the April issue of your valuable journal. This added to the above set gives good loud-speaker strength on the local station, and moderate strength on a few main British stations and one or two Continental ones.

Concluding, I would like to say that the above combination of set and amplifier gives excellent results, all who have heard it having remarked on the wonderful purity of reproduction.

Wishing you every success,
Yours faithfully,
E. MEESON.

Leeds.

[For reception of 5XX I suggest a No. 150 for the aerial coil, with a No. 250 in each of the other two sockets.—ED.]

The All-Purpose Crystal Set

SIR,—I recently constructed the "All-Purpose" crystal set described by Philip H. Wood, B.Sc., F.P.S.L., in the January issue of THE WIRELESS CONSTRUCTOR, and am receiving Daventry at good strength using two pairs of headphones. Since we are at least 130 miles from the high-power station, I think the reception is very good, especially as only a temporary aerial has been put up. After a full 100-ft. aerial has been erected I hope to receive 2LO also.

I presume you have received letters from other readers and constructors of the set, and hope to see what results they have obtained.

Wishing you the very best of luck with your valuable papers,
Yours faithfully,
H. C. CHURCHYARD.

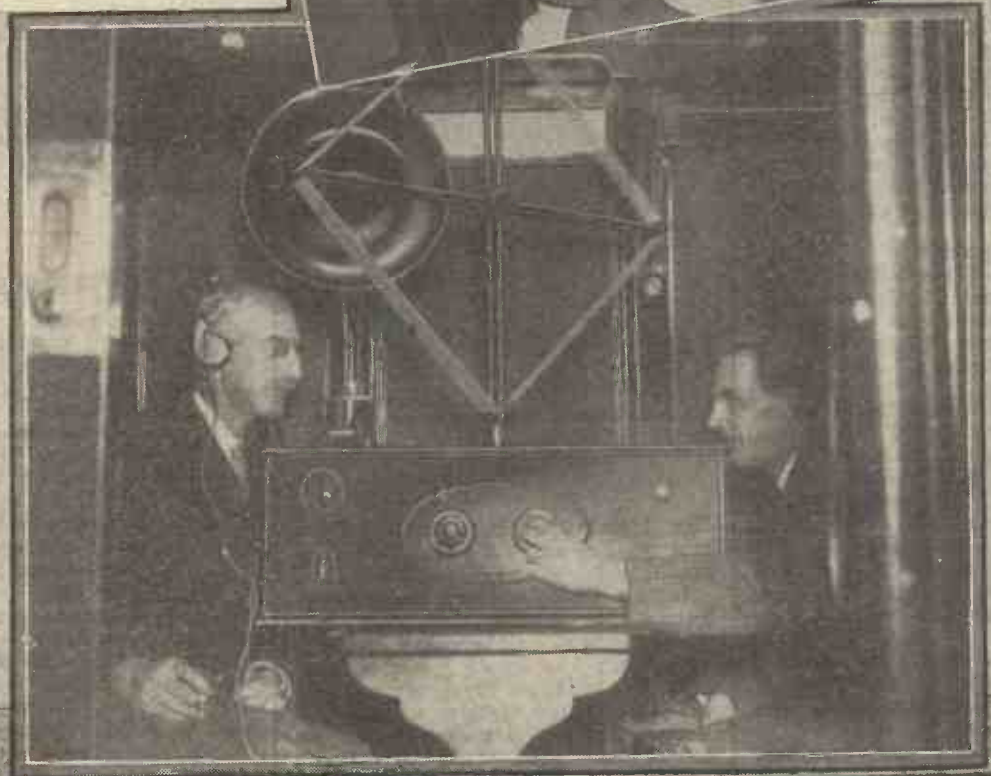
Harleston, Norfolk.

Wireless in trains! In connection with Captain Plugge's article it is interesting to note that the Great Western Railway's Cornish Riviera express was fitted with wireless the other week, when music from six countries was heard.

Above — A loud-speaker in use in the luncheon car.

Right—Some passengers on the express preferred to use headphones.

Below—The frame aerial receiving set installed in one of the compartments.



LISTENING-IN AT A MILE A MINUTE

by Capt. L. F. Plugge, B.Sc., F.R.Ae.S., F.R.Met.S.

An account of our travelling correspondent's experiences with a seven-valve "super-het" on the railway systems of Europe.

A TIME will come—and this will probably be in the near future—when every traveller will go equipped with his own portable receiving set, whether his journey be short or long. When one considers the great progress wireless has made during the last two or three years, the imagination can conceive no limit to the uses to which the ether may eventually be put.

Canada Takes the Lead

We have already been furnished in Canada with striking examples of organised broadcasts which are being received on moving trains: in fact, this method of reception has been a working proposition out there for some time, and may be said to have passed its experimental stage, if, indeed, any branch of wireless telephony can yet be said to have ceased to be "experimental." The Canadian National Railways have established broadcasting stations at all the chief stopping places of their transcontinental system, in order to provide special concerts for passengers travelling on board the trains of that excellent railway chain.

To carry out this particular method of reception, a special twin aerial is used, which is permanently fitted to the sides of observation cars. Wireless operators travel with each train on board the wireless observation car, their duty being to operate the receiving instruments and keep the transmissions tuned in. The broadcast concerts provided by the company are thus at the disposal of those passengers who wish to listen, with either headphones or loud-speaker.

An Individual Affair

Nevertheless, the connections in wireless, figuratively speaking, are individual connections. With wireless the listener wants to be independent of outside assistance. I will go further, and say that wireless broadcasting would probably not have received such an enthusiastic reception had it not been that the whole receiving end was under the sole control of the listener himself.

This is at once a joy and a convenience. Under ideal conditions, the listener should be able to switch on or off according to his own desire; moreover, he should be in a position to select the station or programme to which his fancy inclines, and this without the necessity of consulting anybody or anything but his own particular whim of the moment. And here it seems to me the case for the traveller's portable set presents itself. It was with a view to investigating possibilities for the use of such sets on moving trains that I recently completed sixteen thousand miles of travelling on the many different railway systems of Europe.

The start of the tour. The three cases standing on the pavement contain the frame aerial, receiver and batteries.

Ordinary Sets Useless

My object was long-distance travel as well as long-distance reception. We have heard a good deal about portable sets capable of receiving the local station within a range of about ten miles, but this kind of set would be of no use on train journeys, where the traveller would be leaving the "live" area after a few minutes, and would have to wait for some considerable time before encountering another. If long-distance reception is to be entertained, an efficient aerial is required. In a train it is not possible for the travelling passenger to erect an aerial wire for the journey, and, consequently, the aerial used must, like the set, be compact, easily portable, and adaptable in every way. This feature is the stumbling block with the usual type of set, which is not capable of receiving over the range indicated when an aerial of such reduced dimensions provides the only means of picking up the desired signals.

My other consideration was the investigation of the various forms of interference set up by trains when in motion, and their bearing on reception on the various wavelengths and under the varying conditions which I was likely to encounter.

A Possible Development

I propose dealing at present with the reception of broadcasting programmes only, although my investigations were also concerned with two-way communication on board trains, which would enable passengers to ring up their friends or their offices whilst travelling, and so enjoy the benefits of carrying on telephonic communication whenever and wherever they desired. The advantages of being able to carry on "business as usual" while travelling need not be enumerated. Under

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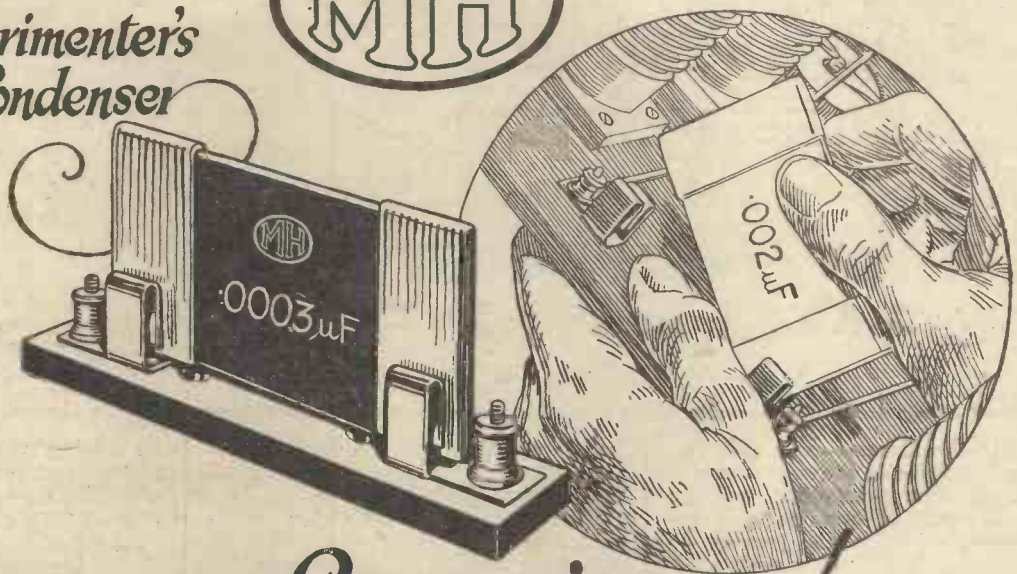

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these conditions, the reverse also holds good, of course, which means that the traveller would be easily accessible from any town, and thus land subscribers could in their turn get hold of travellers with whom they might require to communicate whilst the latter were travelling.

Sampling Many Railroads

The railway systems in connection with which I have investigated the possibilities I am discussing include in this country the Southern, the London, Midland and Scottish, and the London and North-Eastern Railways. On the Continent the investigations have covered the State Railways of Italy, the Austrian Railways, the Dutch Hollandsche Spoor Maatscapy, the Danish State Railways, the German Reichsbahn, the State Railways of Sweden, and the Swiss Federal Railways, and in France the Compagnie du Nord, Compagnie de l'Est, the Chemin de Fer de l'Etat, and the Compagnie P.L.M. Experiments were also carried out on the great trunk trains of the Compagnie Internationale des Wagons-lits.

Not for Everyone—Yet

I may at once break the news to all those who are prospective wireless travellers proposing to tour the Continent, that at present it is very difficult, except under very special circumstances, to take a wireless set when going from one country to another. The question of Customs arises, and also the question of nationality in connection with the permit necessary for possessing and using a wireless receiving station. I was privileged in this respect during my investigations, as I was in possession of special authority from the countries and companies concerned in order to carry out my experiments.

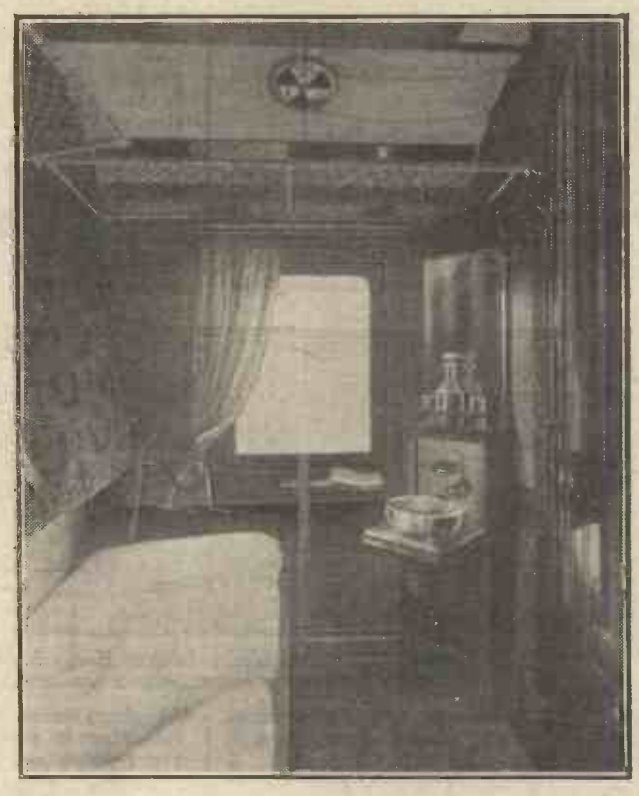
The Receiver Used

Great progress will certainly be made within the next few years in the construction of portable wireless receiving sets, and the one I have been carrying might be described by some as being rather cumbersome. The set is a seven-valve supersonic heterodyne, which works on a dry battery giving 8 volts and a small high-tension battery of 40 volts. The aerial is a non-collapsible frame 15 in. across, with about twenty turns. Specially designed leather cases were used to carry the set. There were three in all, as the reader will see by the photographs. One case housed the supersonic proper, the second the dry battery, and the third the frame aerial. The third case was also fitted with pockets in which the headphones could be placed.

Headphones or Loud-Speaker?

It seemed undesirable to carry a set on long-distance journeys which was meant to operate a loud-speaker, as on such journeys only headphone reception could be resorted to without disturbing other passengers. With head-phones it is possible to listen as long as desired without disturbing anyone.

The leather case in which the frame was housed had a special trap-door arranged at the lower end to allow connections to be made to the main set without removing the aerial from the case. Wireless waves, as readers know, find no difficulty in going through wood and leather, or similar substances, and consequently the frame aerial was capable of receiving the station desired just as well while it was in the case as when the case was removed. In certain instances I did remove the frame from its housing, but more often I found that it was not worth while doing so.



A sleeping compartment on the Swedish Railways, over which the writer travelled

Frame Aerial Reception

I do not think that for reception on a moving train any set could be more suitable than the supersonic heterodyne. Under the special conditions in which the listener is working it is necessary, in the first place, to have a set which can receive effectively on a frame aerial. A frame is a compact instrument to handle, and its use does not present much difficulty or inconvenience, especially when travelling on foreign trains, where compartments are, as a rule, fitted with a small table by the side of the window. This table provides, in many instances, an excellent rest for the frame aerial.

That the receiver should be a very long range one is essential for obvious reasons, especially as travelling with a receiving set will more readily apply to long-distance journeys when the passenger has considerable time at his disposal, and when such travel will take him far from those countries in which his interest will unconsciously remain. Again, it is always more interesting to be able to listen to the broadcasting from one's own country.

A Link with Home

While travelling in foreign lands, apart from the character of the transmissions themselves, one likes to hold a link which keeps one in touch with home. This only makes the whole experience the more wonderful. What more thrilling sensation could one have than to be travelling between Rome and Naples at a speed of some 60 miles an hour and at the same time to be listening to the news given out from Savoy Hill? This I accomplished with no more effort than if I had been listening to it in my own flat in town, and as clearly as if the announcer himself had been sitting in the same compartment just opposite me. Could a greater wonder be conceived? Such a miracle is not difficult of achievement provided the necessary permission has been obtained and the right kind of set is taken on the journey.

Where the Italian Trains Score

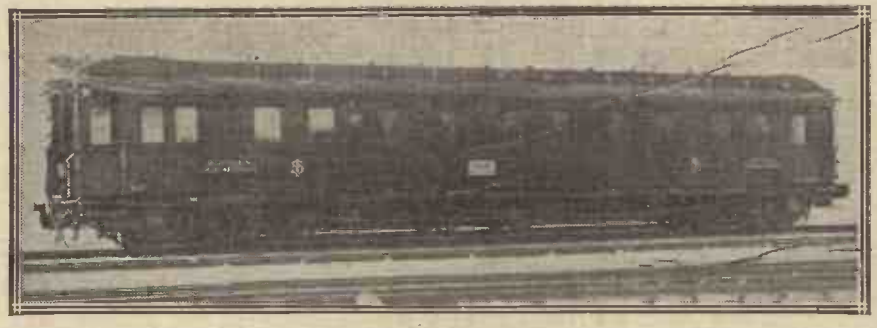
While on the subject of Italy, I should mention that I found the Italian trains to be the most suitable for reception. Several of the coaches on the Italian State Railways are not equipped at present with electricity, but are lit by gas. This is a great asset, as interference is thereby

greatly minimised, so much so, in fact, that while the Italian trains were moving at great speed it was very difficult to recognise any difference between the reception then obtained and reception when at a standstill.

Another point that is important on the Italian railway system is the size of the small window-table to which I have previously referred. The tables provided in Italy are usually rather long and wide, and this makes them very suitable for the frame aerial, as it permits orientation in the precise direction necessary for receiving the desired station. This is owing to the possibility of placing the base of the frame sufficiently far from the window to permit complete rotation. I found that it was always possible to place the case containing the battery underneath my feet without its being in anybody's way.

Supporting the Set

The main set was the most difficult part of the equipment to handle during reception, and I found it fairly convenient to hold it on my knees with the dials and tuning switches in front of me. If I was fortunate enough to be in a compartment only partly occupied, which was several times the case when I was travelling in Austria, I could place the instrument on the seat just alongside where I was sitting. This proved to be an ideal position. Some of the best receptions which it has been my lot to obtain were made on the Compagnie du Nord in France and on the sleeping cars of the Compagnie Internationale des Wagons-Lits, both in Denmark and France.



One of the coaches on the Stockholm-Malmo line, where dynamos caused interference on the shorter-wave transmissions.

Swedish Experiences

On the Swedish State Railways between Gothenburg and Stockholm exceptionally clear reception was also obtained and connection maintained during the whole journey, both on short and long waves. On another Swedish line, however, between Velback and Malmo, I experienced considerable interference, due to a dynamo which was apparently situated underneath the compartment in which I was travelling. This dynamo did not come into action until the train reached a speed of approximately 10 miles an hour. When the train was proceeding below this speed, as would be the case on approaching or leaving a station, reception was perfect, and I could use the directional properties of the frame in order to secure the best reception possible of Daventry or Paris on long waves and other stations, such as Newcastle and Aberdeen, on short waves.

A Dynamo Defeated!

As soon as the train started, everything went well until we attained the critical speed mentioned. I would then notice a flicker of the electric lights and a violent grinding noise, blotting out reception altogether. This interference could easily be recognised as proceeding from an electrical generator.

Here, again, was demonstrated the usefulness of a frame aerial, for by placing the latter in such a position as to be perpendicular to the direction of the train's motion, it was possible to reduce to a minimum the interference caused by the generator. In this position it became again possible to secure reception of the same concerts with sufficient clearness to render the transmission agreeable, but only for those stations on long waves. On short wave distant stations the interference was too violent, despite the frame's orientation, to make the reading of signals possible.

Less Interference on Long Waves

Generally speaking, I found that long-wave stations are far more free from interference, when receiving on moving trains, than short-wave ones. This was to be anticipated, as electrical interference of the kind from which one suffers under the special conditions of rail travel causes short-wave disturbances. However, I had now lost the directional property of the frame for securing the best possible reception of any particular distant station. Under these conditions excellent reception could nevertheless be obtained from stations within a radius of 20 to 25 miles. There were several of the Swedish relay stations along the West Coast line of Sweden (over which on this particular journey the train was travelling), and although these stations use short waves, reception was excellent. The fact that it was not necessary to push amplification so far, coupled with the use of the directional property of the aerial for elimination purposes, no doubt accounted for this.

In Germany

On the German trains between Berlin and Cologne I found reception to be exceedingly good, no kind of interference being noticeable at all. On the German trains, dynamos are not placed under each coach, and as electrical generating interference fortunately only shows its activity within a reduced sphere, a great number of compartments are spared. This means that if one is lucky enough to be in a compartment which has no generator beneath the chassis, the amount of interference is negligible, and reception is as good when the train is in motion as when it is stationary.

In designing new rolling stock railway companies will have to bear this fact in mind, and arrange the whole of the electrical lighting system at one end of the train only.

Curious Effects

Many interesting features arrest one's attention when listening-in on trains. The signal strength is by no means constant. When actually travelling in the open or on the level, reception is more or less normal. Embankments, however, cuttings, level crossings, bridges, tunnels, stations, all have their particular bearing on quality of reception and signal strength. In Switzerland and Germany, while passing under power transmission cables, most unpleasant disturbances are created. They last only for seconds, however, but are very sudden, occurring without warning. When passing under a bridge, or through a station at good speed, one notices that the signal strength diminishes considerably, and sometimes vanishes altogether for a few seconds. The position of the vanishing point is interesting.

A Wireless "Shadow"

This vanishing point does not occur just under the bridge or just in the station, but some distance beyond the bridge or beyond the station. It appears as if the bridge casts a kind of wireless shadow beyond it, and on passing through this "shadow" one gets the ill-effect. Again, when passing through tunnels the signal strength diminishes very rapidly, and while the train is actually negotiating the tunnel signals disappear entirely, only to revive immediately the tunnel has been quitted. These points are all the more interesting, due to the fact that they are all subject to exceptions often inexplicable.

Interest En Route

A considerable amount of interest among passengers and railway officials has always been evinced wherever I travelled with my receiving set, and the latter has been a source of curiosity and often admiration to a

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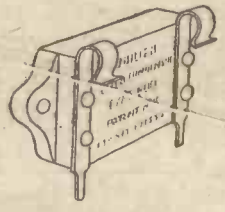

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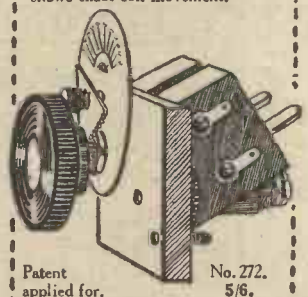

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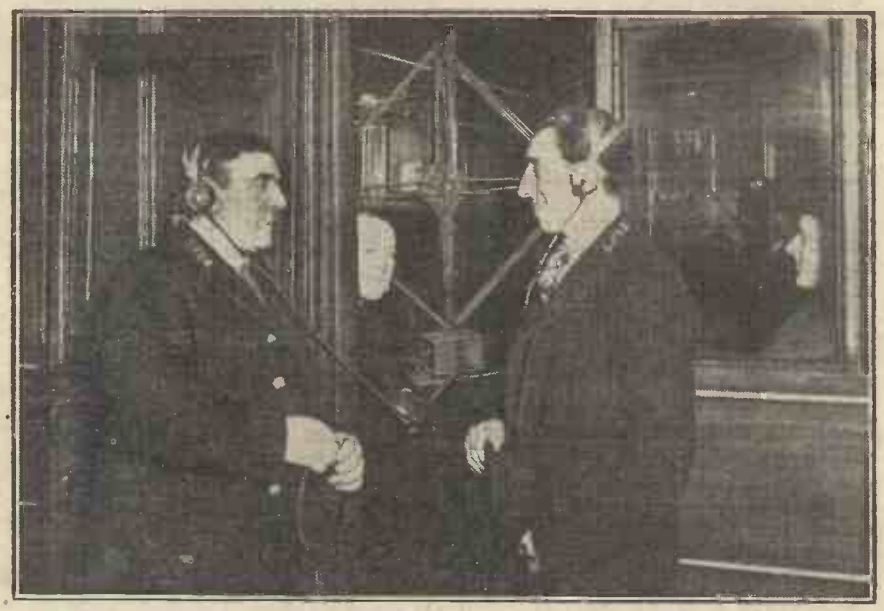
great number of passengers as they passed up and down the corridors, and as the guards came for tickets, and the Customs officials for luggage. I received on all occasions, in the compartment I occupied, many visitors who asked permission to listen, and among them were several who had never listened to wireless before. Their faces were amusing to watch during their first experience. To me it seemed that they had chosen rather extraordinary circumstances under which to listen-in for the first time in their lives.

Effect of Wavelength

Whether it is desirable to obtain reception in daylight or reception at night always constitutes an important factor, and I found when dealing with wireless on board trains that the wavelength adopted by any particular station had a greater bearing in this direction than when receiving under



Two of the railway staff at King's Cross enjoying the London programme before the start of the journey.

stationary conditions. Whether the wave worked was short or long had in itself a bearing on the purity of reception and the diminution of interference. I made some particularly interesting observations with regard to this difference due to wavelength while travelling on the French trains of the Compagnie de l'Est and on the Dutch State Railways. On these two railways the short-wave stations suffered from considerable interference. One had only to tune in a short-wave station to receive a deafening amount of interference, which was obviously coming from electrical generators situated on the train itself. When carrying out reception from a long-wave station, the same interference was so reduced as to be unnoticeable.

Darkness and Daylight

It is worthy of note, too, that long-wave transmissions did not seem to be influenced to any appreciable extent by the question of whether reception took place in daylight or at night. This, however, I did not find to be the case with the short-wave stations, which were received with much greater facility and over greater range after dark. I happened to be carrying out investigations in Denmark during the weeks of Christmas and the New Year. At that time the British Broadcasting Co. was sending out some rather late programmes from London, which in the case of Christmas Eve was prolonged till two o'clock in the morning. This meant three o'clock in the morning in Denmark, a country which uses Central European time.

A Christmas Experience

I was travelling between Esbjerg and Copenhagen, during the night in question, in a sleeping compartment of the Compagnie Internationale des Wagons-Lits. I might mention that the sleeping compartments on these trains are most convenient for installing a wireless set rapidly and for listening-in with ease. Immediately the train left the Esbjerg station I rigged up my wireless set, undressed, and got to bed and put on the headphones. Travelling at great speed lying comfortably in bed, I was able to receive, with the greatest facility, the numerous late transmissions which were being sent out. Among the stations I tuned in with ease on this occasion were Daventry and Radio-Paris on the longer waves, Birmingham, Newcastle, Radio-Toulouse, Union Radio Madrid, Milan and Rome.

That it is possible to design coaches equipped with electric lighting without interfering with the activities of passengers using their wireless sets, was amply proved on this occasion. The "Wagons - Lits" coach was most luxuriously fitted up in this direction. Several lights per compartment, with switches, electric fan and heaters were installed. Yet I found reception absolutely unimpaired by this elaborate electrical installation.

Future Possibilities

Anyone, then, wishing to travel as I did, with a properly designed and balanced supersonic heterodyne receiver plus a frame aerial, can receive the programmes from home and the various European stations without any difficulty during the whole length of the journey, and thus agreeably and profitably employ what might otherwise be wearisome hours. No other experience than these travels could make one realise more vividly the wonders that the wireless link is likely to work in the life of the future traveller.

Another "Midget" Enthusiast

SIR,—It gives me the greatest pleasure to add to the testimony you receive as to the excellence of the "Midget" Single-Valve receiver, by A. S. Clark, which was described in the May issue of THE WIRELESS CONSTRUCTOR.

It is really a wonderful "Little Midget," and I'm having excellent results with it in this part of North Wales, as good as any three- or four-valve sets around the district, and the results are amazingly clear when working.

As this was my first attempt with this business, you can see that I am only a novice, but through the help of instructions by Mr. A. S. Clark, printed so clearly in THE WIRELESS CONSTRUCTOR, everything came out fine, and I was amply rewarded for the little labour that was needed.

I wish to thank Mr. Clark for his design of a simple set, which I should think is ideal for a novice.

Wishing THE WIRELESS CONSTRUCTOR every success.

Yours faithfully,

D. LESLIE EDWARDS.

Bettws-y-Coed.

The paper that caters for all.

WIRELESS WEEKLY

Every 3d. Wednesday.

THE GLAD SEASON

By Our Irresponsible Contributor

SUMMER is at hand, and we are all thinking of living the outdoor life. Lots of my friends are making up portable sets to fit their cars, whilst others are buying cars to fit their portable sets. The voice of the atmospheric is heard in the ether, and everyone is advising his neighbour to fit an earthing switch to his aerial, omitting to mention the fact that he has not such a gadget himself, nor any intention of having one. Shortly we shall see it announced that the B.B.C. will broadcast the song of the lesser spotted whuffeleshrike, coaxed to the microphone by Captain Chuckersley's soulful playing upon the Jew's harp, a comb, or a mouth organ.

Summer Statistics

We shall hear the noise of the sea waves as they plash upon the beach, and the noise of the heterodyne as the wireless waves mingle with one another during relaying. Topical talkers will be busy preparing statistics of heat-wave temperatures and of June snow-storms. The railway companies will advise us to take our holidays early, and we shall be only too jolly thankful if we can take them at all.

The careful wireless man, fearing the effects of evaporation, will feed his accumulators weekly with distilled water; the careless man, like myself, will treat them with the contempt that they deserve, and will obtain just as good results. Expert writers will give hints in their articles on how to treat the earth connection during the summer time; you and I will read them, and wonder lazily whether the experts really practice what they preach.

A Problem

The thing that most worries me in the glad summer time, apart from the second instalment of income tax, is my high-tension battery. You see, I want to give the thing every chance, and I find it rather difficult. The makers tell me that I must keep it in a dry place, pointing out that dampness has terrible effects by causing minute leaks all over the place in the stuff that forms an overcoat for the cells. But other people keep on rubbing in that if I am not very careful lack of moisture will cause the jelly-square stuff inside the cells to dry up and put them out of action.

An Ungrateful Battery

In previous summers I have always done my best by choosing the dampest dry spot in the house for housing my high-tension battery, but the wretched thing has invariably failed to appreciate my efforts on its behalf. Sometimes it simply blows up, beginning by raising the wax or pitch covering into unseemly mounds, which look as though mushrooms are growing beneath them; and sometimes, in the dog days, it foams so badly at the mouth that I am afraid of hydrophobia every time I touch it. But, however it behaves in other respects, its volts grow smaller by degrees and beautifully less, and so does the volume of sound that issues from my loud-speaker.

. . . *cars to fit their portable sets* . . .

Adventures with an Accumulator

You will tell me that I ought to instal an accumulator anode battery. I am sure that your intentions are excellent, and I thank you. The first one that I purchased was entrusted to a charging station whose leading light had a fine contempt for "those little dots." The instructions on the label said charge at .25 ampere. He charged at 25 amperes, and that was that. The second one was really too much of a good thing. Having been used from my boyhood up to lugging six-volt accumulators round to the charging station, I can claim to possess a fine muscular development. But when it came to 200 volts, NO!

. . . *I am afraid of hydrophobia* . . .

A Consultation

Finding myself seriously worried by the high-tension battery problem, I went round, as I always do at such times, to see my old friend Mr. Gumplethorpe, from whom I am certain on all occasions to obtain sympathy, and on some to receive excellent advice founded on bitter experience. I found Mr. Gumplethorpe in a distinctly cheerful frame of mind. His set, he told me, was doing wonders, and life, so far as he was concerned, was an excellent thing.

"But what," I asked, "do you do about your high-tension batteries in the summer time?" "I don't," said Mr. Gumplethorpe. "Eh?" I echoed. "I haven't got any," he beamed. "I have just completed my new high- and low-tension circuit, by means of which I light my filaments and tickle up my plates solely from the mains which our local electric light company so obligingly provides. I simply push in the plug; they do the rest. It is as easy as falling off a log."

When is a Log not a Log?

I was distinctly interested. I told my old friend that I had never succeeded in falling off a log, though, with a view to verifying the truth of the ancient proverb, I had several times attempted to do so. I suggested that the words of the old saw had become corrupted by age-long use, and that they originally ran "as easy as messing up a log," log standing for logarithm. Have you ever tried to do your wireless calculations with the aid of this kind of log? Books on mathematics tell you that they are the most splendid aid to rapid calculations.

Multiplication and division are simply wiped out; all that you have to do is to add or subtract—in fact, a child could perform with the aid of logs the most intricate mathematical feat.

Something Wrong!

But somehow, when you come to use the infernal things, you find that they are full of traps for the unwary, such as you and me. When making your simplified calculations, you omit to notice that there is a bar-thing over the whole number, with the result that, having worked out the inductance of a coil that you have wound, you find that it runs into thousands of microhenries, though its turns are quite few. You surmise from the result that it should bring in Bordeaux, but when you try it out you find that it takes all its time to manage Brussels.

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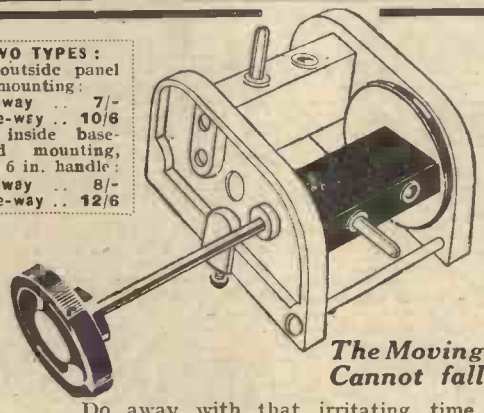

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The Glad Season—*continued*

From the Mains

But to return to Mr. Gumplethorpe. This business of getting all the volts and amps. that you need straight from the mains appealed to me immensely. It is always so splendid to come across any scheme for making other people do all the work. Naturally I begged Mr. Gumplethorpe to tell me all about it and give me an immediate demonstration. Like the rest of us, Mr. Gumplethorpe loves to have a real chance of talking. In the ordinary way he does not get one very often, for Mrs. Gumplethorpe is even keener than he is, and since she is provided by nature with a loud voice, a piercing eye, and a double-jointed jaw, she usually gets her way.

I have seen it reported that the vocabulary of a farm labourer is limited to two hundred words. For days on end Mr. Gumplethorpe uses far less than this, the only remarks that escape from his lips being, "Yes, my dear," and "No, my dear," and "Really." It is not surprising, then, that when I gave him an opportunity of describing his new apparatus in detail he fairly let himself go.

Up too Early

I think that it is highly probable that he gave every word in the dictionary an outing, but I cannot be sure of this, since, having been called that morning two hours before my usual time by a new maid (who mistook the "twelve" on the slip of paper that I had left outside my door for "ten"), I was feeling a little fatigued, and I fear that my eyes must have closed for a spell whilst Mr. Gumplethorpe was taking the floor. However, when he had finished and I had recovered consciousness I thanked him warmly for his most interesting explanations, telling him that he had made me feel a different man.

. . . *she usually gets her way* . . .

The Demonstration

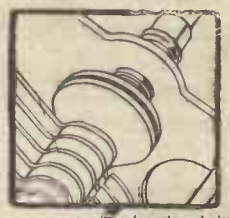
"And now," I said, "lead me to your wireless set and let me see you put in that wonder-working plug of yours." Mr. Gumplethope led me as desired and showed me the plug in question. It was quite a complicated affair containing half-a-dozen contacts for the filament, grid bias and plate connections. "I just insert it so," he said, "and there you are." We were, for even as he pushed his five dull emitters suddenly belied their name by becoming wondrous bright. For an instant they gave a positively dazzling display, and then with one accord they threw up the sponge.

Merely the Wrong Way Round

In the course of an explanation which included a number of words not to be found in the dictionary, Mr. Gumplethorpe made it clear that he had carelessly pushed in his plug the wrong way round. "It is plain," I said, "that what you want is a fool-proof plug." Mr. Gumplethorpe, who was quite rattled by the little contre-temps that had occurred, rounded on me and asked if I was implying that he was a fool. I managed to soothe him down about this, and presently he departed in search of a fresh outfit of valves.

Whilst he was out of the room I took a good look at the apparatus. It appeared that the only neon lamps that he had been able to get were those which form illuminated letters. These he had tastefully arranged so as

In the months to come



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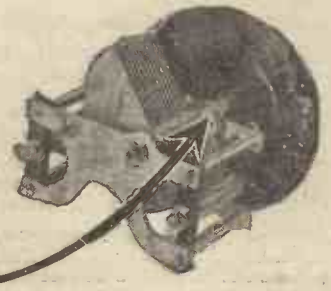

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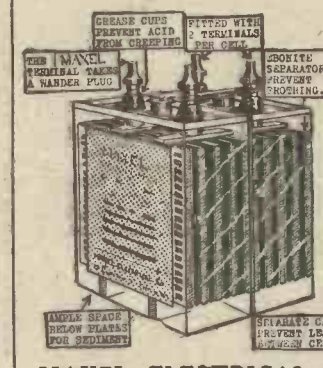

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The Glad Season

(continued)

to spell out "Bless Our Home." I thought that this was one of the prettiest wireless ideas that I had seen. Wishing to examine these lamps closely, I pulled several of them out of their sockets, and I fear that I must have been a little careless about the order in which I replaced them. When

. . . they gave a positively dazzling display . . .

Mr. Gumplethorpe returned and plugged in once more, after having fixed up the new valves, he became suddenly livid with fury.

A Pure Accident

At first I could not make out what was biting him, and then my eye was caught by the lamps, which now flashed out in letters of fire, "O Horuble Mess." "Dear me," I said, "the worst of those lamps is that they cannot spell for nuts." Nothing would induce Mr. Gumplethorpe to believe that the re-arrangement of the letters was a pure accident. For a whole week we were not on speaking terms, but we have now made it up, for he came round only last night to borrow a high-tension battery from me.

The Detector and Amplifier in One

SIR,—Having made the "Detector and Amplifier in One," as described by Mr. A. S. Clark in the November, 1925, issue of THE WIRELESS CONSTRUCTOR, I am pleased to say I am getting very good results. Daventry, London, Nottingham, Cardiff and Birmingham have been obtained very distinctly, as was also Radio-Paris, when using the set as a detector. After a two-valve set nearly all the British stations and Radio-Paris are obtained at loud-speaker strength, while Hamburg and other foreign stations are heard at telephone strength.

Using the set as an amplifier after a crystal, the strength of the signals is greatly increased. The height of the aerial used is 48 ft. and it is 95 ft. long.

Wishing success to your paper.

Yours faithfully,
C. N. PEARSON.

Swayfield, Grantham.

The Low-Loss Crystal Set

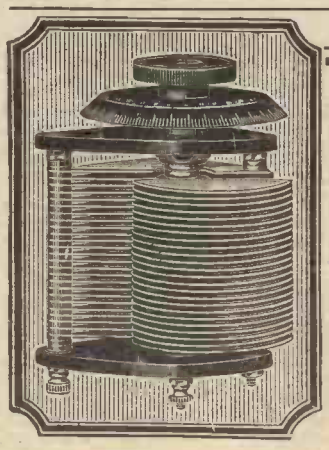
SIR,—I have recently finished making the "Low-Loss" Crystal Set described by Percy W. Harris, M.I.R.E., in the February, 1925, issue of THE WIRELESS CONSTRUCTOR, and I am glad to say that it gives excellent results. My aerial is 100 ft. long altogether, and is about 30 ft. high, unfortunately embracing the house. The earth lead is about 5 ft. long, and is connected to a buried pipe. I have carried out the "low-loss" principle whenever possible, and the plug-in coils which I use for the higher waves are wound on matches between two cardboard discs.

Up to the present I have been able to identify (in order of volume) Chelmsford, Daventry, Bournemouth, London, Radio-Paris and Petit Parisien. Chelmsford has been the "local station," and there is very little difference between its strength and that of Daventry, speech being quite clear on two pairs of 'phones.

I am 100 miles from Daventry, 75 from Chelmsford, the same from Bournemouth, and about 200 miles from Paris. London is about 50 miles away.

Yours faithfully,
E. B. STEAD.

Lancing, near Worthing.



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With a small unscreened aerial much excellent reception can be obtained with a good circuit.

A good circuit, however, is as much dependent upon reliable components of efficient design as upon its arrangement being suitably sensitive and controllable.

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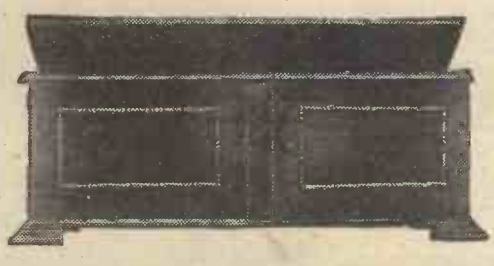

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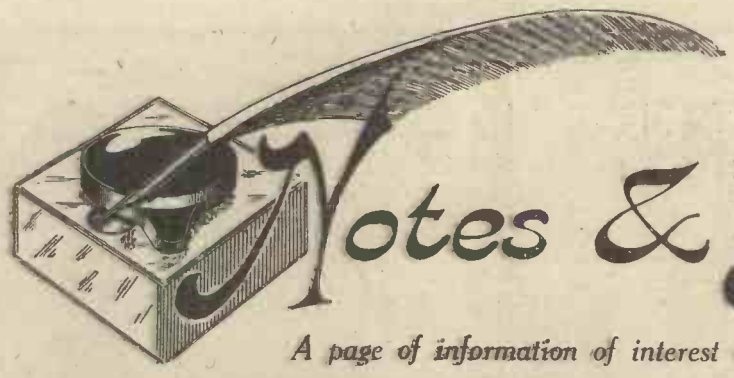


Notes & Jottings

A page of information of interest to all constructors.

By H. J. BARTON-CHAPPLE, Wh.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

WITH many types of loud-speakers it is found that a condenser shunted across the terminals improves the quality of the reproduction to some extent, the value of this condenser being generally determined by the trial and error method. The capacity of this condenser is often found to be in the neighbourhood of .002.

Satisfactory results from the quality point of view are also possible if the arrangement shown in Fig. 1 is adopted, the loud-speaker being connected across a choke of the order of 2 henries through a condenser of about 1 microfarad capacity.

I WONDER how many readers of this journal have made use of the very simple and inexpensive method of tuning known as spade tuning? The action is really due to the effects of the eddy currents set up in the metal plate or spade, mounted behind a loading coil, by the high-frequency currents in the coil itself.

These minute eddy currents are actually in the opposite sense to those in the coil, and consequently an effect is produced which is equivalent to a reduction in the self-inductance of the whole system, owing to the mutual induction between the currents in the spade and the coil. Various types of tuning can be devised, including straight-line tuning, by designing the metal plate in various shapes in much the same way as we design the plates of variable condensers to produce certain pre-arranged conditions.

IT is surprising how many users of crystal sets spoil the surface of the crystal when searching for sensitive spots by scratching across the crystal face with the catswhisker. This practice really defeats the main object in view, and all adjustments should be made lightly to ensure the most satisfactory results.

WHILE on the subject of crystals, it is as well to remember that a crystal can be fixed temporarily in its cup with the aid of ordinary "silver paper" (metal foil), when the recommended Wood's Metal does not happen to be at hand.

SMALL springs, made from phosphor bronze wire and wound in an ordinary solenoidal shape on a cylindrical former about ¼ in. to ⅜ in. in diameter, make handy connectors for the constructor when making temporary connections or carrying out experimental "hook-ups." The two ends of wires which must be joined need not be twisted together, but can be pressed between the turns of the

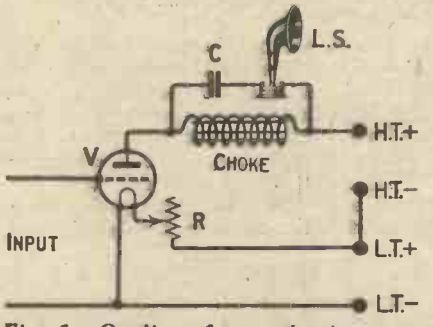


Fig. 1.—Quality of reproduction may be improved by connecting the loud-speaker in this manner.

spring, when quite a good electrical contact will result. This also can apply to the tags at the ends of telephone leads when two or more pairs have to be joined in series or parallel.

MANY constructors of receiving sets are apt to overlook the golden rule that the movable plates of variable condensers should be connected to the earth side of any particular wireless circuit. This avoids objectionable hand capacity effects when tuning in the set to the desired station.

WHEN purchasing variable condensers for accurate calibration work, such as for incorporation in wavemeters, be sure that the component in question adequately fulfils its purpose. Careful attention should be paid to the mode of construction, noting whether the spindles have any play in the bearings and if backlash is present in the particular type of dial and gearing chosen. The latter defect would prevent constancy in the chart calibration.

Again, the plates should preferably be made of a metal which does not oxidise readily, with a minimum of insulating material in the end plates, or if these are made of metal the insulating bushes should be amply proportioned. A scale marked with divisions which are quite clear is a feature which needs no commendation, and the condenser can be enclosed in a complete case to avoid any calibration defects due to dust particles getting between the fixed and moving plates.

The "pigtail" or spring connection between the moving plates and the appropriate terminal must not be unduly long, and also it is better for it to be insulated throughout its length. All these points are worthy of the attention of the discriminating constructor and experimenter if accuracy is the ideal aimed at.

THE approach of the finer days inevitably heralds that much belied operation — spring cleaning. This, however, should serve to jog the memory of the keen wireless enthusiast that attention must be turned to the aerial system. During the winter months the insulators will have collected a considerable amount of dirt and grime, and it will well repay any expenditure of time if the whole aerial is lowered, the insulators thoroughly washed and the aerial wire itself examined for any signs of defects.

If the wire is beginning to corrode it is better to replace it, while the lead-in wire should also be overhauled. The earth lead must not be forgotten, together with the actual connections between this wire, or wires, and the particular type of earth in use. Due attention to these details will produce a sense of satisfaction that as far as this part of the receiving station is concerned doubts as to unreliability need not exist.

A ONE-DIAL REFLEX RECEIVER

By E.J.Marriott

Employing only two valves, this simply-controlled reflex set gives both good range and excellent volume.

MANY readers will recollect the general popularity attaching to reflex circuits some time ago, and there is no doubt that this popularity was well deserved. Some of the reflex arrangements were capable of giving extraordinary results, both from the standpoint of distance and volume, the latter feature being the most evident in most cases.

Economy

One valve was made to do the work of two, two valves the work of three, and so on. It must not be forgotten that at that time valves with a very low filament current consumption were not as easily procurable as they are at present, thus the saving of one valve was worth the consideration of a large number of constructors to whom economy was an important feature.

Out of Fashion

Since that time, however, apart from those well-known and well-tried arrangements which have become standard, such as the S.T. 100 and "The Twin-Valve" Receiver, reflex circuits as a whole do not seem to be receiving a great deal of attention from wireless enthusiasts.

Valves procurable nowadays have a low filament current consumption, it is true, thus making the addition of a further valve to a receiver a less serious economic problem than formerly; nevertheless, there is a certain satisfaction to be derived from the knowledge that the utmost is being got out of the number of valves in use.

Results Required

In designing the set shown in the accompanying photographs, it was desired to use only two valves (this being a very popular number) and to be able to hear the local station at good loud-speaker strength, besides getting several other more distant stations on the telephones.

The second requirement immediately suggests L.F. amplification whilst the third indicates that H.F. amplification should be used. Seeing, then, that two valves only are to be used, one has been arranged as a detector, the other being made to function in the dual capacity of H.F. and L.F. amplifier.

Points in the Design

To a very large section of the wireless public simplicity of operation forms one of the foremost features which are generally required in a wireless receiver, and in order to achieve simplicity of operation in the set to be described, a circuit has been used in which only one variable condenser is necessary.

Further, instead of the usual plug-in coils, a commercial type of tuning unit with variable reaction has been incorporated. This unit, by means of a simple switch, covers the whole of the broadcast range including Daventry, and thus it is unnecessary to replace coils every time it is desired to change to a different wave band.

The Actual Circuit

The actual circuit of the receiver is shown in Fig. 1, and it will be seen that the aerial is directly coupled to the grid circuit. This latter feature, together with the aperiodic coupling used between the two valves, does not tend to increase selectivity—in fact, the reverse is the case.

In most reflex receivers, however, some desirable features have to be sacrificed to a greater or a lesser extent in order that more desirable features

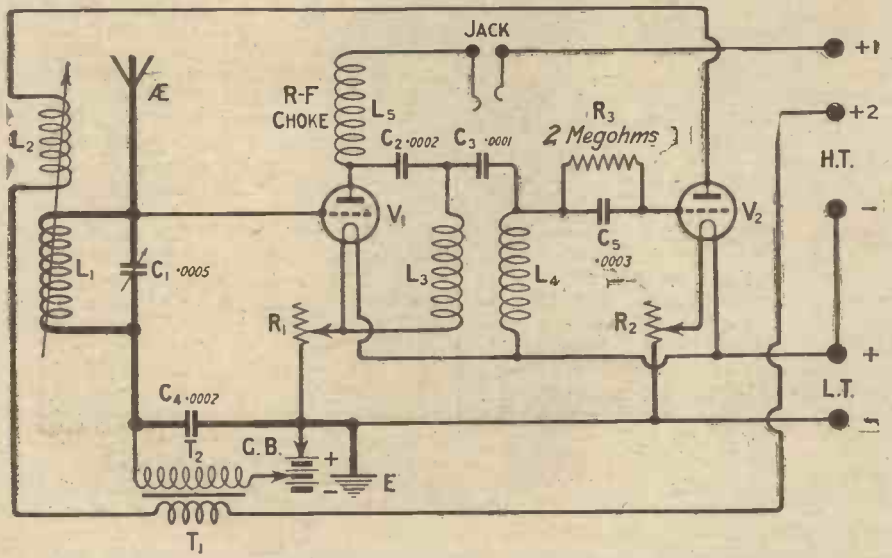
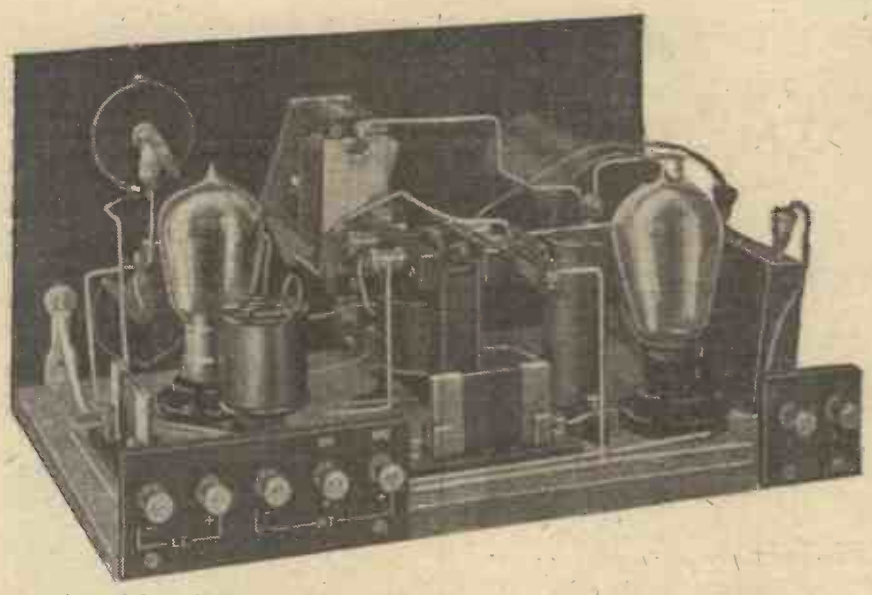


Fig. 1.—The receiver utilises only one variable condenser, since an "aperiodic" H.F. transformer is used.



A grid-bias battery can be accommodated at one end of the baseboard.

may be obtained, and thus, in the set being described, no great degree of selectivity is claimed.

H.F. Amplification

Referring to Fig. 1, signals received by the aerial are passed directly to the grid of V_1 and appear in the anode circuit of this valve in an amplified form. L_3 is a radio-frequency choke which offers a high impedance to the passage of H.F. currents, therefore the amplified H.F. currents will take the path via the fixed condenser C_2 through L_2 (the primary winding of the aperiodic transformer L_3L_4) and so back to the filament of V_1.

Rectification and L.F. Amplification

The resultant currents induced into L_4 are rectified by the valve V_2, and rectified impulses pass from the anode of V_2 through the reaction coil L_2 and the primary of an L.F. transformer (T_1) to the H.T. battery and back to the filament.

The secondary of the L.F. transformer, however, is connected in the grid circuit of V_1, and thus this valve will now function as an L.F. amplifier, the amplified L.F. impulses passing through and actuating the telephones or loud-speaker as the case may be.

Earth Connection

It will be observed that the earth connection is made to L.T. negative, and not to the bottom end of L_1, and that a fixed condenser C. is connected across T_2 and the grid bias battery.

Also a fixed condenser of .0001 capacity is shown connected between L_3 and L_4. This latter is optional, but in most cases it is found to be an improvement and is therefore recommended.

Components

In order to construct a replica of the receiver, as shown in the photographs, you will require the following items. Good quality components, other than those specified, may, of course, be substituted in most cases. Regarding the more important components, however, it is desirable in a receiver such as this to adhere as closely as possible to the list given below. A change of L.F. transformer, for instance, may have a decided effect on the results obtained.

Panel, 14 in. × 7 in. × ¼ in. (Peto-Scott Co., Ltd.)

Cabinet to take panel, with base-board 9 in. deep. (Peto-Scott Co., Ltd.)

One Efesca Aerial Regenerative Tuning Unit. (Falk, Stadelmann and Co., Ltd.)

One .0005 low-loss slow-motion square law variable condenser. (Jackson Bros.)

One H.F. choke. (Lissen, Ltd.)

Two aperiodic H.F. transformers (Nos. 1 and 3). (Burne-Jones and Co., Ltd.)

Pair small angle brackets. (Burne-Jones and Co., Ltd.)

One 5 terminal strip and one A and E terminal strip.

One Magnum anti-capacity valve holder. (Burne-Jones and Co., Ltd.)

One fixed .0002 condenser with base mount. (L. McMichael, Ltd.)

One fixed .0001 condenser with base mount. (L. McMichael, Ltd.)

Two dual filament rheostats. (L. McMichael, Ltd.)

One "Super" 3—1 ratio L.F. transformer. (U.S. Radio Co., Ltd.)

One .0002 fixed condenser (Freshman). (Igranic Electric Co., Ltd.)

Two Lotus "Buoyancy" valve holders. (Garnett, Whiteley and Co., Ltd.)

One .0003 grid condenser and 2 meg. leak. (Watmel Wireless Co., Ltd.)

One Pacent single open telephone jack; one Pacent telephone plug. (Igranic Electric Co., Ltd.)

Short length of flex; two wander plugs; screws; Glazite, etc.

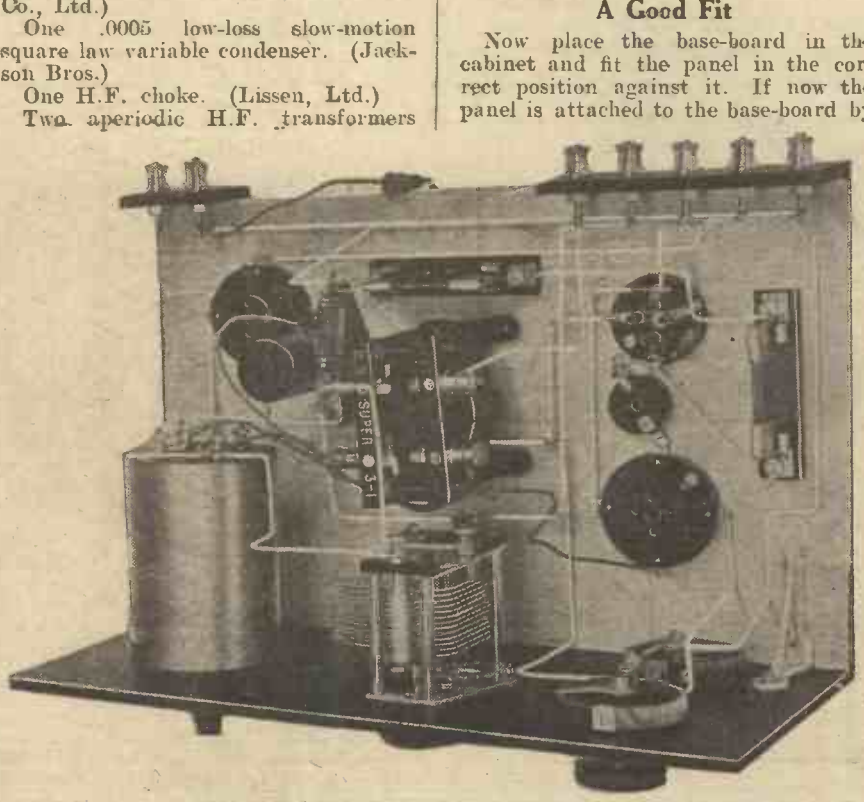
Construction

Having procured all the necessary components indicated above, proceed with the actual construction in the following manner:—

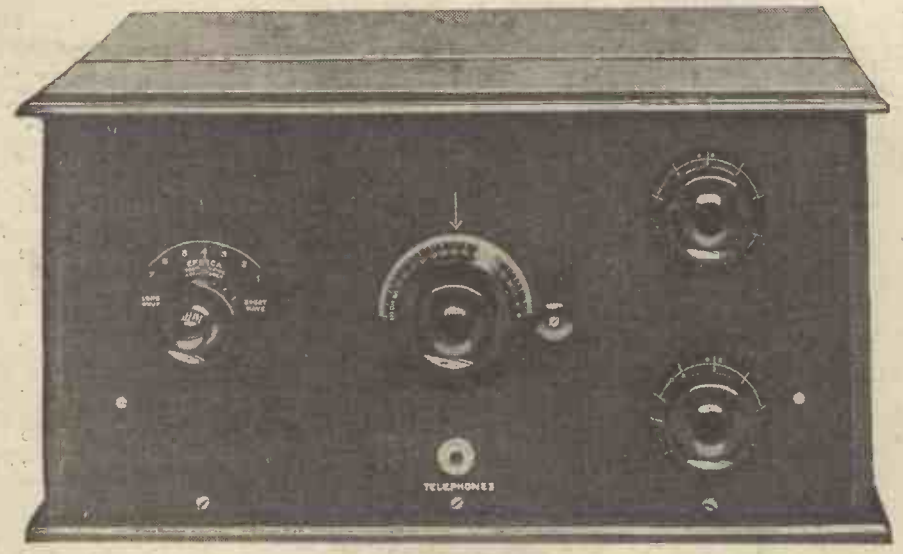
If you have procured one of the guaranteed brands of ebonite, the panel will not need any preliminary treatment, but can be marked out and drilled in accordance with the diagram (Fig. 2), in which all the necessary dimensions are given.

A Good Fit

Now place the base-board in the cabinet and fit the panel in the correct position against it. If now the panel is attached to the base-board by



The absence of the usual swinging reaction coil greatly simplifies the baseboard layout.



The arrangement of the controls facilitates adjustments, while all terminals are placed at the back of the receiver.

means of three screws, the whole can be withdrawn and the angle-brackets secured in position, and in this manner a good fit into the cabinet will be assured.

The two terminal strips can also be affixed to the base-board whilst the latter is in the cabinet.

Now secure on to the panel the various components which it has to carry, and, following this, the rest of the components can be screwed down to the base-board, as nearly as possible in the positions indicated in the photographs and drawings.

Wiring Up

Regarding the actual connecting up little need be said. No difficulty should be encountered here, as it is not complicated and each connection is clearly shown in Fig. 3. The back of panel photographs give an indication of the relative positions of the various wires, and these positions, as far as is possible, should be followed out.

It may be found that the soldering of the connections to the telephone jack is facilitated if the L.F. transformer is temporarily removed. This is not essential, but the man who is not quite at home when using the soldering iron will probably make a better job of these connections with the L.F. transformer well out of his way.

Reaction Leads

The leads to the reaction terminals on the tuning unit are carried out with rubber flex, and it will be noticed that the two leads are twisted together where possible. The actual connections to the two unit terminals marked R will be made clear by the instruction pamphlet which is included with each unit when purchased. In order to obtain the correct reaction effect, the lead from the anode of V_2 must join to the reaction terminal on the left, looking from the back of the panel.

Both the flex lead from the earth terminal and that from the I.S. terminal on the L.F. transformer are terminated with wander plugs, in order that a variable tapping may be taken from a grid-bias battery which will stand in the cabinet next to the tuner.

The H.T. Leads

Regarding the H.T. leads, that supplying the anode of V_1 is soldered to the terminal marked H.T.+1. Remember that in this instance this is the *second* terminal from the end of the terminal strip, H.T.+2 being the end one.

Checking the Wiring

Having completed the connecting up and carefully checked over all the leads against Fig. 3, insert a valve into the socket for V_1 and connect up your L.T. battery. Now turn the bottom rheostat and note that the filament lights up correctly. Repeat this with the top rheostat and the valve inserted into the holder for V_2.

If all is apparently correct, as a further check join the L.T. accumu-

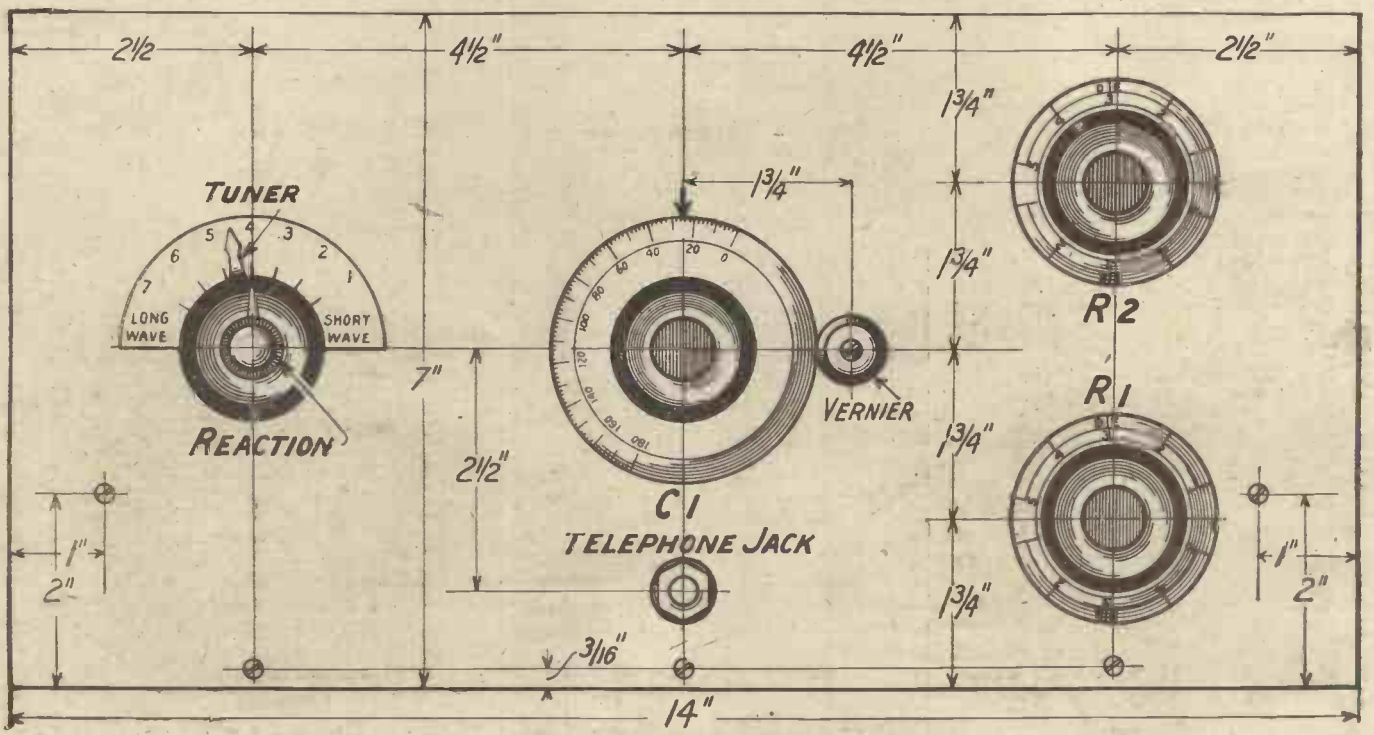


Fig. 2.—The panel may be drilled in accordance with this drawing. Blueprint C 1040A.

Built to last

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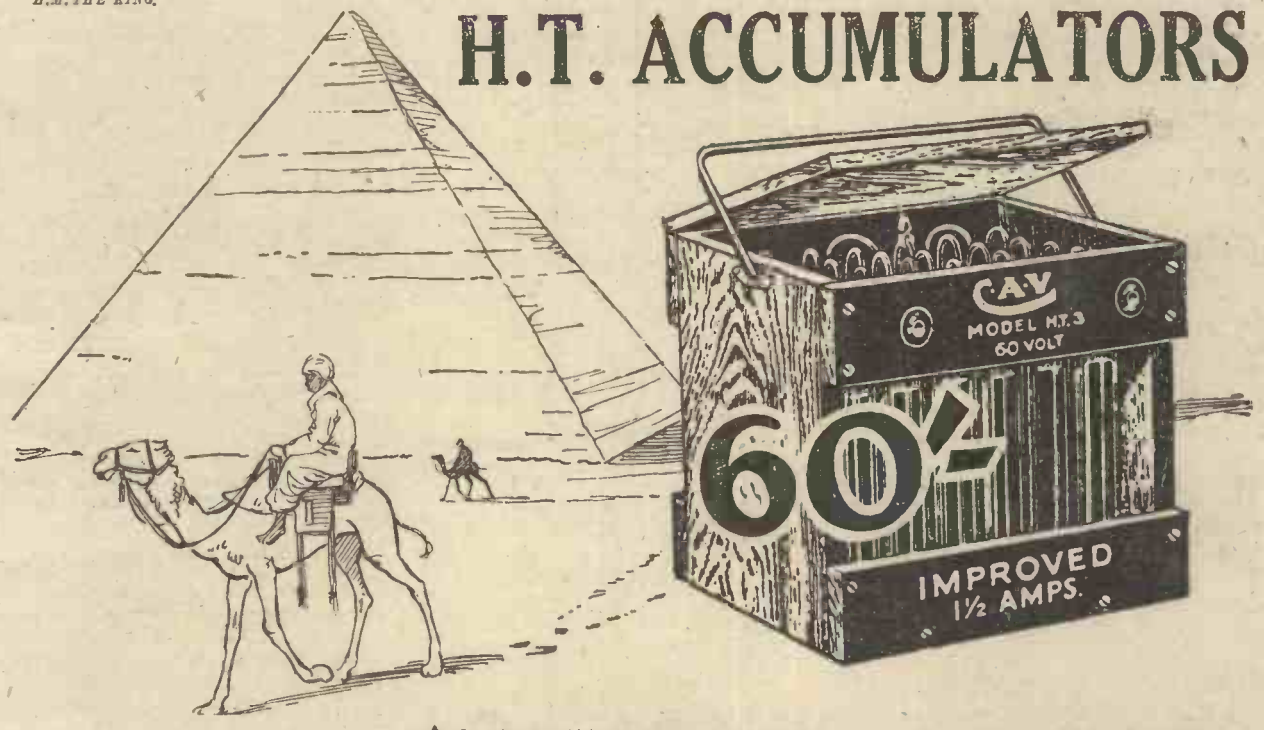
H.T. ACCUMULATORS



ACCUMULATOR claims are numerous, but C.A.V. claims 33 years' manufacturing experience. The C.A.V. H.T3 was designed with that experience behind it and is constructed to work with the average broadcast receiver. It is electrically efficient and all that can be desired for really reliable radio reception. OVER 10,000 SATISFIED USERS. Moreover, it is exclusively used by those who know, namely:—

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Mr. V.E.M. Oliver, B.A., A.M.I.E.E., radio 6 BV;

Mr. J. A. Partridge, radio 2 KF;

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and others who find them essential when setting up wonderful records in reception throughout the world.

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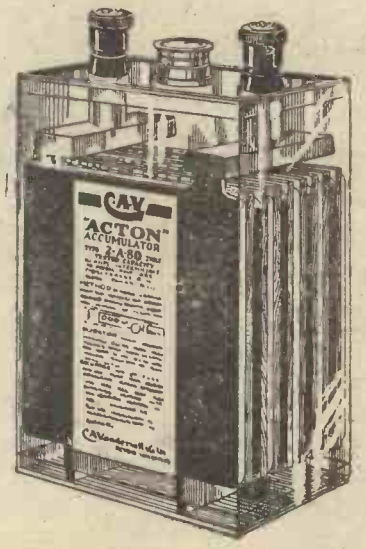

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Including knob and dial, as sketch, with vernier.
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Post 6d. per set.

Supreme SELECTIVITY
Each station has a CLEAR TUNING SPACE
CROWDING entirely ELIMINATED
SIMPLIFIED tuning
DISTINCT and DEFINITE Radio reception
PRECISION workmanship
HEAVY BRASS VANES, BRITISH MAKE
Pigtail connection to rotor gives silent working
Special Spring top Bush gives a firm but easy movement

UNSOLICITED TESTIMONIAL.

19/2/26. 78, Copenhagen Road,
Messrs. Raymond, Gillingham, Kent.

Whilst in town a short time ago I purchased 3 of your Low Loss Straight Line, etc., condensers, viz.: .0003, .0005 and .0003 with vernier. I did not have an opportunity for testing these until Wednesday evening last, when I banked up a straight one-valver incorporating the .0005 without vernier. The results were absolutely astonishing, because I got a station with almost every degree of the dial. I got as far as Stockholm. The other stations were London (of course), Berlin, Bournemouth, Breslau, Brussels, Hamburg, San Sebastian, Paris, Hilversum and Daventry. I almost forgot to include Dublin. This station is rarely heard in this district, but it came in well on two pairs of phones. I have never used a better condenser and I felt that you would like to know. The hook-up was on a piece of board. (Signed) A. BOWER.

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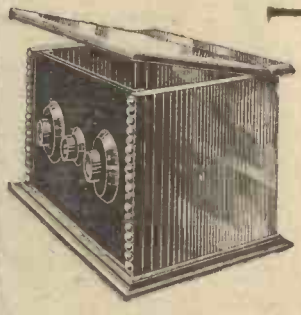

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14 × 10	× 8	14/0	19/0
16 × 8	× 8	14/0	19/0
16 × 10	× 8	16/0	21/0
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Hinged Top 1/6 extra.

Prices include packing, carriage and insurance to any station in England and Wales. Prompt delivery guaranteed.

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Cabinets can be supplied for all sets described in Radio Press publications. Quotations sent by return of post.

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H.F. 42

lator leads to the H.T.– and H.T.+1 terminals, and make sure that the valve does not light up in either socket. Also try it with the accumulator across H.T.– and H.T.+2. If the valve does *not* light up, it may be assumed that all is in order.

These tests may seem rather childish to the more advanced constructor; they form, however, a very simple test for the beginner, who by this method of test will not burn out his valves if he has made a wrong connection. Having assured oneself that all is O.K., the receiver is ready to be tested.

Testing Out

Join up aerial and earth and the H.T. and L.T. batteries, applying about 70 volts to H.T.+1 and about 30 or 40 to H.T.+2. The grid-bias leads in the cabinet might be tapped across, say, 1½ volts (*i.e.*, one cell), while the reaction control knob should be set at its minimum position.

Two valves — two general-purpose types will do—must be inserted into the holders, and a No. 1 aperiodic transformer plugged into the holder provided for this. The telephone leads should, of course, be connected to the plug, which must be inserted into the telephone jack.

Finding the Local Station

Set the tuning unit switch to the third or fourth stud, light up the valves, and adjust the variable condenser slowly from the minimum to the maximum position.

Now, if your local station is transmitting, you will hear it at very good strength in the telephones. When you have adjusted the condenser to the best position, *very* gradually increase the reaction, when the strength of signals will become much greater. Do not, however, work so near to oscillation that music or speech is distorted.

Whilst receiving the local station you will be able to get the "feel" of the set, and make certain little improvements in reception by small adjustments of the H.T. and G.B. voltages.

Daventry

For the reception of 5XX, replace the No. 1 aperiodic transformer by a No. 3, turn the tuner switch to the last stud, and tune in on the condenser in the usual manner, with the reaction knob at its minimum position. Both 5XX and the local station should be very loud indeed in telephones.

It is assumed that the condenser across L_3 and L_4 in Fig. 1 is in use: In most cases it will be found that when it is omitted the control suffers to a certain extent.

Loud-speaking Reception

When it is desired to replace the 'phones by a loud-speaker, the H.T. applied to H.T. + 1 can be increased up to 120 volts, with an appropriate increase in the G.B. tapping.

Wavelength Range

Although the tuning unit is stated to cover from 170 to 2,600 metres when used in conjunction with a P.M.G. aerial, it must be remembered that in this receiver the condenser C_4 is really in series with the aerial, and thus reduces its capacity. In this manner the wavelength of the tuner is lowered, and, in the writer's case, 5XX came in with the tuner switch on the last stud, and C_1 at about 70 deg.

In the same manner, any station will

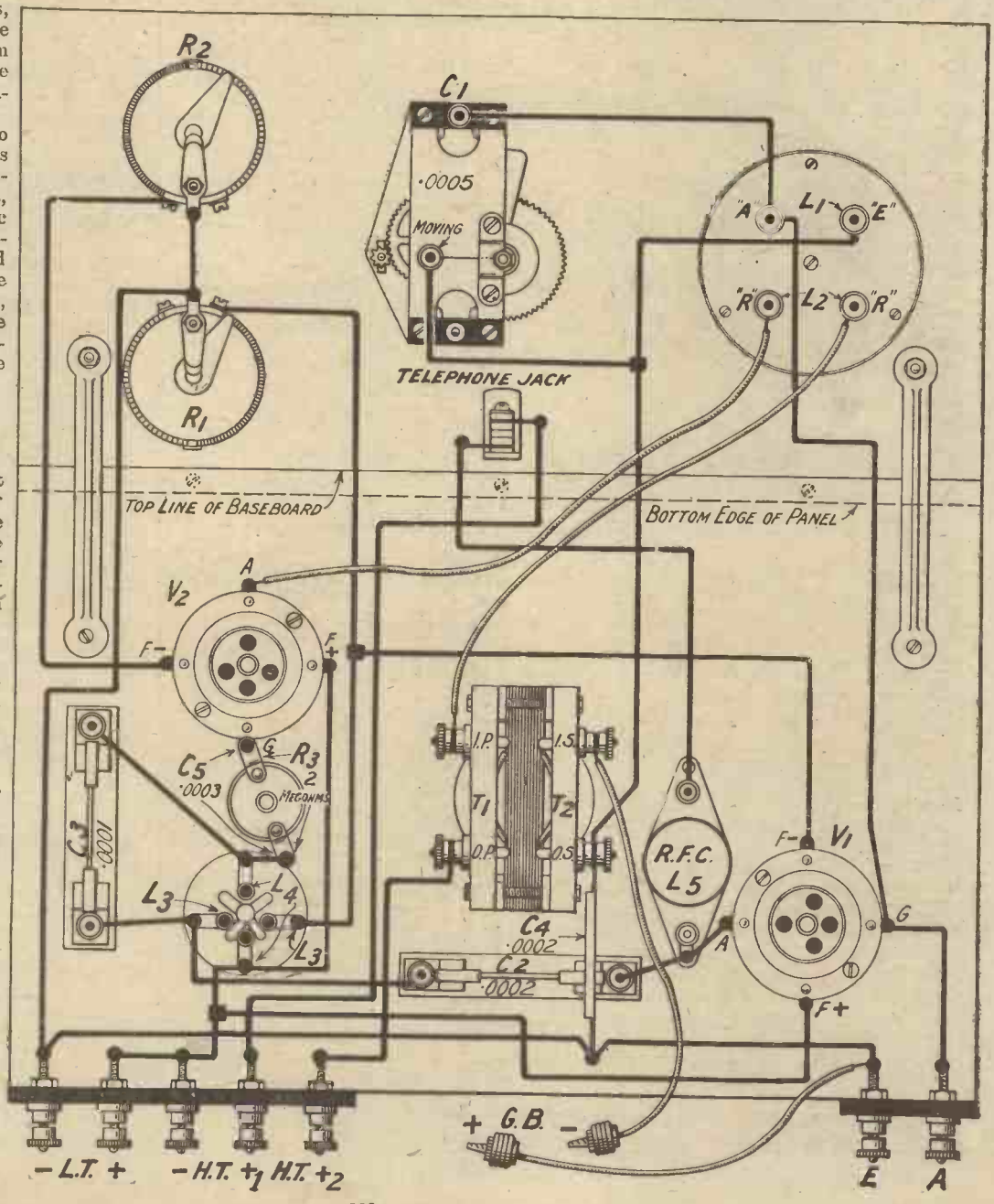


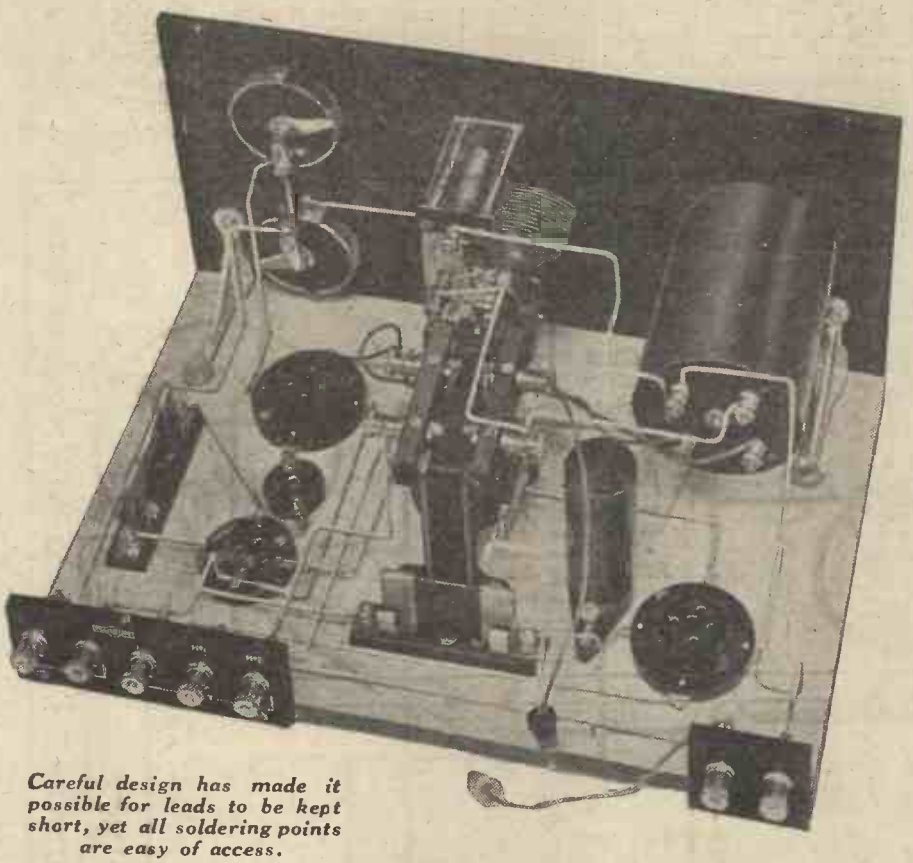
Fig. 3.—A complete guide to the wiring of the receiver. Notice that the H.F. transformer plugs into an ordinary valve holder. Blueprint C 1040B.

be heard on a higher tapping than would be the case normally.

Valves

Almost any type of valves will work in this set, two of the ordinary general-purpose valves giving quite good results.

The writer actually tried the D.E.R., D.E.3, Mullard H.F. (red ring) bright emitter, French micro, D.E.4, D.E.5, and the D.E.5B. types. All of these gave good results, but the best signals were obtained when V_1 was a small-power valve, with 120 volts applied to its anode, and an appropriate value of grid bias.



Careful design has made it possible for leads to be kept short, yet all soldering points are easy of access.

H.T. Values

In all cases as high an H.T. voltage as is permissible (together with the correct grid bias value) should be applied to the anode of V_1, and in this respect the maker's instructions should be followed carefully.

When, however, it is desired to use telephones, it will be advantageous to reduce the H.T. somewhat, in order that the telephone windings shall not suffer.

Regarding the H.T. voltage to be applied to V_2, this will be best decided upon by experiment. In any case, it will be fairly low if smooth reaction control is to be obtained, somewhere in the region of 30 to 50 volts being correct generally.

Test Report

On testing this receiver on a poor aerial about four miles west of 2LO that station gave very good loud-speaking on a "Lissenola" loud-speaker unit in conjunction with one of Messrs. the Scientific Supply Stores' non-metallic horns, the tuning adjustment, as previously stated, being in a higher position than that indicated for 2LO's wavelength in the leaflet which accompanies each tuner, owing to the inclusion of the .0002 fixed condenser in the aerial circuit.

Daventry also came in at good strength on the loud-speaker, whilst Radio-Paris gave good loud telephone signals in daylight.

Apart from the local station, a number of Continental transmissions were received at very good strength on the telephones, among these being Hamburg, Radio-Toulouse, Petit Parisien and Munster.

These Continentals do not seem very anxious to give their names, and several other stations were heard which were not identified.

Both Bournemouth and Birmingham came in well, but the transmission from 2LO interfered with all stations whose wavelengths are in the neighbourhood of 360 metres.

The report on this receiver by our Elstree Laboratories fully confirmed the above results, the tuning on this receiver being quite simple, so long as a little care was taken with the reaction adjustment.

It was also found that the best results were obtained using a small power valve in the first stage with a high value of H.T. and appropriate grid bias, whilst a general purpose valve or one of those specially designed for rectification, with a fairly low value of H.T., was found most effective in the second valve holder.

The "Midget" Gets America

SIR,—You may be interested to hear that I have made up the "Midget" single-valve receiver described in the May, 1925, issue of THE WIRELESS CONSTRUCTOR by Mr. A. S. Clark.

I am writing to say what a remarkable set it is. I have received the following stations:—2LO, 5NO, 6BM, 2ZY, 5WA, 5IT, 5XX, Radio-Paris, Hamburg, Berlin, Hilversum, and Madrid (E.A.J.6), all at very good 'phone strength.

Madrid, London, Daventry and Bournemouth come in on the loud-speaker, and when I couple up one stage of L.F. amplification London and Daventry can be heard all over the house. What I want to tell you about most is that I think I accomplished a record on Sunday morning, March 7, between 1 and 2 a.m. I tried for America, and succeeded in picking up KDKA with the above-mentioned set and 1 stage of L.F. amplification.

I am situated about 15 miles from London, and my aerial is 45 ft. high and about 85 ft. long.

Would you kindly let me know if this is a record?

Wishing you every success,

Yours faithfully,

CHAS. H. ENGLAND.

Uxbridge.

[Although we are getting accustomed to glowing reports of reception on the "Midget," we certainly think Mr. England is the first to hear KDKA on this popular one-valver.—ED.]

"WIRELESS"

The One-Word Weekly.

Valuable Prizes offered in a Simple Competition.

COSMOS RADIO COMPONENTS

Filament Rheostats and Potentiometers

With the windings carried on a porcelain bobbin and having the contact arm moving on its inner side, the "Cosmos" Filament Rheostat takes up remarkably little space, is strong in construction, and has a very smooth and reliable movement. It is fixed by ONE HOLE and is provided with a handsome knob and dial. Made in four types, two of which are double wound for Dull OR Bright Valves and one a Potentiometer. The prices are as follows :—

Description	Ohms	Current Carrying	PRICE
Single Wound	6.0	1.0 amp.	4/6
Double ,,	18+2	.4–1.5	5/0
Double ,,	30+4	.2–1.0	5/0
Potentiometer	300	——	6/0

Anti-Vibration Valve Holders

No sponge rubber, which absorbs moisture, is used in the construction of "Cosmos" Anti-vibration Valve Holders. They are made in two types as shown in the illustration. The panel mounting type can be readily fitted in place of an ordinary holder, as the fixing screws have standard spacing, while the baseboard type can be fitted to a wooden base with wood screws. "Cosmos" Anti-vibration Valve Holders abolish the objectionable noises due to vibration and "sound-coupling" and obviate trouble from the microphonic tendency of some valves.

Price { Panel Mounting / Base Mounting } **2/9**

BUY "COSMOS" COMPONENTS IN "COSMOS" CARTONS

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Cosmos

RADIO COMPONENTS

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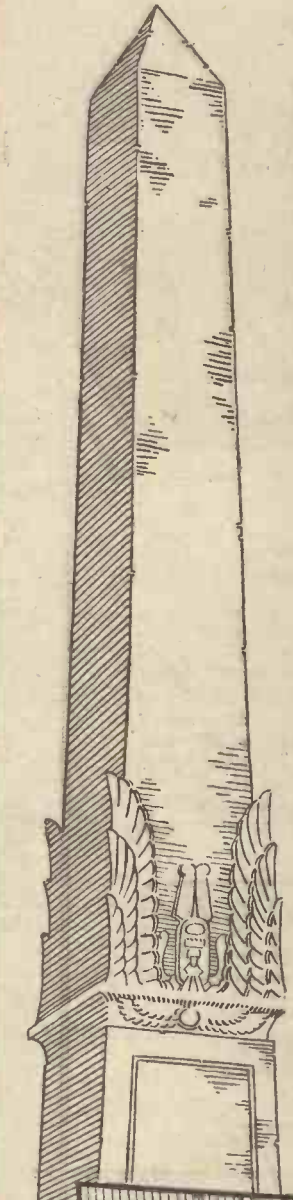

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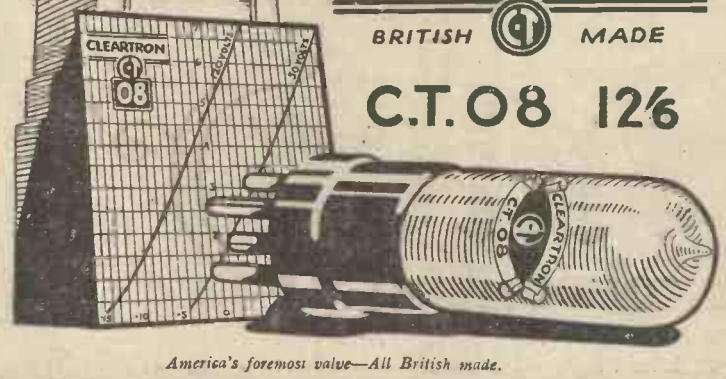

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44/524D

Controlling Reaction with a Condenser

(*Continued from p. 645*).

A Few Hints on Operation

As stated above, in preliminary tests with the receiver the larger tapping on the "X" should be used, as this will result in ease of operation and probably best signal strength. When a higher degree of selectivity is required, however, the smaller tapping should be used and tuning on the condenser C_1 will be appreciably sharper.

The size of the choke coil L_3 offers scope for the experimenter, as it materially affects the reaction control. If the choke is small it allows the H.F. currents to pass through the telephones to a certain degree, and hence a smaller reaction effect is obtained. On the other hand, with a large choke, reaction control may be rather jerky, and only individual experiment can fix the size of choke coil which will give the smoothest and most effective control.

Elstree Tests

Tested at the Radio Press Laboratories, the receiver was found to give good strong signals on the London and Daventry transmissions and reasonable results from several distant stations. The stations heard included 5XX (Daventry), 2LO (London), 5NO (Newcastle), 5IT (Birmingham), 6BM (Bournemouth), and 5NG (Nottingham), and several Continentals.

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ANOTHER SIMPLE ONE-MAN JOB

To erect a wireless mast single-handed at first sight appears a rather difficult task. If the following instructions are carefully followed, however, it will be found to be well within the abilities of most enthusiasts.

AFTER reading the article on "Erecting a 25-ft. Aerial Mast Single-Handed," by Mr. A. V. D. Hort in the March issue of THE WIRELESS CONSTRUCTOR, it occurred to the writer that an account of another simple method of erection

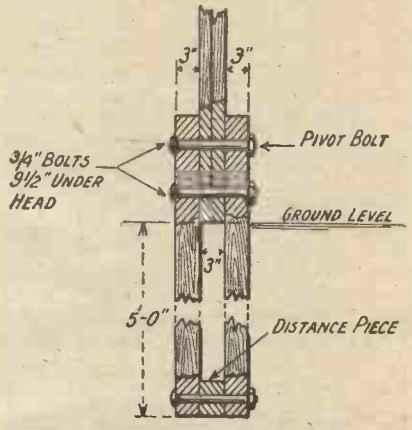


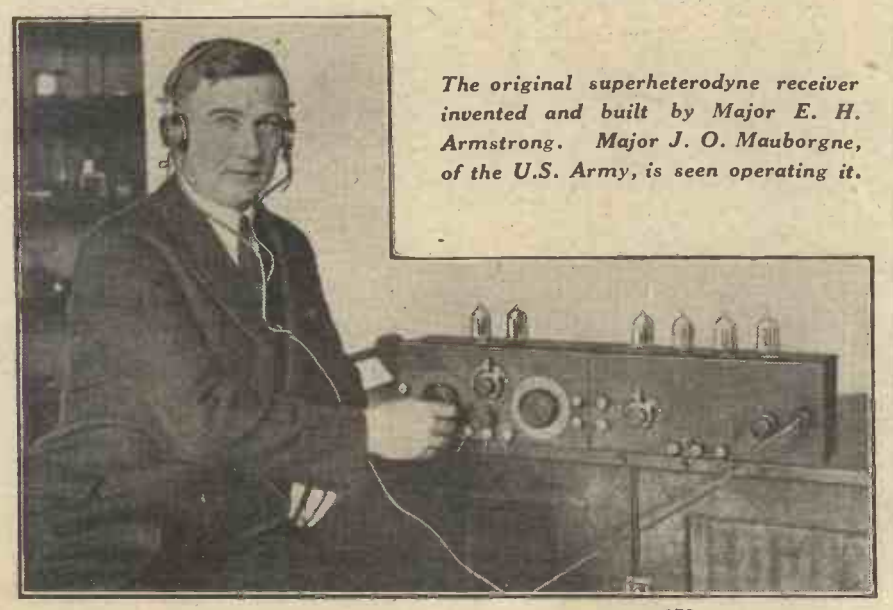
Fig. 1.—The method of fixing the mast proper to the two footings is clearly shown in this figure.

would be acceptable to readers. It is much to be regretted that the average aerial mast is erected without any consideration as to prolonging its useful life by painting and occasional attention to the halyard pulley. It is usually fixed with its base 4 or 5 ft. in the ground, and so, owing to its slender nature, coupled with its height, it is a difficult proposition to tackle should the halyard unexpectedly break and connect "aerial to earth."

With the method of fixing described herewith, however, it is only a question of minutes to undertake lowering, examining, and re-erecting, therefore the matter of periodically painting and thoroughly overhauling the fittings may be undertaken without any qualms. Such attention will tend to give a much longer life to a much-neglected part of the receiving system.

The Pivoting System

The mast proper does not go into the ground, but is pivoted on a ¾-in. bolt through the upper ends of two footings which are sunk 5 ft. in the ground and thoroughly bedded down. Care must be taken to keep them perfectly upright, but before fixing them in the ground it will be advisable to bore the holes for the fixing of the mast. Obtain a piece of deal 9 in. by 3 in. by 7 ft. long and saw down the centre, making two pieces 4½ in. by 3 in. by 7 ft. Square lines round both pieces at distances of 6 in. and 18 in. from what will be the top when fixed, and bore corresponding holes through the foot of the mast 6 in. and 18 in. from the base.



The original superheterodyne receiver invented and built by Major E. H. Armstrong. Major J. O. Mauborgne, of the U.S. Army, is seen operating it.

Boring the Holes

A good way to ensure the mast being bored at the exact spot is to lay the two 7-ft. pieces on edge on a fairly level stretch of ground with the mast in between them. Whilst in this position the mast may be marked out for boring, and then, when it is finally hoisted (provided due care has been exercised when fixing the footings to keep them plumb upright), the mast when bolted fast will naturally be upright. A piece of wood the thickness of the mast should be secured between the bottom of the footings to act as a distance piece. The mast may be hung loosely on the pivot bolt and will help to steady the structure whilst being fixed; needless to say the top end of the mast must be resting on the ground until the base is firmly fixed.

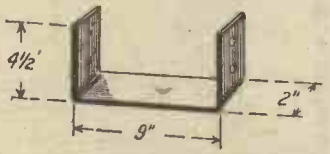


Fig. 2.—Details of the strip of iron which acts as a stop when the mast is erected.

A strip of iron 2 in. wide by ¼ in. thick and 18 in. long should be bent round to embrace the sides of the bearings and screwed thereto to act as a stop when the erection takes place, or the mast would simply swing right over and probably do some damage.

Making a Mast

A simple mast may also be constructed as follows:—Obtain four pieces of wood 9 ft. by 3 in. by 1½ in. and one piece 4½ ft. by 3 in. by 1½ in., a number of 2½-in. oval wire nails, and two ¾-in. bolts 9¾-in. long under head. Lay one of the 9-ft. pieces flat on the ground and securely nail the 4½-ft. piece on to it, keeping them level at one end. (First paint all faces that come together, also the ends of all butt joints.) Now take a 9-ft. piece and nail the same on top of the free half of the first 9-ft. length, with the end butting up to the 4½-ft. piece. Turn the work over and fix another 9-ft. length, butting up to end of the first long length, turn the work once more, and fix the remaining long length, thus leaving the upper 4½-ft. single, as no useful purpose would be served

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by fixing a 4½-ft. piece here: it would only be adding weight to the top.

A Simple Means of Extension

Extensions may be carried out at any future time by adding extra 9-ft. lengths, each such length increasing the effective height by 4½ ft. This method of erection has the advantage that it may be used in a confined situation; also there is no risk of the mast falling over to one side, and the principle is suitable for any type of mast.

Erection

When the base is secure, proceed to erect the mast as follows:—First make sure that the iron strap is securely fastened on the side of footings

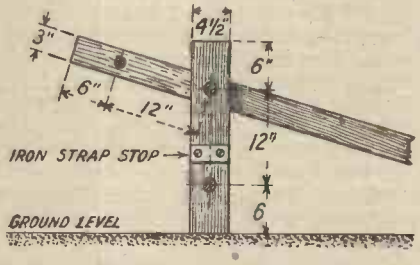

Fig. 3.—The mast is actually pivoted between the two footings which are driven about 5 feet into the ground.

nearest the top of the mast. Now raise the top end 5 or 6 ft. from the ground by placing a pair of household steps under it, see that the halyard is placed round the pulley and the back stay fastened on, when, if the aerial is securely fastened to the building, hoisting may be accomplished by hauling on the halyard, the height of the aerial being of great assistance

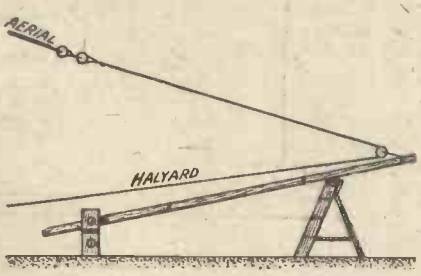

Fig. 4. — The final hoisting may be accomplished by hauling on the halyard.

during this operation. In the writer's case a back stay is found sufficient to keep the structure secure, although additional stays may be used where space is no consideration.

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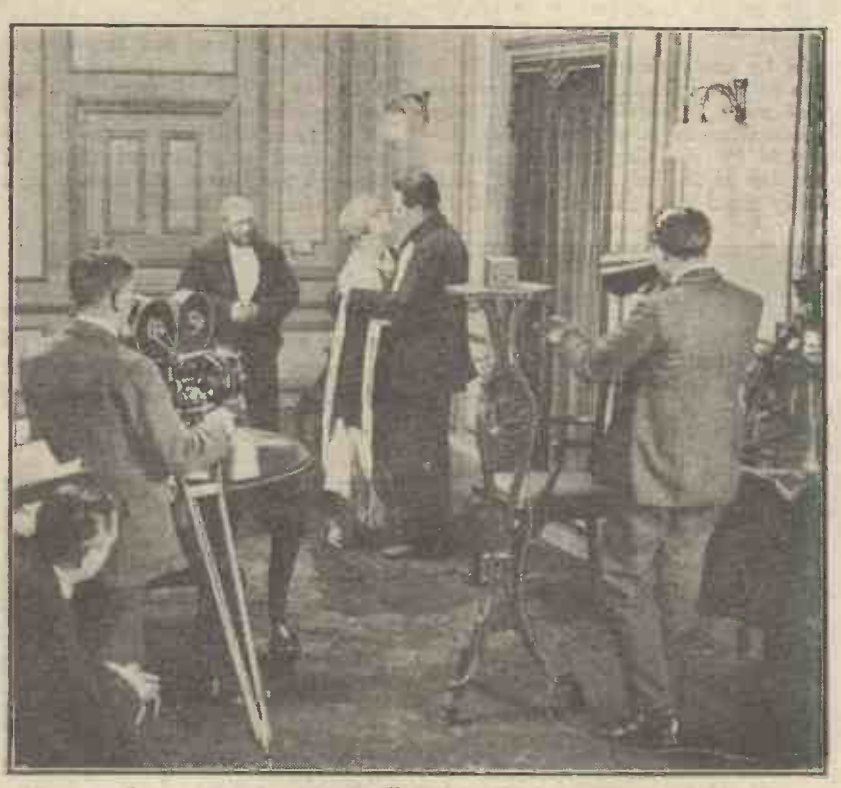

The sounds associated with the "shooting" of a scene for a film were broadcast recently. Notice the microphone on the right.

HOW DO YOU TUNE YOUR CRYSTAL SET?

Notes on set operation will form a regular feature in "The Wireless Constructor." Here are some notes on methods of tuning employed in crystal receivers.

IT seems probable that there are more sets making use of the crystal as a rectifier than of any other one type in this country. The crystal set possesses certain advantages which undoubtedly contribute greatly to its popularity, and amongst these one would naturally place its low initial cost, its negligible cost of upkeep and the fact that, unlike a valve set, it does not require "messy" accessories such as accumulators.

Is It Easy to Operate?

There are some who would also claim simplicity of operation as a characteristic of the crystal receiver. However, one is inclined to disagree with this statement when all the facts are taken into consideration. A single valve receiver without reaction gives approximately the same results as a crystal set, and, like the latter, has but one tuning control.

As for the other controls, most people, one is inclined to think, would agree that it is easier to turn the knob of a rheostat than to adjust a cats-whisker to give the best results. It is only when one compares it with valve sets employing reaction or additional tuned circuits that one can speak of the "simplicity" of operation of the crystal set.

Getting the Best from a Set

However, whether a crystal set is comparatively easy to manipulate or otherwise, there are certain modes of operation which will give more satisfactory and consistent results than mere haphazard methods. This applies both to home-constructed apparatus and to commercial receivers, although the former have the advantage that they can usually be modified where necessary without a great deal of trouble.

Into Two Divisions

In dealing with a crystal set it is convenient to divide it for purposes of consideration into two parts—a tuner and a detector.

The valve-testing room at the R.A.F. establishment, Farnborough.

The tuner may take several forms, but invariably consists of an inductance or coil, often (but not necessarily) used in conjunction with a variable condenser. The purpose of the tuner is to "lengthen" or "shorten" the aerial system, in an electrical sense, until it is in "tune" with the transmission it is desired to receive, as explained by Mr. Harris in his "Talks to Beginners" in this journal.

Coil and Slider

Probably the simplest form of tuner (and one that was extremely popular in the early days of broadcasting) consists of a single-layer coil of insulated wire wound on a cylindrical former. Each turn is bared of insulation at one point, and a sliding contact is arranged so that it can make electrical connection with any turn, thus altering the number of turns, and hence the "inductance," in the aerial circuit.

The precautions to be taken in operating such a tuner are not numerous, but must have careful attention if satisfaction is desired. The slider must be arranged so that it makes good connection with any turn on which it happens to be resting, and does not "jump" or miss any turns in its passage from one end of the coil to the other. Furthermore, there must be a good connection between the slider and the terminal to which it is electrically joined, hence any spring contacts should be looked to.

Dead End Effects

A third point concerns the ill-effects due to the turns of the coil which are not in use when any particular station is tuned in. These are known as "dead-end effects," and may result in reduced signal strength and lack of sharpness in tuning. The remedy is to short-circuit these extra turns by connecting the "unused" end of the coil to the slider. Hence, if the aerial is connected to the one end of the coil and the slider goes to earth, then the free end of the coil should also be connected to

Harry Lauder listens-in with the Kiddies —they all use Brown Featherweights

The man who has provided enjoyment for thousands is here seen listening-in with evident relish among the kiddies at the Cheyne Hospital for Children. This is one of the many hospitals throughout the country in which the famous Brown Featherweights have been installed.

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the slider (and hence to earth), so that the unused turns between the point of contact of the slider and the lower end of the coil are at earth potential and can cause no ill-effects.

Selector Switch Control

A second type of tuner working on somewhat the same principle has instead of slider a switch arm, which can make contact with any one of a number of studs. These studs are connected to various turns of the coil, and hence a varying number of turns can be brought into circuit by means of the switch arm. Here the same remarks apply regarding dead-end

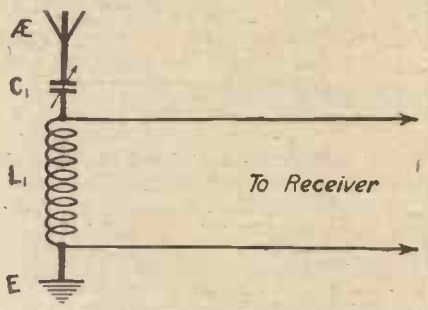


Fig. 1.—A series tuning condenser may give increased signal strength.

effects, and as before the "free" end of the coil should be connected to the switch arm. To get finer tuning a small variable condenser is often used in conjunction with this tapped coil tuner.

The Variometer

However, neither of the above forms of tuner is as popular now as it was a couple of years ago, but another old favourite—the variometer—is still extensively used. Some new developments in the employment of the variometer are to be expected, and, indeed, Mr. Barton-Chapple uses this type of tuner in a novel manner in the crystal receiver he describes in this issue of THE WIRELESS CONSTRUCTOR. Except for loose contacts to the moving coil or "rotor" there are few danger points in the vario-

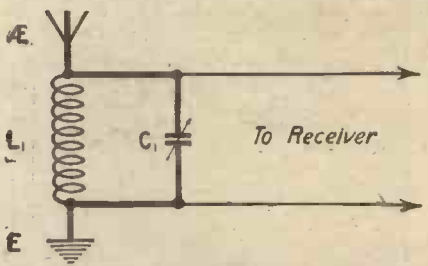


Fig. 2.—The parallel arrangement is probably the more popular of the two.

meter, and it probably offers the simplest means of tuning over a fairly extensive waveband.

The Use of Plug-in Coils

The above tuners do not offer very much scope to the crystal user who wishes to do a little experimental work to improve his set without making extensive alterations. Last of all is left the coil tuned by a variable condenser. The coil may be of plug-in type, wound as a single layer on some sort of cylindrical former, or in the form of a hank.

Series or Parallel?

Now there are two possible positions for the variable condenser in the aerial tuning circuit of a crystal receiver. It can be in *series* with the coil, as in Fig. 1, or in *parallel* with it as in Fig. 2. It is generally found that the loudest signals are obtained with a series condenser, which tends to lower the natural wavelength of the aerial system, so that a larger coil will in

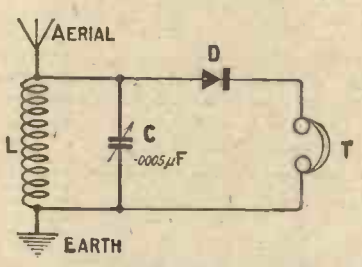


Fig. 3.—The majority of straightforward crystal sets seem to employ this circuit.

general be required than in the case where a parallel condenser is used.

On most receivers it is a fairly simple matter to effect a change-over from series to parallel tuning or *vice versa*, and it is often worth while to try the experiment. There are one or two points worthy of mention here. The first is that when using the variable condenser in parallel with the inductance the latter should be large enough to require little additional capacity to tune in the local station. This means that the condenser moving plates should be almost free of the fixed plates (in, say, the 30-degree position). This is because the use of a large parallel capacity is inefficient for reasons which cannot be discussed now.

Coil Sizes

In the case of a series condenser, however, the coil should not be too large, as it is best with this method of tuning to work with as large a series capacity as possible—*i.e.*, with the moving plates well inside the fixed ones (as would be the case with a dial reading of, say, 120 degrees). The higher the dial reading of the condenser the lower the high-frequency resistance of the aerial tuning circuit and hence the better the signals, provided, of course, that the coil chosen will allow the desired station to be tuned in properly.

Obtaining Selectivity

If some degree of selectivity is desired in a crystal receiver employing parallel tuning (Fig. 3), then "auto-coupling" offers a simple method of achieving the desired result. This is most simply carried out by connecting the aerial, not to the "top" end of the coil L_1, as is

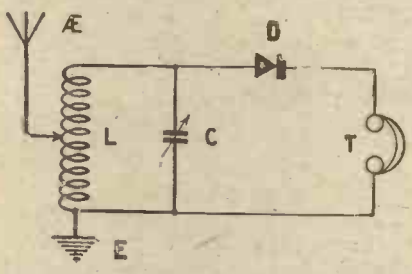
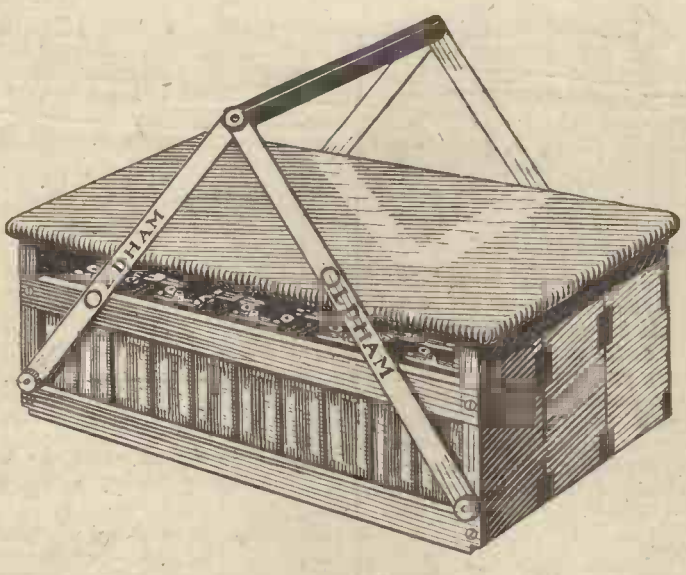


Fig. 4.—Increased selectivity is gained by the use of auto-coupling.

usual, but to a tapping point, as in Fig. 4. To get the greatest selectivity the tapping point should be only a few turns from the earth end of the coil, say 10 or 12 turns in the case of a No. 50 coil.

If a single-layer inductance is used it is a simple matter to make a few tapping points and find experimentally which gives the best results without serious loss of signal strength. On the other hand, users of plug-in coils can purchase tapped coils such as the Lissen "X," which are specially designed for auto-coupled circuits

Mr. Arthur Burrows, better remembered as "Uncle Arthur," is now Director of the International Radio Bureau at Geneva. Here he is seen with his little son.



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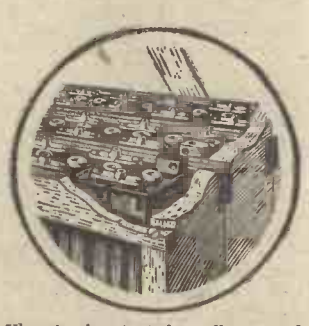

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Crystal Tapping

A further improvement in the circuit is shown in Fig. 5, where the crystal and telephones are also taken to a tapping point instead of being connected across the whole of the coil in the usual manner. This, however, is only possible where a single layer or basket-wound coil having several

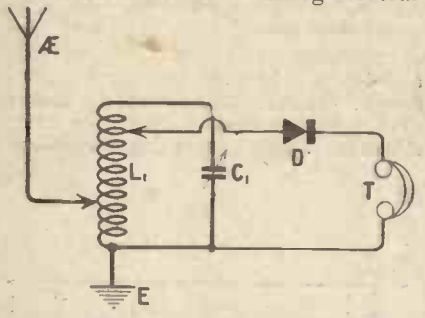


Fig. 5.—Both the aerial and the crystal are taken to tapping points in this circuit.

tappings is used, such as was described by Mr. G. P. Kendall in the November, 1925, issue ("Low-loss and the Crystal Set"), and by Mr. S. G. Rattee in the February, 1926, issue ("The Two-Way Crystal Set").

Interesting developments have recently taken place after much experimental work at our research laboratories, and the results of including high-frequency chokes in crystal arrangements have been recorded in *Wireless*. These new "Crystachoke" circuits, as they are called, are already proving popular, and a practical receiver embodying one Crystachoke arrangement was described in *Wireless*, Vol. III, No. 4.

These notes regarding tuners may prove of interest to crystal users, and in a subsequent article the detector portion of the receiver will be dealt with and hints on operation given.

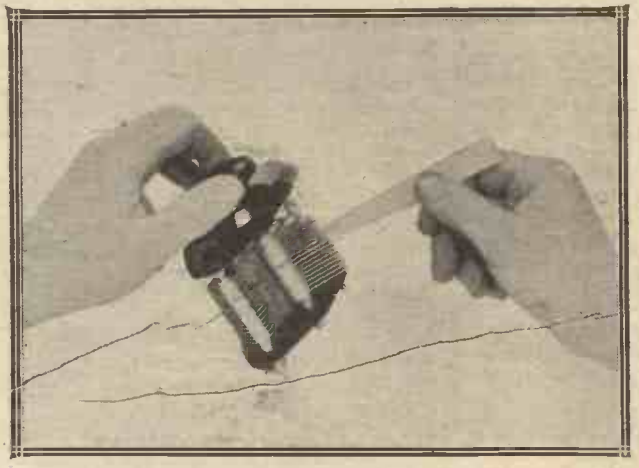
An assistant at the U.S. Bureau of Standards examining the small quartz crystal used for controlling a transmitter.

FAULTS IN VARIABLE CONDENSERS

By G.P. KENDALL, B.Sc.

Despite the fact that most modern variable condensers are both well-designed and well-built, annoying breakdowns are sometimes caused by these components. Some personal experiences of condenser faults are given below.

I AM quite sure that to many readers it will sound somewhat far-fetched to talk about faults in variable condensers, but painful experience has convinced me that such troubles are by no means so rare as one might think. What finally convinced me of the fact that variable condenser faults are a serious consideration was an experience which I had with the first superheterodyne receiver I constructed. What happened was this; the set appeared to be giving all the symptoms of correct "supering," yet the only station that could be heard was the local one, and the frame aerial tuning condenser had no effect whatever upon the signals. It could be rotated through its full range without making the slightest difference, and it seemed that the fault must therefore be located somewhere in the frame aerial or its circuit.



Partial short-circuits due to dust between the plates are easily remedied by cleaning out the offending matter.

'Phones and Dry Cell

Most detailed investigation, however, failed to reveal the slightest sign of trouble in any of the components, with the exception of the variable condenser, which, as it had just come from a reputable manufacturer, was regarded as exempt from suspicion. The symptoms seemed to point to a disconnection at some point in the frame circuit, and the aid of the ever-useful telephones and dry-cell test was invoked with a view to locating this. A test was made across the terminals of the frame aerial, and a response obtained which indicated that the frame itself was not at fault.

Baffling Symptoms

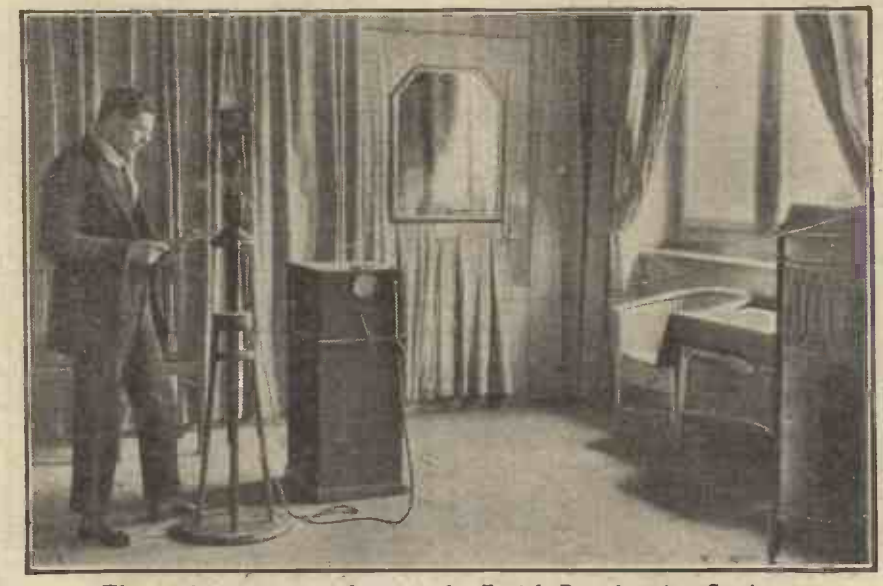
With a view to testing the whole of the frame circuit at one operation, the telephones and dry cell were attached across the fixed and moving plates of the frame tuning condenser, and it was at once observed that no click was heard, such as should have resulted from this test. A very close examination was then made of all the wiring of this circuit, of which, of course, there was very little, and not the slightest sign of trouble could be found. Almost incredulously, I repeated the test, thinking, perhaps, that the first one had not been properly carried out. Quite by chance, this time I tried the test across the actual terminals of the variable condenser, and this time obtained a good click. With a sudden inspiration I then repeated the test, touching upon the plates of the condenser as before, again with negative results.

Discovered

Evidently the trouble was in the variable condenser itself, and a moment's investigation showed where it was. A test applied between the moving plates themselves and the terminal to which they were normally connected on the frame of the variable condenser showed that there was no connection, and more detailed investigation was made. The condenser was one of the type with ebonite end plates, and a phosphor bronze spring bearing on the end of the moving spindle where it protruded through the end plate. Upon removing this spring it was discovered that between it and the end of the spindle there was a small chip of ebonite, evidently left there during the process of assembly.

A Producer of Puzzling Faults

Since this occurred I have had a wholesome respect for the variable condenser as a producer of puzzling



The studio and microphone at the Zurich Broadcasting Station, Radio-Genossenschaft.

faults, and possibly the notes which follow may assist those who are unfortunate enough to find themselves in some similar predicament.

Take first the case of a disconnection in the actual construction of the condenser between one or other of the terminals and the corresponding set of plates. This, on the face of it, does not seem a likely thing to happen, but for that very reason one should be on one's guard against the assumption that it can be ruled out as an impossibility. As a matter of fact, it is such a very easy thing to test for that it is now the first thing which I do if the variable condenser can possibly be at fault.

Testing for Disconnections

All that one needs is a pair of telephones and a single dry cell or other suitable small battery, and then one can test straight between the set of plates concerned and the appropriate terminal, and note whether a good strong click is heard. The fault is an exceedingly unlikely one in the case of the fixed plates, but with the moving ones matters are otherwise.

In the case of these plates, for example, it does not do to assume that all is well if a click is heard upon first applying the test, but, on the contrary, the moving plates should be set in various positions, and the test repeated, since it is quite possible that a fault may exist here that will only show up at certain dial settings.

The Moving Plates

A disconnection between the moving plates and their terminal is quite likely to be partial in nature, especially in the case of a condenser where there is merely a friction contact between the spindle and a bearing or spring, and in such a case it is well to hold the telephones and dry cell connections on to the testing points and revolve the dial, noting whether noises are heard. If they are, it indicates that some adjustment of the bearing or cleaning of rubbing surfaces is necessary. In the case of a "pig-tail" or spiral-spring connection, of course, trouble of this sort is very unlikely, and simple inspection will reveal whether the connection is still intact.

Short Circuits

Sometimes, although rarely, one finds a variable condenser which is actually shorted, sometimes as a result of a drop of solder getting where it should not, and sometimes as a result of an error in the manufacture of one of the metal-frame condensers which are now becoming so popular. It is therefore just as well, when a variable condenser falls under suspicion as being the cause of an entire absence of signals, to disconnect the wires from the two terminals and apply the telephones and dry cell test across the condenser. Only the faintest of clicks should be heard, and if it approaches a real indication it should lead to the condenser being replaced by another.

Of course, the indication of a short-circuit in a variable condenser may quite well mean merely that one or more of the moving plates has been bent from its correct alignment, and is touching its opposite number among the fixed plates, but this fault should be at once obvious, owing to the fact that scraping noises will be heard when the condenser is revolved.

Noises

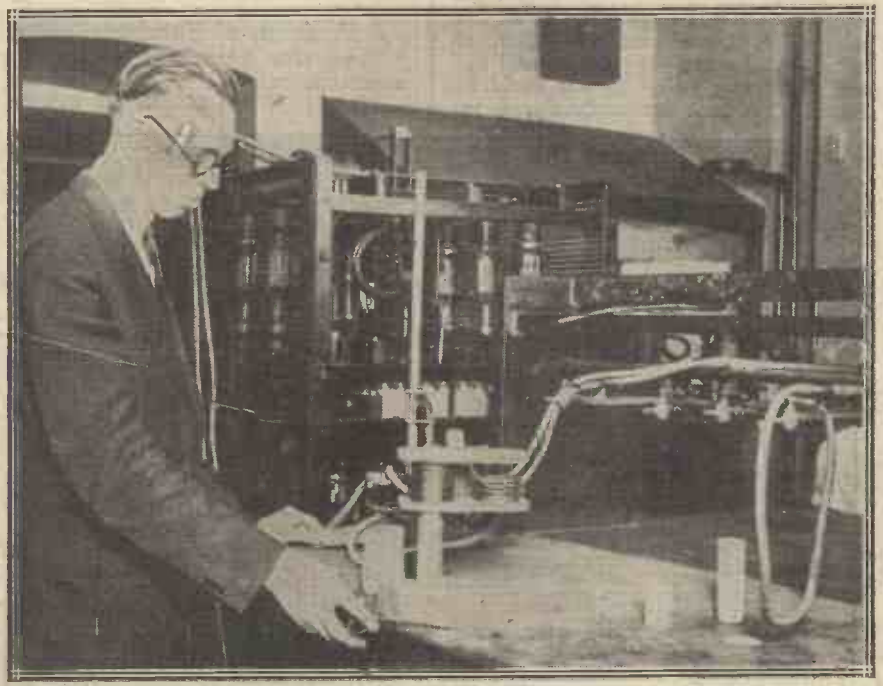
So much for the actual faults in variable condensers. There are, however, a number of troubles which occur in condensers which can hardly be classed as faults, in that they do not actually stop reception. The troubles in question are the various defects which produce noises in the set when the condensers are revolved. An example which will be familiar to everyone who has worked upon the shorter waves is the production of rustling and crackling noises when a condenser is turned in which the contact upon the moving plates is not absolutely perfect. Although this trouble is mostly found upon short waves, if the contact is really imperfect, it becomes a serious nuisance upon the broadcast waves also, and it is worth while learning its symptoms. These are, briefly, that imitation atmospherics are produced every time the condenser is turned, with sometimes an actual continuous crackle.

A "pig-tail" ensures satisfactory connection to the moving plates and spindle.

As a test, try the effect of tapping the dial and also working from side to side the knob of the condenser, taking note whether this aggravates the noise. If it does you may feel fairly sure that the condenser is at fault, and an investigation should follow of the means of making contact with the moving spindle. Where this is frictional the parts should be taken to pieces, polished up with emery paper, smeared lightly with vaseline, and re-assembled.

A Curious Effect

Where a pig-tail connection exists, it is not likely that noises will be heard upon the broadcast band, provided that the two ends of the spiral spring or flexible pig-tail are properly soldered to their respective points. Upon the shorter waves, however, say below 100 metres, the state of affairs is very different, and certain types of pig-tail are so noisy as to be practically useless. In particular, the type consisting of a spiral spring of phosphor bronze with a large number



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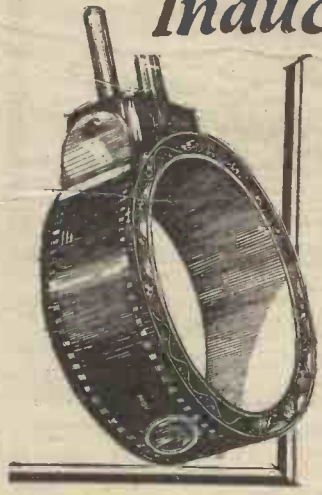

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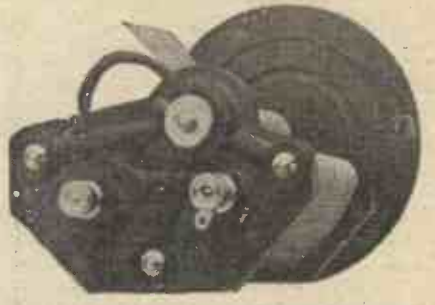
of convolutions is often troublesome. What happens appears to be this: as the condenser is turned in one direction or the other, the spring winds up or unwinds, and the various turns touch one another irregularly at different points. Now, each turn of the spring represents a single turn upon a small inductance, and when one or more of these is shorted, there is a small change in the tuning of the circuit, and hence unpleasant noises are heard.

An Insulated Pig-tail

The only effective remedy in such a case is either to reduce the number of convolutions in the spiral connector to, say, two or three, so that the turns do not actually touch when winding up or unwinding, or alternatively to take the pig-tail off altogether and replace it with a short piece of rubber-covered flexible wire.

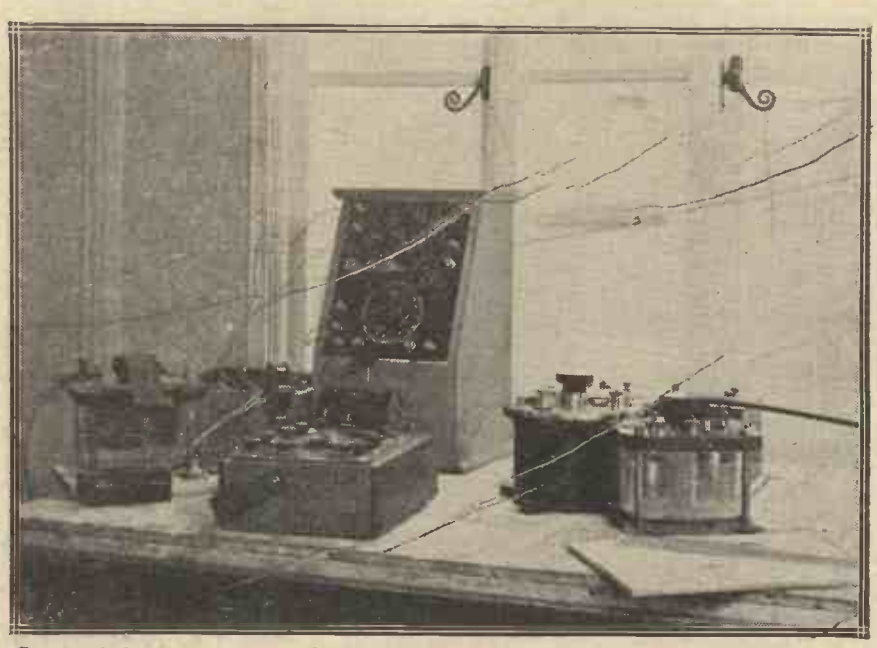


An insulated pig-tail connection is often to be preferred for short-wave work.

This latter is a most effective remedy and strongly to be recommended for all condensers used in short-wave sets, whether or not they are provided with a frictional contact in addition. A particularly good connection, of course, is ensured in this way, and it is practically impossible for trouble to develop at any later date.

Dust

A final hint: it is sometimes observed that a condenser causes noises when it is tuned, and continues to do so after you have assured yourself that the connection to the moving plates is in good order. It indicates that dust has collected between the vanes of the condenser.



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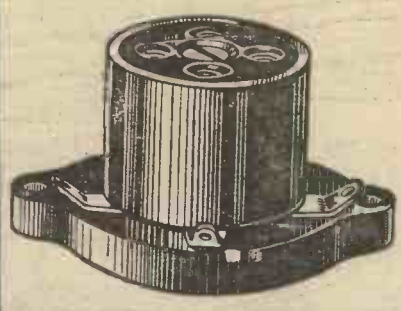

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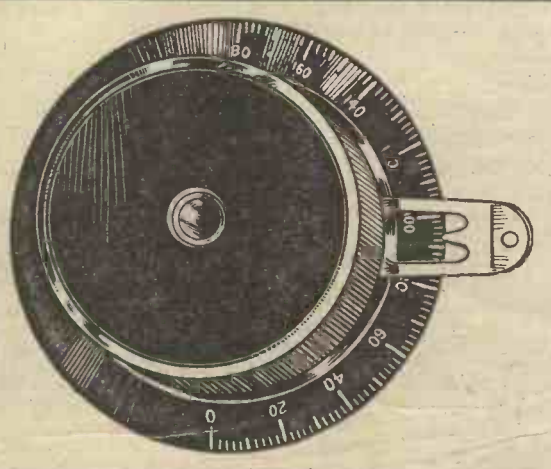

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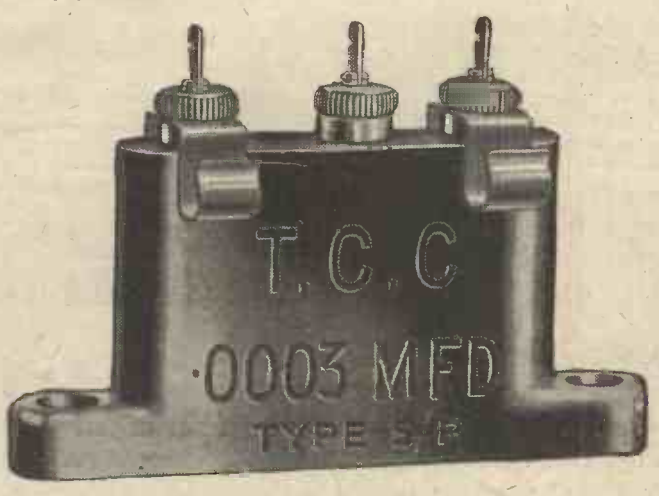

Don't take a chance on a Grid Condenser—for safety's sake specify T.C.C.

WHEN you find the sign T.C.C. stamped on the side of the familiar green moulded case you should appreciate its meaning. It signifies a Condenser manufactured by a firm with more than 20 years' experience in Condenser building. The whole of this period has been devoted to *Condensers only*. Obviously such a unique experience has resulted in an exceptionally high level of manufacturing practice being attained.

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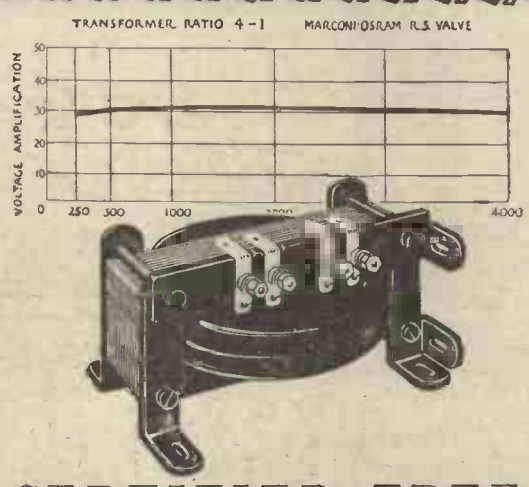

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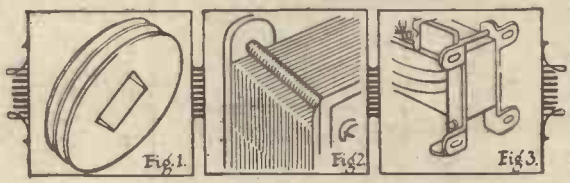
The Pye Transformer curve was plotted from figures officially certified by the National Physical Laboratory. It shows graphically that a very high amplification is obtainable on high and low notes without distortion: and that between 250 and 4000 cycles a second amplification is absolutely uniform.

Primary and Secondary windings are wound in special Bakelite bobbins and very carefully insulated (Fig. 1). The laminated core is 5·6 sq. cms. in area (Fig. 2). Voltages up to 300 v. can be used with perfect safety. All noise and crackling is eliminated. Double angle brackets allow the Transformer to be mounted in two positions (Fig. 3). Connexions can be made to screw terminals or to soldering tags.



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Ratio 2·5 : 1	Ref. No. 651	£1	2 6
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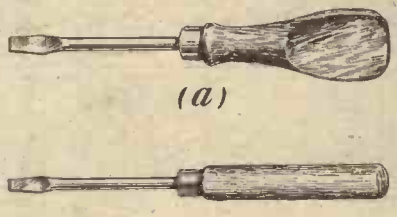
Screwdrivers

I AM often surprised when I go into a friend's workshop to find him using for wireless constructional work a screwdriver of the pattern seen in Fig. 1A. If you take a screwdriver of this kind into your hand, you will find that you cannot perform the motion needed for driving in or extracting a screw without turning your wrist. Without putting the edge of the blade into the nick of a screw, turn the screwdriver in either direction in the air. Its point will wobble, moving eccentrically away from the body if you turn in a screwing-in direction, and towards the body if you reverse



(a)

(b)

Fig. 1.—For wireless work the round-handled screwdriver (b) is to be preferred.

the motion. This means that when a screw is being dealt with there is a tendency for the point of the blade to move across the notch when force is applied, and the screwdriver is likely to slip, especially if its point is not quite correctly ground.

A Better Handle

Now try the same experiment with the screwdriver seen in Fig. 1B, which has a rather thin, round handle. The upper end of the handle rests on the palm of the hand near the base of the third finger. The thumb and the first three fingers close round it, and impart the necessary motion, without there being any turning of the wrist. The point of the blade hardly wobbles at all, even if the screwdriver is turned in the air, and when it is in use for its proper purpose there is much less tendency for it to slip than is the case with the flat-handled tool.

The flat-handled screwdriver is very useful where a good deal of force has to be employed, since the fingers alone will not suffice here, and the wrist must be used. In wireless work, however, one seldom requires to exercise any strength in the tightening of a screw, and the round-handled screwdriver turned by the fingers will do all that is necessary, the wrist being used, if need be, to give the final half-turn to each screw.

How Long Is It?

What is the length over all of the screwdriver which you use for your wireless work? Many constructors use short tools six inches or so in length, feeling probably that the long screwdriver might be found somewhat unwieldy. Try it and see: you will, I think, be surprised to find how much handier the long screwdriver is for most of the work that comes your way. One that I use myself for dealing with 4B.A. and 6B.A. screws is 11½ in. over all, the blade measuring just over 7 in. in length, and the handle, including the ferrule, just under 4½ in. The handle is ¾ in. in diameter in the middle, tapering towards either end. The width of the blade is 3/16 in.

This kind of screwdriver may be bought from any good tool shop, and to those who have previously used only short patterns the delightful ease of using it will come as a revelation. So far from being unwieldy, it is actually very much simpler to use than the short screwdriver, even if the latter has a round handle.

Improving Shears

I have always heard that tinsmiths develop a special muscle which enables them to use their shears easily and comfortably. Not having this muscle myself, I must say that I find cutting metal with tin shears rather a trial, since one has to stop after each snip to open the blades again. Here is a simple tip for improving tin shears which works excellently, and which most constructors will find a great help. Obtain first of all a large, stiff old clock spring—any clock repairer will be glad to let you have a broken one, which is all that is required for the purpose.

Making the Spring

Cut off a suitable length and bend it approximately into the shape shown in Fig. 2. To do this you will have

The Birmingham children's orchestra, conducted by Mr. Cyril Johnson, giving their first broadcast from 5IT.

to "let down" the ends by heating them, and allowing them to cool slowly. Drill two holes at one end, and fix the spring by means of screws or rivets to one of the handles of your shears. It is not usually necessary to re-temper the ends, but this may be done if desired by heating them and plunging them into oil. If the spring is sufficiently strong, it will keep the shears open, as shown in the drawing, when they are out of use, and when metal is being cut the blades will separate automatically as the grip of the hand is relaxed.

A Saver of Time and Trouble

The spring must not be too strong, for if this is the case one's hand is rapidly tired, owing to the force required in order to make a cut with the shears. I found the clock spring tip such a great saver of time and trouble with tin shears that I have since tried it for cutting pliers of various kinds. Here again it is most useful, as any who care to adopt the idea will find. I did once have a pair

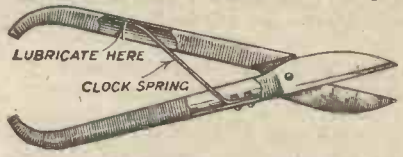


Fig. 2.— By fitting a spring to the handles, shears can be made to open automatically.

of metal shears made on the lines of a tailor's shears. They had large loop handles, and the blades were short and very strong. Unfortunately, I lost these some time ago, and I have not since been able to find a shop which keeps them.

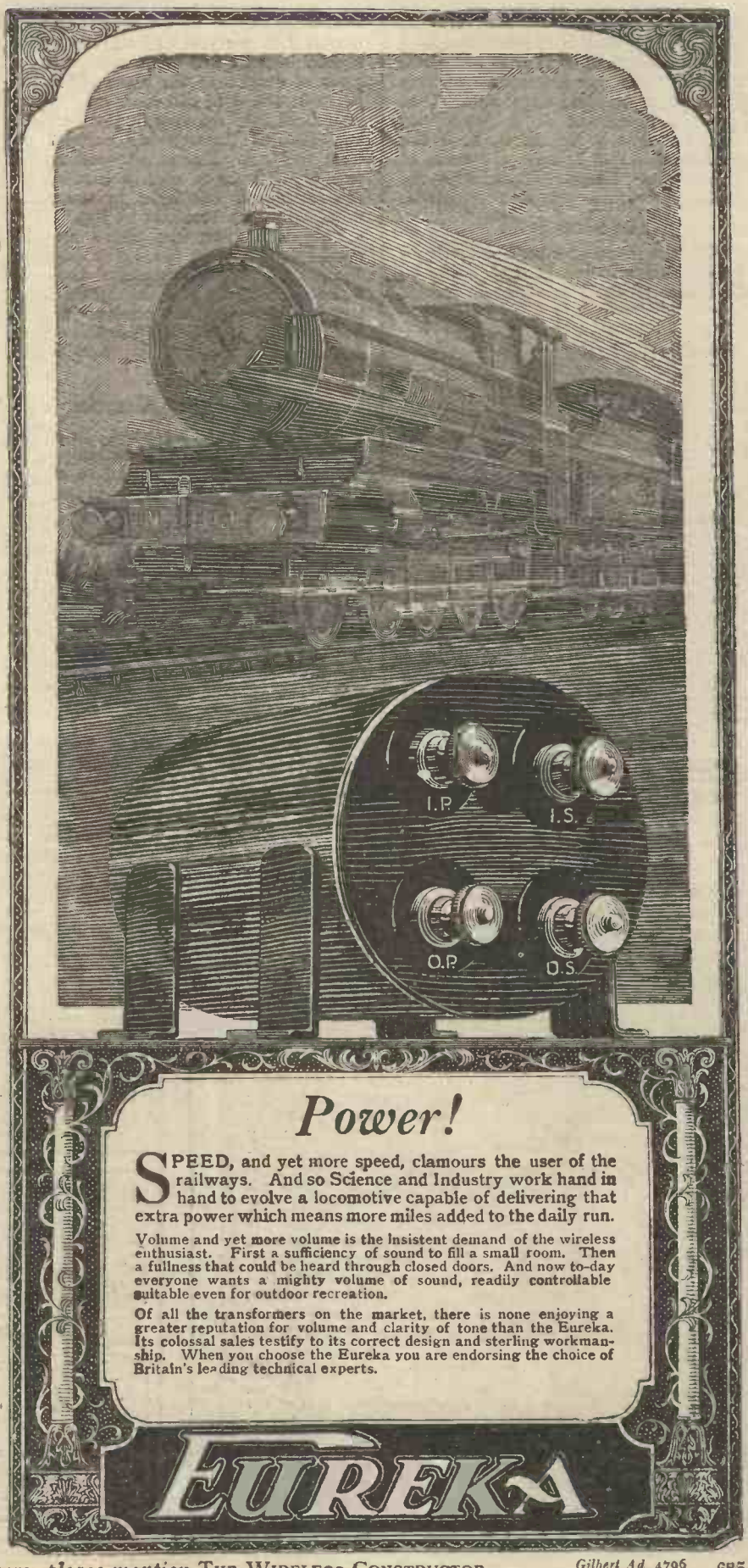
Mounting Vertical Panels

A job which is apt to puzzle those who undertake it for the first time is that of attaching a vertical panel neatly to a baseboard, in such a way that the lower edge of the former is exactly flush with the bottom of the latter, and that the two are perfectly trim and square. It is necessary in the first place to make sure that the edges of the panel are straight, and that its corners are square. Those who are tackling an ebonite panel for the first time will find that it pays to purchase it ready cut to size with ground and finished edges. The cost is very little extra when the panel is ordered in this way, and it is usually well worth while.

How Many Wood Screws?

A most satisfactory way of fixing a panel to a baseboard is to use a bracket at either end and to drive wood screws—one for each 4 in. of length is a satisfactory allowance—through the panel into the edge of the baseboard. Begin by drilling and countersinking the holes for these. The drilling centres should be at a distance equal to half the thickness of the baseboard from the lower edge of the panel.

Next fix your brackets to the base-



board, taking care that the faces of the upright portions are exactly flush with its edge, and that they are quite straight. You can make sure of this by using a straight-edge rule. Now place the baseboard on a flat-topped table, and get a friend to hold the panel in position against the faces of the brackets. Stand yourself with the baseboard between you and the panel.

The First Hole

With the point of a scriber mark on the ebonite a point corresponding to the centre of the lower hole in one of

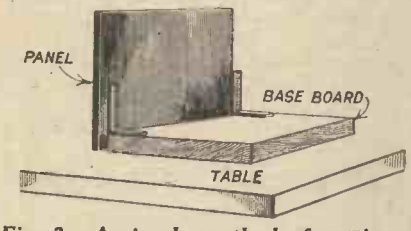


Fig. 3.—A simple method of getting a good fit when fastening the panel to the baseboard.

the brackets, taking great care to see that the panel is exactly in position when you do so. Lay the panel face downwards, make a punch mark at the point indicated by your scriber prick, and drill the required hole. Pass a screw through the panel and the bracket, put on a nut and turn hard down.

Finishing the Job

Deal next with the lower hole in the other bracket. Get the friend who is helping you to hold the panel tightly against this bracket, pressing a piece of wood over the place where the point of the drill will come out. Put your drill into the hole in the bracket, and take it through the panel from back to front. Put in a second screw, and tighten down with a nut. Drill the remaining two holes in the same way, using the brackets as jigs.

This done, you can drive in the wood-screws along the lower edge of the panel, which completes the job. Suitable brackets are obtainable from any ironmonger or wireless dealer. Those which I generally use have horizontal and vertical portions $2\frac{1}{2}$ in. in length.

Piercing Thin Material

I referred not long ago in these notes to the difficulty of making neat, clean-cut holes in such stuff as copper foil or very thin sheet brass, the trouble being that if one uses a drill a tear is apt to occur. I have just found a way of making these holes which many readers will find useful. This is to use for the job one of the punches intended for piercing papers for filing purposes. Simply insert the foil that you wish to pierce under one of the plungers of the punch, as shown in Fig. 4, press the lever down sharply and you will find that a neat hole results.

If the foil is very thin or very soft it is best to place a sheet of stiff paper below it before punching. This tip can be used for making neat holes in other materials besides foil that are difficult in the ordinary way to pierce cleanly. I have found it excellent for both mica and for very thin ebonite

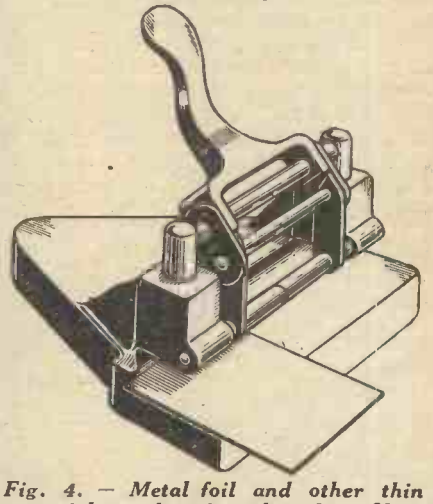
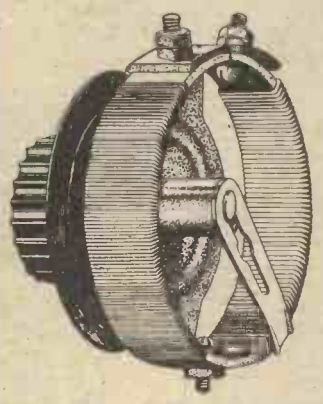


Fig. 4. — Metal foil and other thin material can be pierced with a filing punch.

of the kind that is often used for covering the windings of transformers. An alternative to the filing punch is the punch used by saddlers for making holes in leather straps, which is obtainable quite cheaply in various sizes. When this is used the material to be pierced must be placed upon a block of lead; the punch is then given



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E. K. COLE (Dept. D), 505, London Road, WESTCLIFF-ON-SEA.

one sharp tap with a hammer, which drives it through and leaves in the material as clean a hole as can be desired. Here, again, if the material is very thin a sheet of stiff paper should be used below it so as to make quite sure that there will be no jagged edges.

Worn Drill Chucks

When the wheel brace or bench drill has been in use for some time the jaws of the chuck are apt to become worn, so that they will not grip very small drills firmly. Provided that the chuck will still hold drills of medium size satisfactorily there is no need to scrap it, since for a shilling you can purchase the little tool shown in Fig. 5. This is known as a spring chuck, since its jaws are formed by cutting slots in a drilled metal rod, and spring naturally apart. They are brought together and caused to grip a drill by the action of the threaded cone which screws on to the rod. A chuck of this kind will grip little drills firmly, holding them so that they are properly centred. Its shank fits into the jaws of the drill chuck itself.

Spare Chucks

When the jaws of a self-centring drill chuck become so badly worn that they will not hold properly the larger drills that one commonly uses for wireless constructional work, there is no need to scrap the whole tool if it is of good make. Most large tool shops stock spare chucks, which are by no means expensive. Fit your old drill with one of these, and it will be as good as new, so long as the gears are in respectable condition.

Do not forget, by the way, if you

Fig. 5.—A spring chuck for fine drills.

are ordering a new chuck to obtain if possible one that will take drills up to $\frac{3}{8}$ in. One uses this size a good deal for mounting one-hole fixing components as well as for making the holes for the spindle bushes of rheostats and so on. It is therefore a considerable handicap to have a chuck that will take nothing bigger than a $\frac{1}{4}$ in. or $\frac{5}{16}$ inch drill.

Useful Flex Leads

The experimenter who is frequently engaged in making "hook-ups" of new circuits will find it most convenient to keep on his wireless table a box containing a number of pieces of flex of various useful lengths. If the ends of these leads are tagged they will last indefinitely, but if the strands are left unprotected they soon break and the ends become straggly. The job of tagging rapidly a large number of flex leads is an easy one, and it is well worth while to undertake it in a spare half hour. The best tags to use are those of the type shown in Fig. 6, which are intended primarily for use with screw-down terminals. These are known as spade tags.

The width of each arm of the fork portion may be slightly reduced with the tin shears if necessary, to enable these tags to be used for making connection to telephone terminals. When this has been done one simply pushes one arm into the hole of the terminal and turns down the point of the screw upon it.

Quick Tagging

Tags are so cheap that it is not, as a rule, worth while to make them,

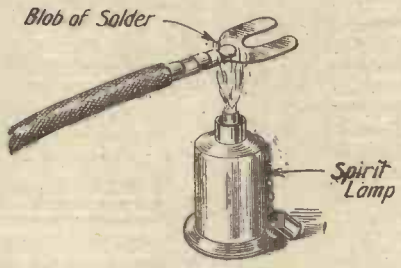


Fig. 6. — Leads can be tagged very simply by this method.

though they can be cut, if desired, from sheet brass. When you undertake the task of tagging a large number of leads tackle it in the following way. Begin by clamping with the pliers a tag to each of the ends to be treated—I find that round-nosed pliers are the handiest for this work. Apply a little flux both to the wires and to the tag. Next with the tin shears cut from a stick of blowpipe solder a number of chips each about the size of the head of a match. Light a spirit lamp or bunsen burner. Take the first prepared lead, place a blob of solder at the top of the "neck" of the tag as shown in the drawing, and hold in the flame of the spirit lamp until the solder runs. This is only a matter of a few seconds, and by working on the lines suggested one can tag a wonderful number of leads in an odd half hour.

The same method may be used successfully for tagging the ends of square tinned rod when it is desired to make connections with this material to the terminals of transformers and so on whilst wiring up a receiving set. It is both quicker and more satisfactory than doing the soldering with an iron.

BLUEPRINTS OF THE "MIDGET" RECEIVER

IN response to numerous requests we have made arrangements whereby readers can obtain blueprints of the "Midget" single-valve receiver, described by Mr. A. S. Clark in the May, 1925, issue of this journal.

The blue prints will be obtainable on application to the Sales Department, Radio Press, Ltd., Bush House, W.C.2, and are priced at 1s. 6d. each, post free.

The broadcasting studio at the Ideal Home Exhibition. Olympia was flooded with music by the Marconiphone Public Address System, the microphone used for the purpose being that in the centre of this photograph.

ANOTHER WORLD'S RECORD

CONTINUOUS DAYLIGHT RECEPTION

from

AMERICA

with

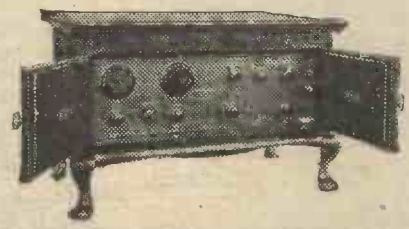
THE CURTIS Double-Circuit Super-Het 8

..... I thought it might interest you to know that on Sunday last, the 14th inst., whilst experimenting about 2 o'clock in the afternoon on my Curtis Super-Het., I was surprised to hear a voice say "Hullo, New York." After this was repeated several times a voice was heard "Hullo, England!" "Hullo, London!" and London was heard to ask from what spot they were talking and the reply came back "about 20 miles from New York." For the remainder of the afternoon I was able to listen to a series of two-way talks between New York and London. During the afternoon Boston also had a chat with London. The strength was maintained fairly evenly and I was only using 7 valves.

This performance I consider clearly demonstrates what can be done on the set after a little experience.

You will note that I am living in the South of London about 4 miles from 2LO's aerial.

A.T.G., London, S.W.2.



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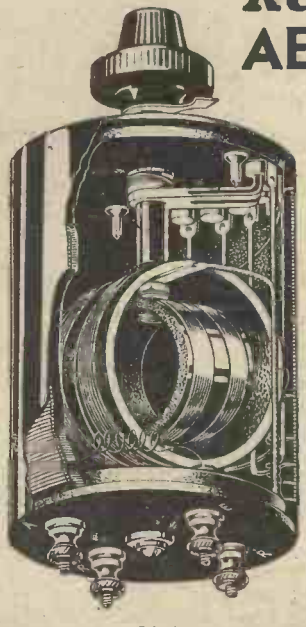

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A HOME-MADE PUSH-PULL FILAMENT RHEOSTAT

AN efficient home-made filament rheostat is not usually the easiest component to make up at short notice, but the one illustrated was made up in a few minutes and has been in use satisfactorily for some time.

Very little is required, and the figure should make the actual construction quite clear. You will require a bobbin (an old cotton reel was used), a wooden rod which should fit tightly into the hole in the bobbin and a knob into which has been fixed a short length of threaded rod. Two terminals, a piece of springy brass, a square of wood, some Eureka or nickel-chrome resistance wire, and, if desired, a bush may be fitted.

The Resistance Element

Wind on the bobbin sufficient resistance wire to give the necessary resistance. No. 22 S.W.G. Eureka has a

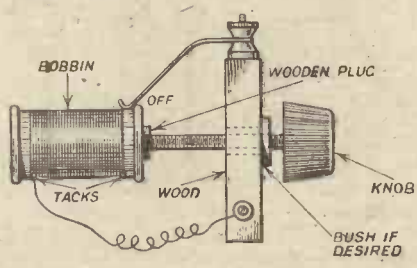


Fig. 1.—A vernier control is obtained by twisting the knob, whilst pushing or pulling the knob gives a coarse adjustment.

resistance of approximately 1 ohm per yard, so that if a 6 ohm resistance is required, you will need 6 yards of wire. This will carry 2.2 amps. without overheating. If 26 S.W.G. Eureka wire is used (and this is recommended for dull-emitter valves), it has an approximate resistance of 2½ ohms per yard, so for a 30-ohm bobbin 12 yards of wire will be necessary. This will carry 1 amp. without overheating.

In winding on the bobbin the wire should be very slightly spaced to prevent shorting of the turns. A little coil should be left, as shown in the figure, to allow the necessary back and forth movement of the bobbin.

Finishing and Assembling

The resistance wire should be twisted round two small tacks in the positions shown to prevent slipping, and a small space left at one end of the bobbin for an "off" position. The piece of brass rod in the knob should be pointed and screwed into the end of the wooden rod which carries the bobbin. Having mounted the bobbin on the wooden rod, push the brass rod through the hole in the wooden block, screw on the knob, mount the two terminals and make a contact arm from brass strip and bend to the shape shown. It should be of sufficient length to rest on the space left on the bobbin when pushed in to its fullest extent.

A fine control of resistance is given by twisting the knob, as the metal tongue makes contact between two turns of the resistance element as it travels. This enables a small variation of the resistance to be made.

A SEMI-PERMANENT DETECTOR

THE permanent detector is now recognised as being a very desirable addition to any crystal set, while it is realised that the cat-whisker-crystal detector usually gives superior signals, from the volume point of view, to those from a double crystal. In the latter type we have the advantages of a permanent or semi-permanent contact.

The following component was made in a few minutes, and while having all the permanence of a double crystal detector also incorporates the crystal-catwhisker contact with its attendant advantages of louder signals.

It may be mounted on the panel direct or as a separate unit. Fig. 2 shows the simplicity of the construction. Nothing is required other than what may be found in the junk-box.

Materials Required

Procure a small piece of ebonite; drill two holes in it, one for the terminal and the other for the crystal cup. The exact distance between these two holes is quite immaterial. In the crystal cup mount a good piece of crystal—any one of the synthetic galena type may be used. Take a length of copper wire and shape as shown in the figure. The little spring immediately over the contact point is made by wrapping part of the wire round a nail or other rod of about ⅛-in. in diameter. Clamp one end of the wire under the terminal nut and bend the wire so that it rests with a light contact on the crystal. Its natural springiness will cause it to retain its position.

Adjustment

Now connect up the detector to your crystal set, and while listening to the signals, find as sensitive a spot

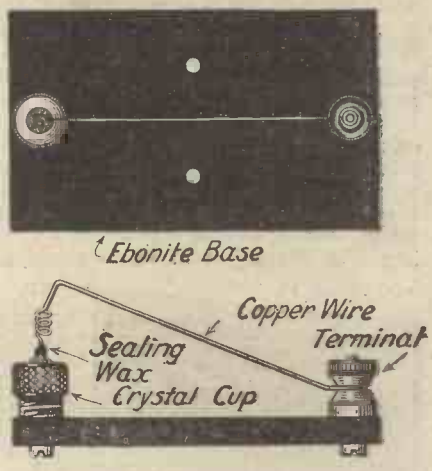


Fig. 2.—The construction is very simple and the above diagrams give all the necessary details.

as you can get. When you have made sure that you are getting good signals, take a piece of sealing wax and, holding this in such a position that it will drip on to the face of the crystal at the point of contact of the wire, apply a match to the wax. Allow enough to drip to fix the wire firmly to the crystal, and allow to set. This completes the component. After some months it may be found that the spot in use becomes desensitised. All that is necessary is to melt the wax off the crystal and proceed again as described.

Wireless Weekly Every Wednesday 3d.

AUTO-COUPLING AND THE VARIOMETER

By H. J. BARTON-CHAPPLE,
Wh. Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

A selective crystal receiver employing a variometer in a novel manner.

READERS of THE WIRELESS CONSTRUCTOR and other Radio Press journals will have noticed a great deal of discussion concerning the best type of aerial circuit to employ in order to meet the conditions imposed mainly by questions of environment.

The Needs of the Crystal User

The exigencies of the moment seem to demand a greater degree of selectivity than was necessary when the number of transmitting stations was smaller, and in this connection the needs of the crystal user have not been forgotten. Since this is a constructional article, it will not be in keeping with the object in view—namely, to give details of the crystal set—if we study the merits and demerits of various aerial circuits.

The greatest trouble experienced by crystal set owners situated in localities where spark interference is troublesome is to obtain a sufficient degree of selectivity to reduce this annoyance.

Auto-coupling

Although an auto-coupled aerial circuit does not generally give such a high degree of selectivity as one with a separate aerial winding, the difference when suitable adjustments are made is not very great. The application of a variometer to an auto-coupled scheme was pointed out by Mr. G. P. Kendall in the March, 1926, issue of *Modern Wireless*, and the crystal set to be described in this article makes use of this principle.

An Explanation of the Circuit

The theoretical diagram is given in Fig. 1, and it is seen that if terminal A_1 is used, the aerial is brought to one side of a condenser C_1, the other side of this being connected to the junction of the fixed and moving windings of the variometer. The terminal at the end of the moving winding of this variometer is connected to earth through a loading coil L_2, while the

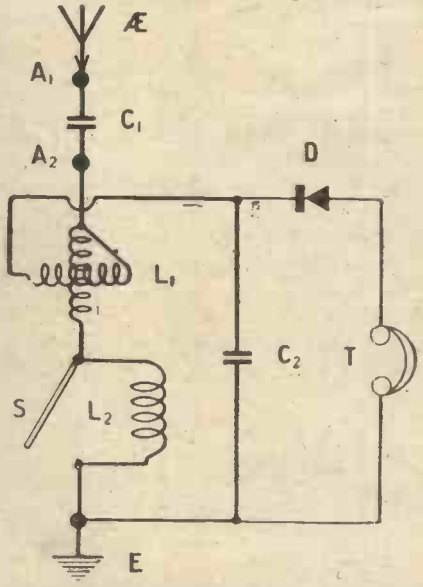
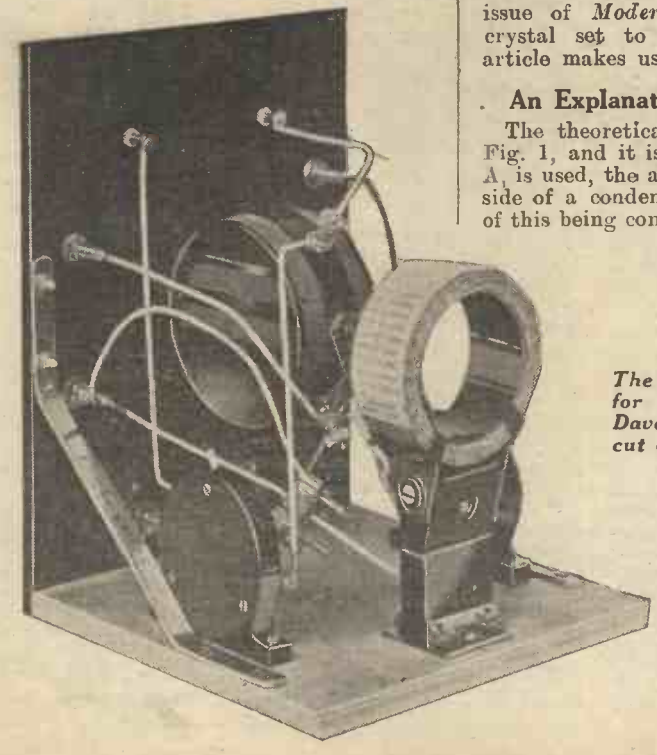


Fig. 1.—Condensers C1 and C2 are of multi-capacity type and their best values are found by trial.

end of the fixed winding is joined to the crystal, the usual pair of telephones completing this portion of the circuit to earth. A condenser C_2 is connected across the crystal and telephones.

Condenser Values

When testing out this circuit I made C_1 and C_2 variable condensers, but this is a refinement which would only make the cost of the complete crystal set unduly large, so a compromise was effected by employing multiple fixed condensers. These condensers are supplied in two ranges—.0001 to .0015 and .001 to .015, the former range being used in this case.



The plug-in coil is used for the reception of Daventry and can be cut out of circuit when desired.

Elstree Tests :

Simple operation ; efficiency above the average.

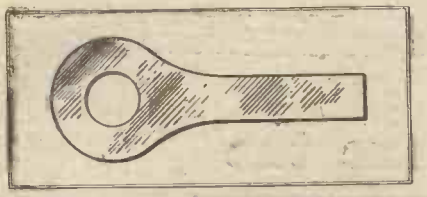


Fig. 2.—A brass tag cut to this shape must be made for the variometer spindle.

By joining one lead to the soldering tag marked 000, and clipping a second lead to any of the soldering tags marked 1, 2, 3, 4 or 5, capacity values from .0001 to .0005 are possible, while higher values are secured by connecting these in parallel.

The coil L, is an ordinary plug-in coil to enable the set to receive 5XX when so desired, but for the local station, on the ordinary broadcast band, this coil is short-circuited by the link S.

Components and Materials

One ebonite panel, 8 in. by 6 in. by ¼ in. (Peto-Scott Co., Ltd.).

One baseboard, 6 in. by 6 in. by ⅜ in. (Peto-Scott Co., Ltd.).

One cabinet (with hinged lid) in oak (polished) (Pickett Bros.).

One crystal detector (panel mounting type) (Service Radio Co., Ltd.).

Two multiple fixed condensers (.0001 to .0015) (C. A. Vandervell & Co., Ltd.).

One variometer (Maxtone) (Watson Jones, Ltd.).

Two "Lico" spring clips (Peto-Scott Co., Ltd.).

One baseboard coil holder (Burne-Jones & Co., Ltd.).

Two "Eddystone" aluminium brackets (Stratton & Co., Ltd.).

Seven nickel-plated terminals.

Packet Radio Press panel transfers.

Small quantity of Glazite, short length of square wire, three wood screws.

Notes on Components

The above list of components and materials employed in making this set is given in accordance with our usual practice, but it will be understood readily by any potential constructor that it can be varied according to taste, provided any substituted components are of recognised quality, such as are advertised in the columns of this journal.

In addition, if other components are employed, it will be necessary to ensure that the apparatus in question can be conveniently accommodated in the allotted space, while attention must be paid to any consequent alteration in the wiring. The theoretical diagram of Fig. 1 must then be referred to.

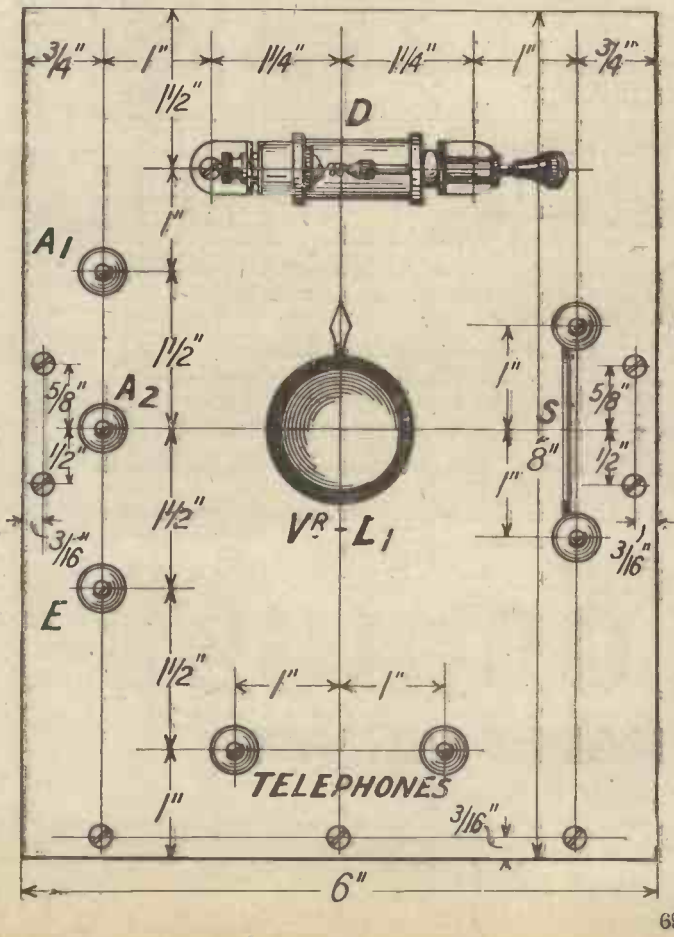


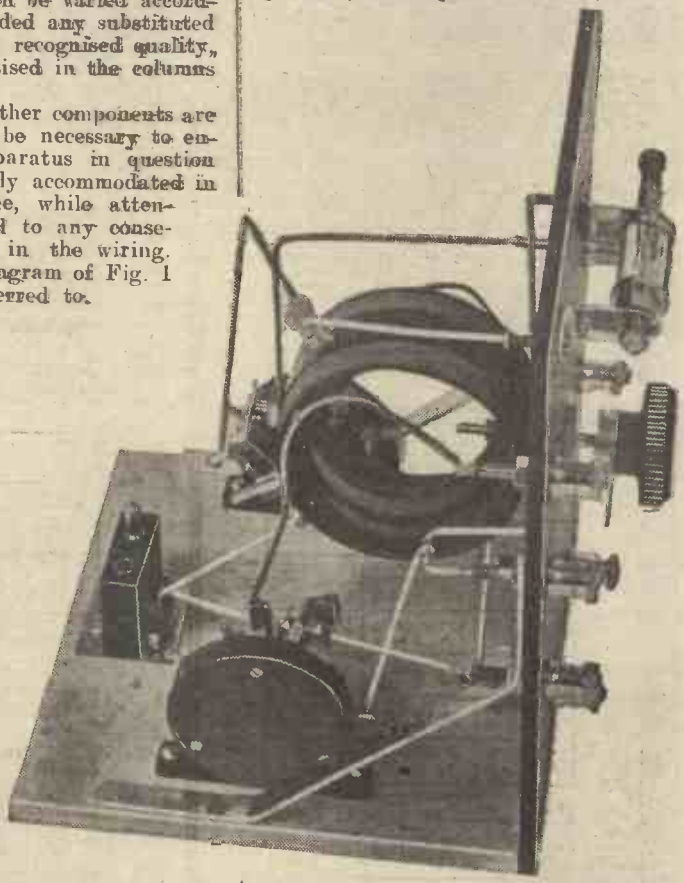
Fig. 3.—Drilling dimensions for the panel layout are given here. Blueprint C 1042A.

The Panel

Complete panel details are given in Fig. 3, and the necessary centres for drilling the holes should be carefully marked out with a centre-punch on the back of the ebonite panel. Having drilled holes of the requisite size, the wooden baseboard must be screwed in position, and the aluminium brackets attached to maintain rigidity, this preferably being accomplished with the baseboard and panel in the cabinet. Next mount the seven terminals and crystal detector.

An Important Detail

Before fixing the variometer in position, cut a piece of thin brass to the shape shown in Fig. 2. This must be slipped over the variometer spindle so as to be held in place between the nut and the back of the ebonite panel when the variometer is screwed into position. This spindle is usually the junction of the stator and rotor windings of the variometer, and in this set connection has to be made to the junction from the aerial.



An end-on view showing the connections to the earth and two aerial terminals.

Wiring

Before fixing the two condensers and coil socket on the board, part of the wiring should be carried out while the positions are quite accessible.

Join the top terminal of the variometer to the crystal detector, and the other side of the detector to 'phones, and thence to earth. The lead from A_2 to the brass junction piece can also be soldered in position.

Take the SHORTPATH to Better Reception

KEEN constructors are continually seeking fresh methods of obtaining better results from their sets. There is now available one simple method—one SHORTPATH to improved results.

The unique construction of the "Cosmos" SHORTPATH valves, whereby the path between filament, grid and anode is reduced to an absolute minimum, enables results to be obtained unequalled by any other valve of the one cell accumulator class.

Compare their characteristics with published figures of other makers:

	S.P.18 Red Spot	S.P.18 Green Spot
Voltage Amplification Factor (μ). ..	7	15
Impedance	7,000	17,000
Mutual Conductance (g) micromhos	1,000	850
Figure of Merit $\sqrt{\mu g}$	84	113

"Cosmos" S.P. 18 Valves provide a

SHORTPATH to: { MORE POWER / FAITHFUL REPRODUCTION / GREATER ECONOMY }

S.P. 18 valves consume 0·3 amps., at from 1·6 to 1·8 volts. and require only a single cell 2-volt accumulator. They are recommended for use as shown in adjoining table.

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HIGH FREQUENCY STAGES:	
Tuned Anode	Green ●
Transformer Loose Coupling	Red ●
.. Tight Coupling	Green ●

If set oscillates use Red ● for all H.F. stages, especially for dual stage valves.

OTHER STAGES:		
STAGE	TRANSFORMER COUPLING	RESISTANCE CAPACITY COUPLING
Detector	Green ●	Green ●
L.F. (1st Stage)	Green ●	Green ●
L.F. Intermediate	Red ●	Green ●
L.F. (Last Stage)	Red ●	Red ●

Price, Red or Green Spot, 12/6

The "Cosmos" D.E 11 Dull Emitter Valve takes 0·25 amp. at 1·1 Volts. and is a splendid Dry Cell Loud Speaker Valve.

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Cosmos
RADIO VALVES

Now mount the other components and complete the wiring according to the wiring diagram of Fig. 4, a rubber-covered flexible lead with a spring clip attached being taken from the terminal A_1, and another from the bottom terminal of the link S.

The Finished Receiver

The appropriate Radio Press panel transfers should now be affixed to the front of the panel in the usual manner, and, since the terminals, detector, variometer pointer and screws are all nickel-plated, the finished receiver will present quite a neat appearance.

Testing Out

Join the aerial lead-in wire to A_1, connect up the telephones and earth and short-circuit the two right-hand terminals with the link S, which in this case was made from a short length of square section tinned wire. Adjust the spring clips so that condensers C_1 and C_2 each have a capacity of .0001, and turn the variometer knob until the local station is heard at maximum strength with the catswhisker adjusted to a sensitive spot on the crystal.

Note the strength of the signals, and then adjust C_2 to .0002, retune, and again note the signal strength. Various values of C_1 and C_2 should be tried in this manner until the best combination is found.

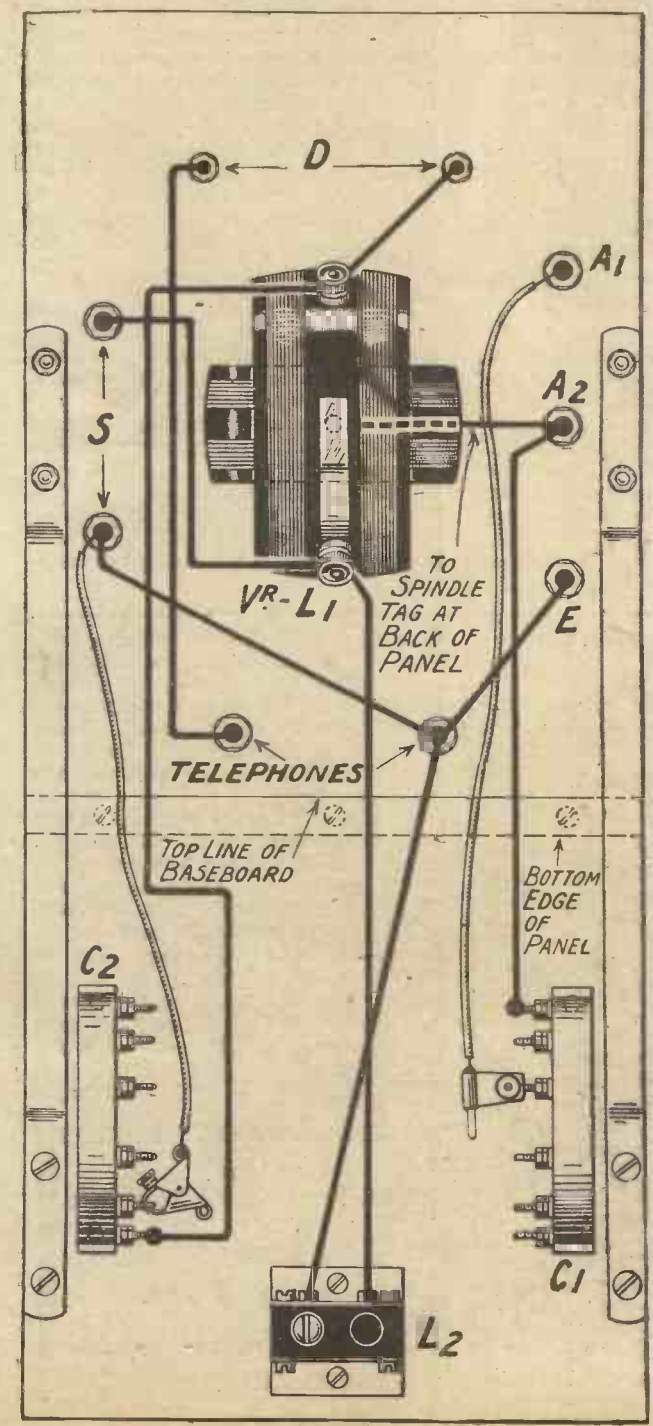


Fig. 4.—The wiring diagram. Note that the tag shown in Fig. 2 is placed between the variometer and the panel, being slipped over the spindle. Blueprint C 1042B.

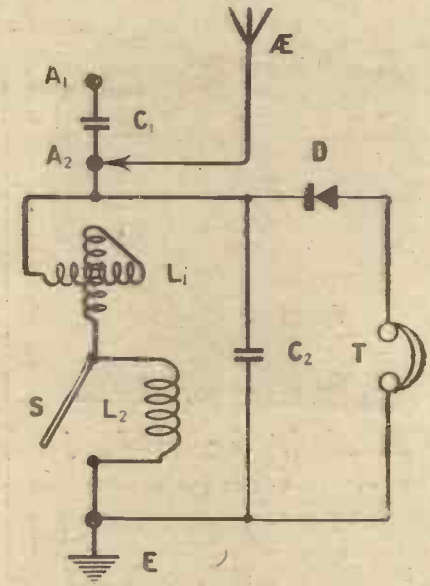
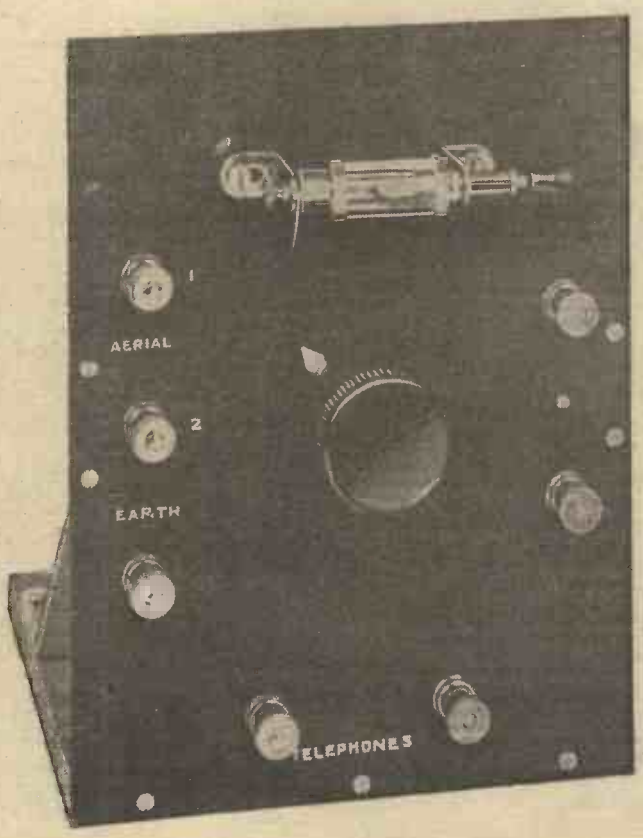


Fig. 5.—For purposes of comparison the circuit of the receiver can easily be changed to a "straight" arrangement.

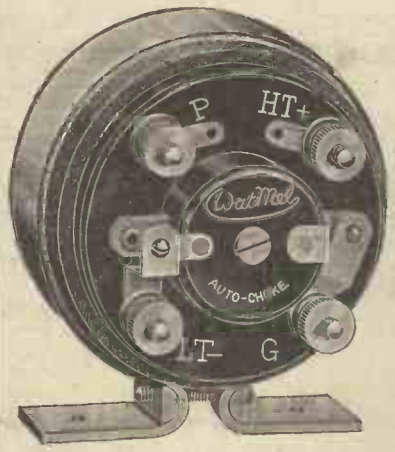
Test Report

When tried on an aerial of reasonable efficiency 9½ miles outside London, that station came in at good average strength, the combination of the condensers best suited to my case being C_1 = .0001 and C_2 = .0002, although with C_2 = .0001 the signal strength differed but little.

The receiver was found to be quite selective, inasmuch as signals vanished



A photograph of the panel front.



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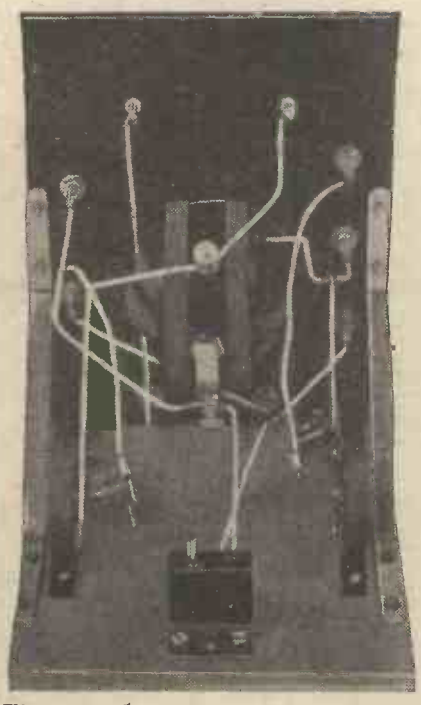

The general direction of much of the wiring can be seen.

completely with but little deviation of the variometer knob from its maximum position. This feature, of course, is the one which had been borne in mind when designing the set, and will commend itself to those listeners situated in coastal or other districts where spark interference is objectionable. The effect of joining the aerial lead-in wire to terminal A_3 should be tried, thus eliminating condenser C_1 from the aerial circuit. Signals will still be strong, but the set, on the whole, will not be so selective.

Daventry

When reception of the Daventry programme is desired, open the link S and insert a plug-in coil into the L_2 socket, a suitable size being a No. 150 or 200, or, of course, the equivalent in lettered makes. Tuning is accomplished in the same manner as before, and the strength of the signals will naturally vary according to the distance of the receiving set from 5XX.

An Experiment

In view of the fact that this simple adaptation of the variometer may not have been apparent to many experimenters and constructors, it would serve a useful purpose if a comparative test was tried by anyone making this set. To accomplish this the only alteration necessary is to take the connection from A_2, which previously had been made to the junction of the stator and rotor windings, to the point directly connecting the crystal and one winding of the variometer.

A Simple Alteration

This simple alteration is indicated in Fig. 5, and it will probably be found that the aerial connection will have to be joined to A_2. The effect of various values of C_2 can be tried, provided, of course, tuning to the local station is still possible, and the constructor will then appreciate the benefits derived by the slight modification introduced into the original receiver from the more orthodox crystal set arrangement employing a variometer.

LOW-LOSS AND THE REINARTZ CIRCUIT

Sir,—In your pages I have seen many letters in praise of your excellent sets, but not one referring to the one I selected and which I regard as being among the best of them. I refer to the single-valve set described in your issue for September, 1925, under the heading of "Low Loss and the Reinartz Circuit," by G. P. Kendall, B.Sc.

Except for the substitution of different variable condensers, my set is identical with that described, but with the addition of a transformer-coupled note mag., which may be switched in or out as desired. For this purpose I have used an anti-capacity D.P.D.T. switch, by which the output circuit (comprising two H.T. positive terminals) is adjusted so that the same terminals can be used for telephones or loud-speaker, leaving all battery connections *in situ*, an idea I have not seen incorporated in any other set. At a distance of about six miles from 2LO that station and Daventry came in at satisfactory loud-speaker strength, whilst using 'phones on both valves I have had several Continental stations, besides Bournemouth. I may say that my aerial is none too good, consisting of a zig-zag wire at the top of the house.

Finally, as a family receiver, the set is, as are all Reinartz circuits, delightful to handle, and can be switched on or off by means of the rheostats and the switch mentioned, whilst Daventry and Radio-Paris can be received on the substitution of a single coil in place of a shorting plug.

Congratulations on your splendid paper, and to Mr. Kendall for such an ingenious arrangement of a deservedly popular type of circuit.

East Ham, E. H. ALLSOPP.

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THOSE LITTLE SCREWS!

By W. H. FULLER

Can you tell a cheese-head screw from a coach bolt? Do you know the tapping size for a 6B.A. screw? This article will tell you these and many other interesting facts about screws and their use.

THERE are so many sorts, shapes and sizes of screws that sometimes the amateur is at a loss to know which is the correct type and size to use. There are wood screws, metal screws, coach screws, and many others, all with their particular uses.

The wood screw is, perhaps, the most used of any, and at the same time the most misused of all. A wood screw is made with the same precision as the metal screw, and should be used as carefully.

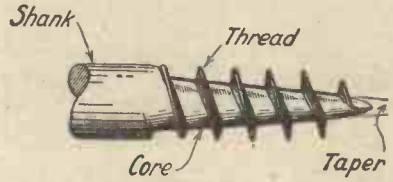


Fig. 1.—A wood screw thread is thin, so that it can cut into the fibres of the wood.

Wood Screws

Fig. 1 illustrates the threads of a wood screw. It will be noticed that the thread is thin, and can be likened to a piece of tape set edgewise on a tapering core. The thread is, however, thicker at the base than at the top, where it is more or less sharpened to a fine edge. It must also be noticed that the bottom of the thread is square, or nearly so, thus making the core nearly flat, and is so shaped that it will cut into the fibres of the wood and not burst them.

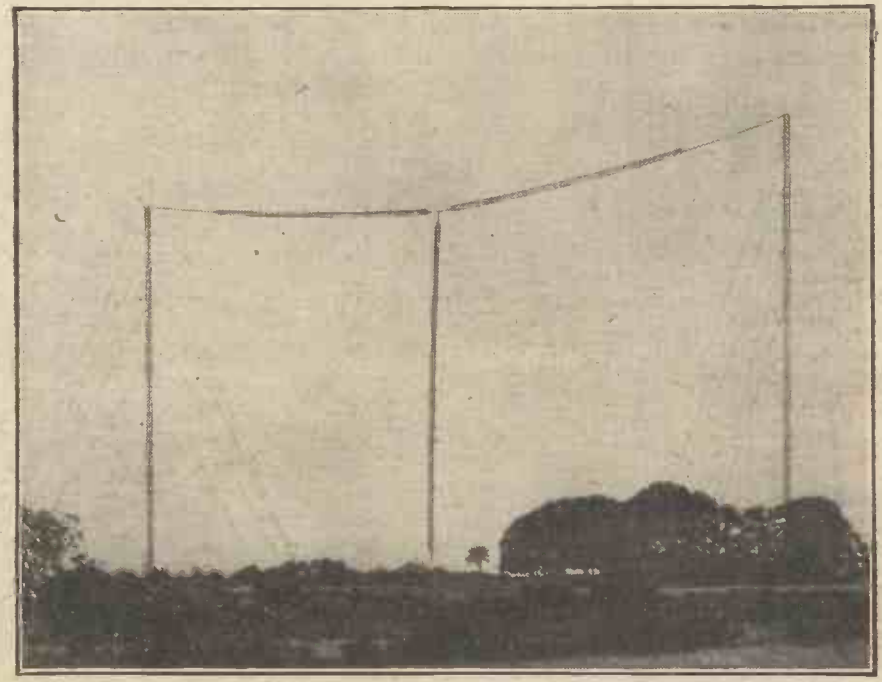
The depth of the thread is the same for nearly the whole length of the screw, only varying at the tip, where it decreases rapidly to form a sharp point to aid insertion in the wood, and also at the point where the thread joins the shank. The outside diameter of the screw, however, diminishes gradually to form a taper, and the core does likewise. The shank of the screw (the part directly below the head) is quite straight until it reaches the thread.

Sizes

Wood screws, besides being of different lengths, are also of various sizes, these being distinguished by numbers which follow the figures indicating the length of the screw. For example, in the case of the screw known as ¾ in. No. 4, the ¾ in. indicates the length of the screw and the No. 4 the thickness. In wire gauges the larger the diameter of the wire the smaller the gauge number, but wood screw sizes are reversed, and the thicker the screw the larger the number. The gauges in general use range from No. 2 up to No. 14, and a table is given above showing the correct drills to use for clearing the most-used sizes.

Table No. 1.—Wood Screws

Number.	Clearing Size.		Leading Size.	
	Morse.	Inch.	Morse.	Inch.
2	44	3/32	54	1/32
4	36	7/64	48	1/16
6	28	9/64	44	5/64
8	19	11/64	38	3/32
10	10	13/64	34	7/64
12	2	15/64	30	1/8
14	—	1/4	22	5/32



A distant view showing the immense masts and lead-in of the Daventry high-power station's aerial system.

Hard Wood

When screws are driven into hard woods, such as oak, it is advisable to drill first a small leading hole, as a precaution to prevent the breaking off of the screw. Brass screws will break easily in oak if this precaution is not taken, and, where possible, stout screws should be used.

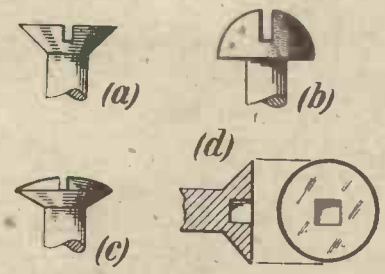


Fig. 2.—Here are the four commonly used types of wood screw head. (d) is more popular in the U.S.A. than in Britain.

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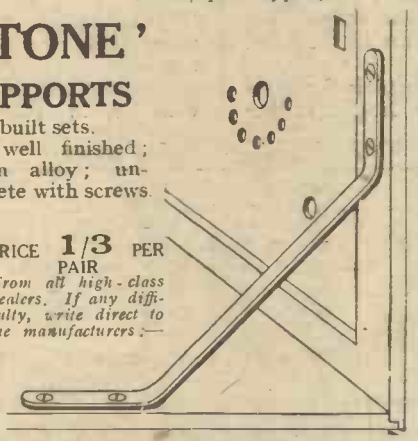

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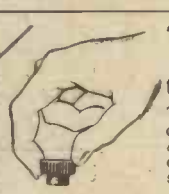

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the writer on very hard wood, box, ebony, etc., and also on thick ebonite, is to use the popular "Rawl-plugs." A hole is first drilled to the size of the plug with a twist drill, and the plug then used in the conventional manner.

The fourth and fifth columns of table No. 1 indicate the drills to use for making leading holes. The diameters of the drills are just a little smaller than the diameters of the cores of the screws.

Shapes of the Heads

Wood screws are made with various types of heads, these being shown in Fig. 2. The first of these (*a*) is known as countersunk, and should be always

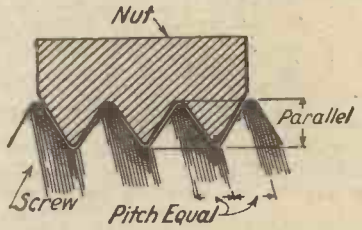

Fig. 3.—The metal screw does not taper like the wood screw, and has a totally different kind of thread.

used where a flush finish is required. The second (*b*) is a round-head, and may be used in any position where the underside of the head can be driven on to something hard such as a piece of metal.

This type of screw should not be used for fixing wood, as the sharp under edges of the head are liable to burst the surface of the wood. Even if a washer is placed under the head the wood is often damaged. The third (*c*) is known as raised head, and is a cross between countersunk and round-head, the top surface of the head being only slightly rounded. This type of screw looks particularly well on instrument panels, and is stocked by most ironmongers, although it appears to be unknown to many amateurs.

The "Square-Hole" Screw

A screw which is not very much used in England is also shown in Fig. 2, and is known as the "square hole," of which the Americans are very fond. A square hole is cut in the head of the screw, and it is driven in by means of a square-nosed key or bit. The main advantage of this type of screw is that when the screw gets old and rusty it is much more easily withdrawn than a slotted screw.

Table No. 2.—Countersinking Sizes

Number of Screw.	Drill.	
	Morse.	Inch.
2	24	5/32
4	5	13/64
6	—	17/32
8	—	5/16
10	—	3/8
12	—	27/64
14	—	31/64

The R.A.F. directional transmission station at Cove, Hants., as seen from an aeroplane. The masts and buildings are in the large field in the centre of the photograph.

Countersinking

In the absence of a countersinking "bit," drills (table No. 2) may be used for that purpose. The sizes indicated will just allow of the head lying flush with the top of the panel.

Standard Thread Screws

The next type of screw in general use is the metal screw, the thread of which is the same over the whole length of the screw, both as regards diameter and pitch. As opposed to wood screws, the shape of the thread is exactly the same as the groove which it forms.

A sectional drawing of a standard screw thread and nut is shown in Fig. 3. The pitch, i.e., the distance between the tips of two threads of a screw, depends upon the standard to which it is classed, and the number of threads per inch may be anything from 150, or even more, down to quite low figures such as one or two. Of course, the diameter of the screw more or less regulates the pitch, the smaller the diameter of the screw the larger the number of threads per inch.

Table No. 3.—B.A. Screws

B.A. Number.	Clearing.			Tapping.	
	Morse.		Inch.	Morse.	Inch.
	Fine.	Easy.			
0	—	—	1/4	9	3/16
2	13	16	3/16	26	9/64
4	27	26	5/32	35	1/8
6	35	34	1/8	44	3/32
8	43	42	7/64	51	5/64

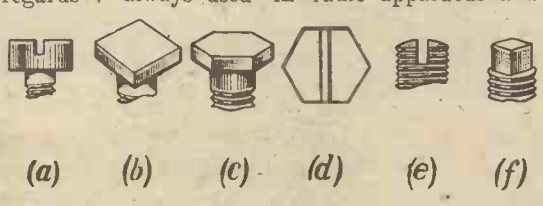

Fig. 4—In addition to the screw heads in Fig. 2, metal screws are made with several other shapes of head.

B.A. Threads

This, however, varies according to the standard used. As British Association screw threads are nearly always used in radio apparatus and other scientific gear, only figures for these standards are given. The sizes of holes for tapping and clearing will be found in table No. 3.

The second and third columns refer respectively to the drills which may be used for very accurate work and

for holes which are a fair distance apart.

Metal Screw Heads

The heads of metal screws are much more varied than the heads of wood screws. In addition to those already mentioned, there are cheese-head, Fig. 4 (*a*); square (*b*); hexagonal (*c*); hexagonal-slotted (*d*); and, of course, screws with no heads, usually called studs, with plain, slotted (*e*), square (*f*), or hexagonal ends. Many of these screws the amateur rarely uses, but they are often incorporated in ready-built components.

Coach Bolts

A further type of screw is the coach bolt, which is shown in Fig. 5. It has a raised head, but immediately below the head is a square shank, which prevents it turning round in the wood while the nut is being screwed up from the other end. These bolts are mentioned as they are particularly useful for some forms of aerial construction. These bolts may be had in a large variety of lengths and sizes and are usually obtainable at the ironmonger's or builder's store.

The studio of FPTT, Ecole Superieure, Paris, seems quite unimposing compared with our own B.B.C. studios.

The Coach Screw

Fig. 5 also illustrates the coach screw. The thread of this screw, although intended for wood, is not cut as is usual with the smaller types of wood screws, but is much larger and stronger. The heads are usually of two types, square or hexagonal, and are intended to be turned home with a spanner. A hole a little smaller than the core of the screw should be drilled in the wood for some distance so that the thread has a good chance of getting a grip in the wood. Unless this is done it is quite possible that the screw will strip itself out of the material.

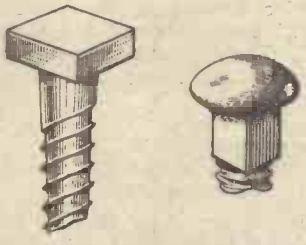

Fig. 5.—On the left is the coach screw, which has a strong thread, while a coach bolt head is shown on the right.

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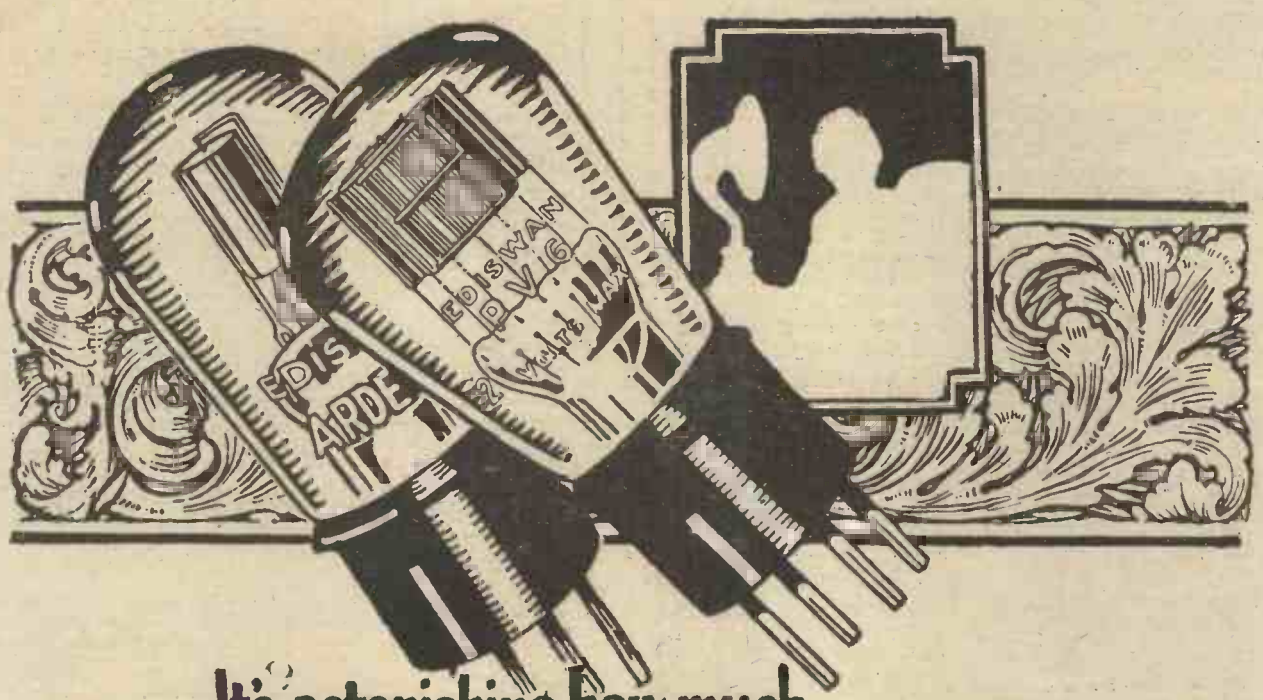

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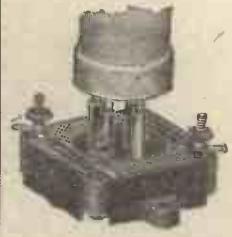

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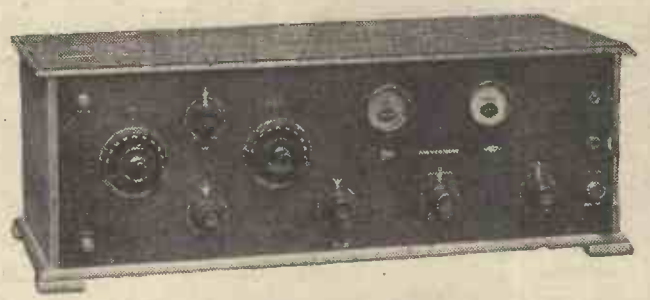

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Do not build a Super-Het in a haphazard manner without any definite idea as to whether your efforts will be successful. It is not sufficient to hope—more or less vaguely—that when the set is finished it will bring in distant stations on a silent background. Surely it is much better to commence the job confident in the knowledge that the set when completed will do the work you require of it. If you build the Keystone Super-Het with Keystone components, and adhere to the marvellously clear diagrams and instructions supplied, we definitely guarantee you good results worthy of a real Super-Het. Many have received as many as **30 stations on the Loud Speaker in one evening** and the set has even been known to operate a Loud Speaker in a car while travelling at normal touring speed.

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THIS MONTH'S PILOT SETS.

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"Pilot" kit of components	£6 2 0
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Polished Mahogany Cabinet	1 5 0

P.S. 4813

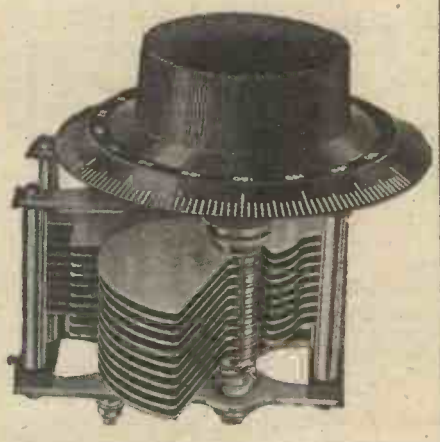
For "The Wireless Constructor" at our Elstree Laboratories.

"Cyldon" Variable Condenser

MR. S. S. BIRD has submitted for test a .0005 "Cyldon" square-law variable condenser of grounded rotor type. The skeletonised metal end plates are joined by a pig-tail connection to the moving plates and spindle to reduce hand-capacity effects, while the bearings can be lubricated. The smooth action is facilitated by the large knob provided, while tests showed the condenser to be electrically and mechanically sound. The finish is excellent, and the component can be thoroughly recommended.

A Novel Panel Lamp

A LAMP for illuminating the dials and panel of a receiver has been sent in by Messrs. A. F. Bulgin & Co., Ltd. Called the "Decko Dialite," it consists of a plated holder, with a reflector, designed to hold a small flash-lamp bulb. Mounted on a 36-in. panel,



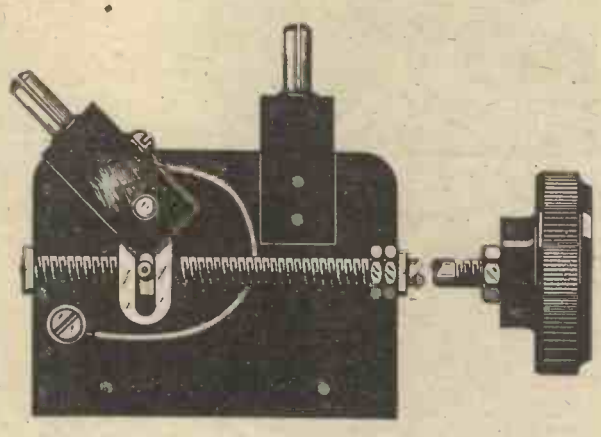
The "Cyldon" variable condenser is characterised by its excellent finish.

it illuminated four condenser dials satisfactorily. The finish is good, and the device should prove very useful on sets installed in dark corners, etc.

Dull Emitter Rheostat

AN "Efesca Vernistat" for use with dull filament valves has been sent for test by Messrs. Falk, Stadelmann & Co., Ltd. The resistance element is wound in a helical form and lies in a groove cut in a cylinder of insulating material. This groove forms a double spiral, which is also used to guide the contact arm, three complete turns being necessary for the latter to cover the whole of the resistance winding.

On test, the rheostat was found to have a resistance of 30 ohms and to be almost silent in action. The only criticism is that the closely-wound turns of wire are somewhat easily loosened.



A sectional drawing showing the slow-motion device of the "Crescent" coil-holder.

Tubular Connecting Wire

MESSRS. JOHN MOORE & CO.'S "Ravald" tube wire is made of thin copper sheet in the form of a tube, tinned on the outside, and equal in diameter to No. 16 s.w.g. A good, firm soldered joint could be made with it with a minimum of trouble, and, apart from its use as a connecting wire, it might be employed with advantage in winding short-wave coils.

"Crescent" Coil Holder

THE new "Crescent" two-coil holder manufactured by Messrs. W. J. Henderson & Co., Ltd., is so designed that the swinging coil moves in the same plane as the spindle. A collar linked to the moving block is actuated by the rotation of the threaded spindle, giving a fine adjustment through an angle of 90 degrees. Backlash is almost inappreciable, and this well-finished component can be recommended.

"Peerless" Dual Rheostat

MESSRS. THE BEDFORD ELECTRICAL & RADIO CO.'S "Peerless" dual filament rheostat consists of a hard fibre strip carrying both dull and bright emitter resistance windings, mounted on an aluminium frame which forms a bearing for the spindle and contact arm. A graduated dial and terminals are provided.

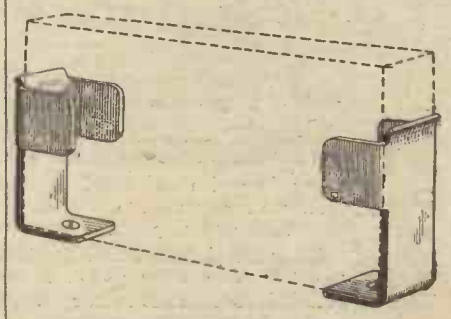
This component is well made and finished, gives good control, and has a particularly smooth movement.

Battery Holders

MR. A. G. BRINE has sent us a pair of "Secure" grid-bias battery holders for examination. These are aluminium right-angled brackets made with side flanges, and can be screwed to the baseboard of a set. They will accommodate any standard grid battery not exceeding $\frac{7}{8}$ in. in width (the length being immaterial), and should prove useful to constructors.

"Sangamo" Fixed Condenser

A "SANGAMO" mica condenser, made by Messrs. The British Sangamo Co., Ltd., has been tested at our laboratories. It is made of brown insulating material $1\frac{7}{8}$ in. long and $1\frac{3}{8}$ in. wide, having rounded ends fitted with metal bushes and screws for con-

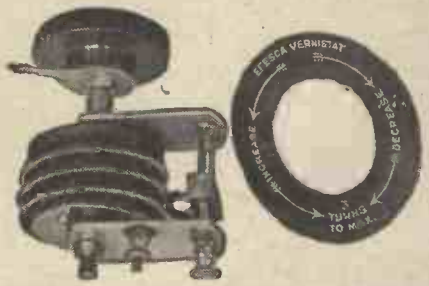


Neat grid battery holders made by Mr. A. G. Brine.

necting purposes. It was found to be of the rated capacity and to possess infinite insulation resistance, both these properties being unaffected by exposure to very bad weather conditions.

A Short Wave Tuner

MESSRS. THE WHOLESALE WIRELESS CO. have submitted for test a "Bruno 99" short wave tuner. This consists of windings of flat copper and aluminium strip for



Fine control is afforded by the "Efesca Vernistat."

the primary and secondary coils respectively. These are wound on a low-loss former of quartzite rods, while the reaction coil is of silk-covered wire on a smaller former and arranged to turn through 180 degrees, being controlled by a knob and scale.

On test it was found to have a range from 20 to 110 metres, KDKA being one of the stations heard when the tuner was incorporated in a single-valve set. This tuner is well designed and can be recommended.

"Decko" Valve Window

THIS valve window, made by Messrs. A. F. Bulgin & Co., consists of a heavily plated metal frame and gauze disc which can be fixed to the panel by means of the three screws and nuts provided. The workmanship is good, and the component can be recommended.

Ebonite Bushes

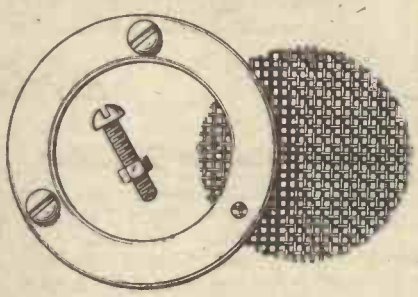
EBONITE bushes made by Messrs. The Darex Radio Co. have been tested at our Laboratories. They are intended for use in mounting terminals, etc., on wooden panels or baseboards, and are made in various sizes to take standard B.A. shanks. Tests showed that the insulation resistance of these bushes was infinity, and they therefore form a useful and reliable means of mounting.

"Aermonic" Valve Holder

ONE of the "Aermonic" anti-capacity board mounting valve holders, made by Messrs. James Christie & Sons, Ltd., has been tested by us. All superfluous insulating material is removed between the sockets without decreasing the mechanical strength of the component. This valve-holder is well finished, and possesses several novel features worthy of recommendation, being both electrically and mechanically sound.

"Accuratune" Vernier Dial

TWO large knobs are provided on the "Accuratune" micrometer control dial submitted to us for test by Messrs. The Mydar Radio Co. One knob is for coarse tuning, while the smaller provides the vernier adjustment. The knobs are hollow, and house the 80 to 1 gearing, while a 4-in. frosted metal scale graduated from 0 to 180 is provided. On test it was



Three screws and nuts are used to fix the "Decko" valve window.

found that there was no appreciable backlash, very fine control was obtainable, and the scale could be read clearly. This dial can therefore be thoroughly recommended.

"Cosmos" Lead-In Tube

THE "Cosmos" lead-in tube, retailed by Messrs. Metro-Vick Supplies, Ltd., consists of a threaded brass

MOUNTED ON WHAT?

Poor ebonite won't help to make an efficient set. You want to be sure of insulation and unless your ebonite is guaranteed this will be unlikely. After all, cheap ebonite is only an imitation of Clayton. Write us for name of nearest stockist—it's worth the trouble.

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Combines mechanical strength with electrical efficiency. Its shell-like structure eliminates the grave high-frequency losses set up in other designs.

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British Isles except above: V. R. Pleasance, 56, Pargate, Sheffield.

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bear inspection and stand constant use. They are guaranteed to give efficient performance for a period of three years.

Price **3/-** **GRID LEAK OR ANODE RESISTANCE** Price **3/-**

(Price with Condenser, as illustrated 4/-). *Postage on either 3d.*

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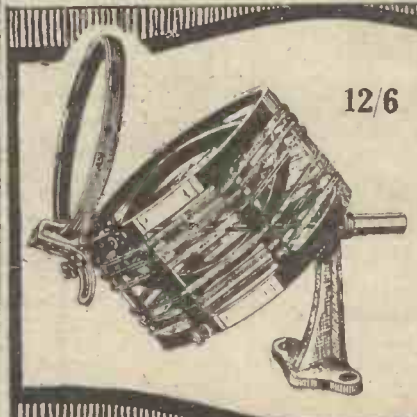

FORMO

12/6

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THE FORMO COMPANY
Crown Works, Cricklewood, N.W.2

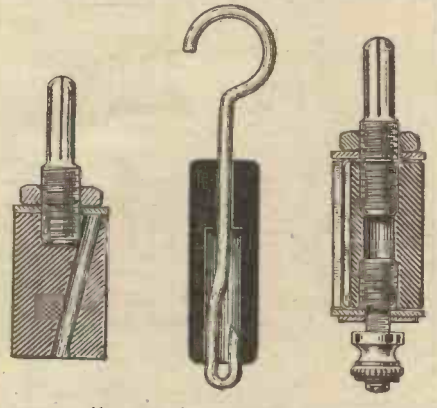
rod, on to which screw two conical insulating bushes fitted with metal nuts. In practice the rod is carried centrally through a hole of larger diameter drilled in the wall or window frame, etc., while the conical portions screw on at either end. Terminal nuts are provided for connections, and the whole forms a very simple and satisfactory lead-in device.

A sketch of the "Cosmos" lead-in device.

"J.J.R." Plugs and Connectors

SAMPLES of "J.J.R." products sent in by Mr. J. Rowe include a safety wander plug fitted with a fuse wire to prevent damage to valves in the event of a wrong connection being made. Another type of wander plug is fitted with a large hexagon nut and washer.

The connectors consist of a coloured insulating sleeve, through which passes a stout wire bent double at one end for the purpose of making a soldered connection, and in the form of a hook at the other end for insertion under a terminal nut. In use the sleeve slides over the soldered connection, thus hiding and protecting it.



Three "J.J.R." products—a wander plug, connector, and safety wander plug with a fuse incorporated.

All these accessories are neat and efficient, and can be recommended for general use.

L. & P. Geared Coil Holder

FROM Messrs. The London & Provincial Radio Co., Ltd., we have received an interesting type of two-coil holder for panel or board mounting. The fixed coil is parallel to the panel, and the moving coil block is made to swing back and away from it by means of a worm gearing. Large terminals can be used for connections, and a useful spanner for adjustments is provided.

On trial this coil holder was found to give fine adjustment and to be free from backlash. The design and finish are both excellent.

Anti-Microphonic Valve Holders

WE have tested samples of the base-board and panel mounting anti-microphonic valve holders made by Messrs. The Norman Radio Co., Ltd.

Apart from the base, these holders work on the same principle, consisting of hollow ebonite mouldings fitted with contact strips to take ordinary 4-pin valves. Below each strip is a C-shaped brass spring, these springs being connected to terminals or screws according to the type of mounting employed.

Tests showed the insulation resistance to be infinite, while the springs were quite satisfactory. These valve holders are of good workmanship, and can be recommended.

"Tixit" Terminals and Couplers

DESIGNED to obviate the necessity for soldering connections, "Tixit" terminals and couplers are made by Messrs. L. H. Reid & Co.

In the end of the terminal shank a hole is drilled eccentrically, while a brass cap with a small central hole screws over the shank. The wire to be secured is passed through the latter hole, and into the hole in the terminal shank, a tight joint resulting when the cap is screwed down.

The coupler consists of a brass disc which screws on to a second disc with turned-up slotted edges, the wires to be joined being gripped between the two.

The resistance of joints made with these devices is satisfactorily low, while the mechanical strength is very good, and these terminals and couplers should prove very useful.

"Security" Vernier Dial

BOTH coarse and fine adjustment is possible with Messrs. Williams, Ellis & Co.'s "Security" vernier dial.

The handsome "Accuratune" vernier dial.

The vernier requires one small hole for fixing, and gives a reduction of about 90 to 1 by means of worm and pinion gearing. The knob and dial are highly polished and clearly marked, and backlash in the vernier device is negligible. The coarse adjustment knob is rather small, however.

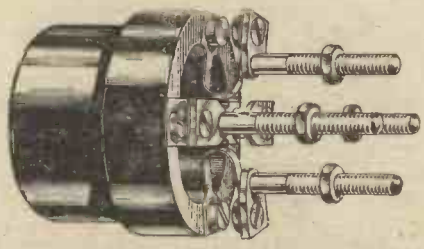
Variable Resistance

A VARIABLE resistance giving values from 0 to 40,000 ohms has been submitted for test by Messrs. The Marconiphone Co., Ltd. It consists of a circular ebonite disc fitted with a contact arm which moves over two raised circular tracks coated with graphite. Soldering tags, knob and dial are provided.

Tests showed the resistance to have a useful range of from about 400 to 40,000 ohms. Smoothness of operation was very marked and the appearance and workmanship extremely good. This resistance should prove useful for volume, tone, and oscillation control in various circuits.

"Victoria" Variable Condenser

A .0003 low-loss square-law variable condenser with vernier dial has been sent to us for test by Messrs. Victoria Electrical (Manchester), Ltd.



"C" springs support the Norman Radio anti-capacity anti-vibration valve holder.

The skeletonised end plates are connected to the moving plates and spindle, while a pigtail connection joins the latter to the appropriate terminal. The dial consists of a metal plate, and the vernier device is fixed to the main shaft and can be brought into use at will by means of a knob. A small milled knob on a threaded rod fixed to an extension arm imparts the vernier motion.

The condenser is well finished and electrically and mechanically sound, while the vernier provides a fine and smooth control.

Radion Valves

FROM Messrs. Radions, Ltd., we have received samples of three types of valves manufactured by them.

The D.E. .06 is a 3-volt .06 ampere valve and on test in a 3-valve set gave commendable performances as H.F. and L.F. amplifier and as a detector. It oscillated readily in the H.F. stage, but was easily controllable.

A second type, a 2-volt .34 ampere valve, known as the D.E. .34, gave good results in the H.F. and detector positions, but provided disappointing

Ever in the lead with news concerning developments in construction, design, etc., the April number of MODERN WIRELESS lives up to the high reputation it has established.

REMARKABLE FIVE-VALVE RECEIVER.

By The Radio Press Laboratories.

On the occasion of a recent visit of Press Representatives to our Laboratories at Elstree, this selective receiver was used for the demonstration, despite the fact that two superhets were available.
Incorporating a true neutrodyning scheme and being both sensitive and selective, the simplicity and ease of handling will appeal to all.
The circuit is 3 H.F., Detector and 1 L.F., and large numbers of B.B.C. (main and relay) and Continental Stations can be received at will.

FURTHER CONTENTS:

ARE YOU PREPARING FOR THE SUMMER MONTHS? *By John Underdown.*
A set largely designed for outdoor Loud-Speaker work on local station and Daventry, also telephone reception on many other stations.

THE "COMPACTUM" TWO-VALVE RECEIVER. *By E. H. Berry.*
A compact Receiver suitable for putting into a small attaché case for transport purposes.

A BIJOU CRYSTAL RECEIVER. *By The Radio Press Laboratories.*
A semi-permanent detector with a tuning inductance which is continuously variable are features of this set.

SOME INTERESTING CIRCUITS FOR THE EXPERIMENTER. *By G. P. Kendall, B.Sc.*

HOW INTERFERENCE HELPS. *By H. L. Crowther, M.Sc.*

AT HOME WITH THE SET. *By A. Johnson-Randall.*

WORKING VALVES FROM THE D.C. MAINS. *By Capt. H. J. Round, M.C., M.I.E.E.*

CUTTING OUT THE STRAY FIELDS. *By J. H. Reyner, B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.*

ALL ABOUT YOUR CONDENSERS. *By H. J. Barton-Chapple, Wh. Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.*

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Modern Wireless

volume as an L.F. amplifier. However, these valves will no doubt prove satisfactory for L.F. work if it is not desired to deal with a heavy load.

The Radion Pyramid 5.5 volt .34 ampere power valve gave excellent results when used for all three purposes, and compared favourably with other valves of the same type, giving results somewhat above the average as an H.F. amplifier.

Single-Coil Holders

SINGLE-COIL holders for panel and baseboard mounting made by Messrs. Norman Radio, Ltd., have been tested at our laboratories. They consist of an ebonite block with standard pin and socket fittings, the material between the plugs being cut away in an ingenious manner. The quality and appearance are good, while the capacity between pin and socket is very low.

A New Mullard Valve

WE have received from Messrs. The Mullard Wireless Service Co., Ltd., three P.M.3 general purpose valves. These are similar to the P.M.4 type in appearance, having an "N" filament, but take .1 ampere filament current at 3 to 4 volts. On test they were found to be satisfactorily uniform and to function well for H.F., L.F. and detector work, bearing out the makers' claims as regards current consumption and general suitability.

"Solenex" Coil

FROM Mr. F. G. Ketelbey we have received a No. 50 "Solenex" coil mounted on a hollow standard pin

"Solenex" radio coils are enclosed in attractive transparent cases and have standard plug-in mounts.

and socket plug. The coil itself is contained in a transparent orange celluloid case 3¼ in. in diameter. On measurement its inductance was found to be 210 microhenries, while its H.F. resistance was satisfactorily low. It proved to be light but robust, and can be recommended.

"Tangent" Loud-Speaker

A "Tangent" Concert Model loud-speaker has been sent for test by Messrs. Gent & Co., Ltd. The aluminium horn is enamelled black and so shaped that it curves back on itself, the enclosed reproducing mechanism thus being situated directly beneath the flare. A milled knob allows fine adjustments of the mechanism to be made. On test the instrument gave excellent reproduction, handing large loads quite adequately.

Silvertown Ten-Way Switch

MESSRS. THE SILVERTOWN CO. have sent for test one of their back-of-panel ten-way switches designed for placing inductances or condensers in series or parallel. Dead-end effects are eliminated (in the case of inductances) since the contacts not in use are short-circuited. Solid construction and positive positions characterise the switch. A dial is provided.

"Wootophone" Variable Condenser

THE "Wootophone" variable condenser is made by Messrs. F. E. Wootten, Ltd., and a .0005 model has been tested at our laboratories. It is of square-law, low loss type, with brass vanes and pigtail connection to moving plates, and on test proved to have satisfactory maximum and minimum capacities. The losses were of a very low order, and this component can be recommended as efficient.

The Short Wire Valve Panel

SIR,—Having read a report on the "Short Wire" Valve Panel, described by A. S. Clark in the January, 1925, issue of THE WIRELESS CONSTRUCTOR, I think perhaps my report on the same set may be of interest.

I use the set with basket coils tuned by a .0003 variable condenser in series. A Dutch valve is used with 4 volts on the filament and 30 on the plate.

5IT at about 3½ miles is almost deafening, while 2LO, 6BM, 5WA, 2ZY, 5NO, 5SC, 2BD, 2BE, 5XX, 2LS, 5NG, 6LV, 6ST, CFR, RI, Petit Parisien, Ecole Supérieure, Brussels, Hamburg, Munster, Munich, Breslau, Stuttgart, Leipzig, Koenigsburg, Frankfort o/M, two other German stations (not identified), and about 20 amateurs from all over England have also been heard.

My aerial is only about 30 ft. high, and I think this set gives excellent results, and I wish THE WIRELESS CONSTRUCTOR every success.

Yours faithfully,
E. BALDWIN.

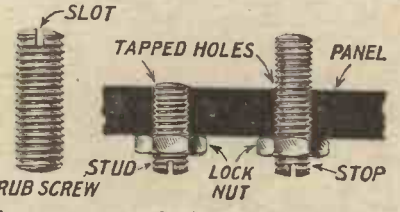
Erdington, Birmingham.

SOME USES FOR THREADED ROD

THE uses to which threaded brass rod (or "studding," as it is often called) may be put are more numerous than many constructors imagine.

This material is commonly supplied in 2, 4 and 6 B.A. sizes, and is often employed for tie rods to hold together condenser plates, coil holder side plates, etc., and as spindles for variometers and rheostats.

Grub screws can be made from short lengths of studding, a small slot being cut in the top of each to take the screwdriver for purposes of insertion



Three uses to which studding may be put are shown in this diagram—on the left, a grub screw made from this material, and on the right a switch stud and stop.

and removal. The slot can be cut with the aid of a fine saw or file. Similar lengths of the 2 B.A. size make excellent contact studs for switches, being screwed into tapped holes in the panel so that the plain ends of the lengths of rod protrude very slightly. These ends should preferably be rounded off slightly before insertion.

Locking in Position

The studs can then be locked in position by nuts on the under side of the panel. Since they lie almost flush with the panel surface they can be placed any distance apart, and "dead" studs become unnecessary. Switch stops can be made from longer lengths of the threaded rod used in a similar manner, but projecting above the panel surface. The accompanying diagram will make the method of construction clear.

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SUPERHETERODYNE OR "STRAIGHT" H.F.?

The difficulties of self-oscillation in multi-stage H.F. amplifiers have now been overcome without efficiency being lost, and a remarkable five-valve receiver has been evolved as a result.

RECENT research into the problems involved in the design of receivers employing a number of stages of high-frequency amplification has resulted in considerable developments in receivers of this type. While quite a number of enthusiasts pin their faith to superheterodyne receivers, there are many who would much prefer to use ordinary high-frequency amplification. An ordinary "straight" high-frequency arrangement of several stages, however, is unsatisfactory owing to the difficulties of self-oscillation and the inefficiency of such a method of stabilisation as, for example, the use of a potentiometer.

Parasitic Oscillations

Even the neutrodyne method, in its simplest form, may prove troublesome, owing to the occurrence of parasitic oscillations in the circuits. These difficulties have now been overcome to a large extent, and a practical receiver, built on the lines indicated by theoretical research work, has amply demonstrated the capabilities of really efficient multi-stage high-frequency amplification.

Three H.F. Stages

During the B.B.C. "silent period" of a quarter of an hour recently, Press representatives were invited to our Research Laboratories at Elstree, where independent measurements were made of the wavelengths of some of the Continental stations. Although two superheterodyne receivers were available, a five-valve set employing three high-frequency stages, detector, and one low-frequency amplifier was used in preference. With this receiver all the B.B.C. main stations, a number of Continentals and many of the B.B.C. relays could be brought in on the loud-speaker.

A Remarkable Receiver

Anyone may obtain full instructions for building this receiver by obtaining a copy of the April issue of *Modern Wireless*, in which it is described under the title of "A Remarkable Five-Valve Receiver." The investigations which led up to the final development of the circuit are discussed, and complete constructional details are included. The number of stations re-

A class at a Nottingham Council school enjoying a lesson on L.F. amplification. Wireless lessons now form a part of the science course.

ceived, as recorded in the test report, is in itself eloquent testimony to the capabilities of a receiver which combines selectivity and sensitivity sufficient to satisfy the most exacting experimenter with an ease of control which will appeal to less experienced operators.

This five-valve set employs three H.F. stages and is described in the April "Modern Wireless."

L.T. from D.C. Mains

Those who are dissatisfied with accumulators as a source of filament current from their receivers, and who are fortunate enough to have direct current mains available, will find of interest the article by Capt. H. J. Round, M.C., A.M.I.E.E. In his article, "Working Valves from D.C. Mains," Capt. Round gives details and circuits for the experimenter to make up his own equipment for the purpose.

Shielded Coils

Attacking the problem of multi-stage high-frequency amplification and allied subjects from a slightly different angle from that exemplified in the receiver already mentioned, Mr. J. H. Reyner, in the same issue of *Modern Wireless*, gives an account of some of his recent experiments. These have dealt with the use of shielded coils as an aid to the design of efficient receivers.

There is little doubt that shielding in the manner which Mr. Reyner describes is capable of useful applications as a solution for certain difficulties which are experienced in receivers under modern reception conditions.

Parallel Feed Circuits

Those who are interested in the testing of various circuits will find in Mr. G. P. Kendall's article on "Experiments with Useful Circuits" an additional stimulus to their enthusiasm. The evolution of parallel-feed circuits is dealt with by Mr. D. J. S. Hartt, and a number of other articles of interest combine to form an issue of *Modern Wireless* which may be read with advantage by every wireless enthusiast.

Screening in Practice

The application of Mr. J. H. Reyner's investigations on the screening of coils to the design of a practical receiver is to be found in the issue of *Wireless Weekly* for March 24. This receiver employs three valves, and is capable of giving excellent results in long-distance reception. In the same issue the short-wave enthusiast will find an interesting contribution by Mr. L. H. Thomas (6QB), who records his observations on the apparent screening effect on his transmitting aerial of its immediate surroundings.

A Short-Wave Supersonic Heterodyne

In the March 31 issue of *Wireless Weekly* is described by Mr. C. P. Allinson a short-wave superheterodyne receiver for wavelengths between 15 and 100 metres, which should especially appeal to those who are interested in obtaining loud-speaker signals from short-wave telephony stations.

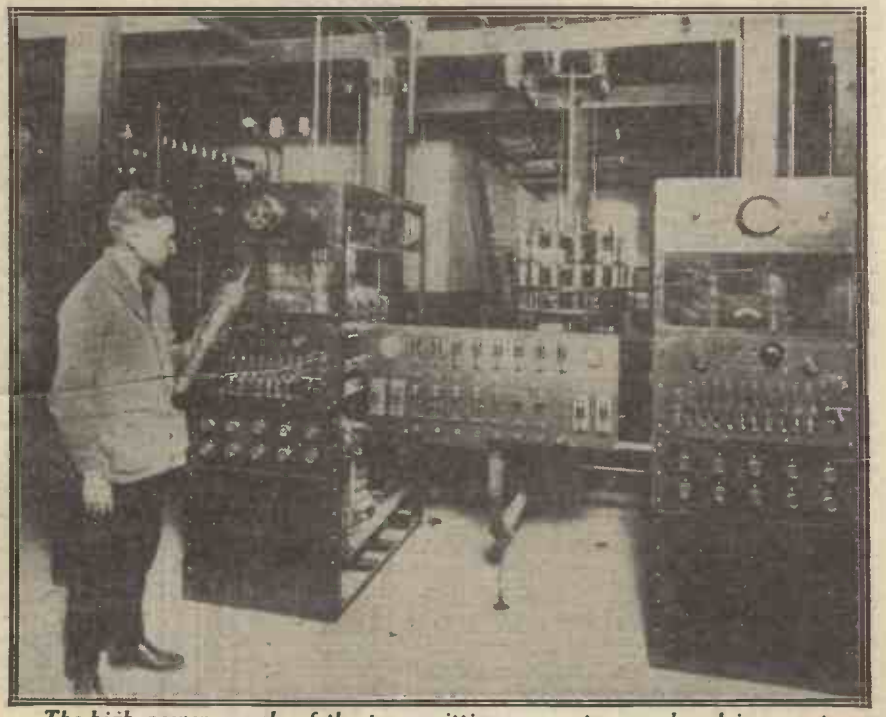
Capt. H. J. Round contributes to this issue an article on valves and valve circuits, which, coming from one who has such a long and varied experience of the subject, will be found of particular interest and assistance in acquiring a clear knowledge of the functioning of valve circuits. In his article entitled "Neutrodyning Your Note Magnifier" in the same issue of *Wireless Weekly*, Mr. J. H. Reyner offers an interesting solution to the problem of oscillation at low frequencies, which frequently causes puzzling forms of distortion in the note-magnifying stages of a receiver.

New Crystal Circuits

The new "Crystachoke" circuits now appearing in *Wireless*, the One Word Weekly, seem to have caught the popular fancy. One of the contributory reasons for their popularity is that they enable a crystal receiver to be suited to a particular aerial in a way that has not hitherto been possible. A practical receiver allowing the use of the first two published Crystachoke circuits is described by Mr. Harris in *Wireless* for March 27 (Vol. III, No. 4), while additional circuits are included in the succeeding issues.

"Cartoonigrafs" are proving better than crosswords, and the entries for these fortnightly competitions literally number thousands for each set of valuable prizes offered. The Cartoonigraf competitions appear in *Wireless*, and there is no entrance fee.

In the March 27 issue of the same journal Capt. L. L. Plugge describes a visit to the Madrid Station, while in the April 3 issue, under the title of "In the Beginning," Capt. H. J. Round discusses wireless waves and the problem of fading.



The high-power panels of the transmitting apparatus employed in recent trans-Atlantic talks by wireless telephone.

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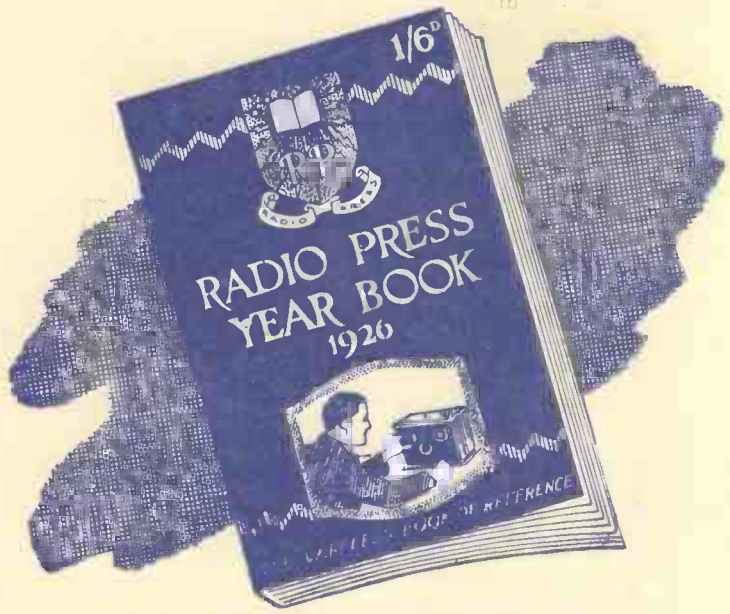

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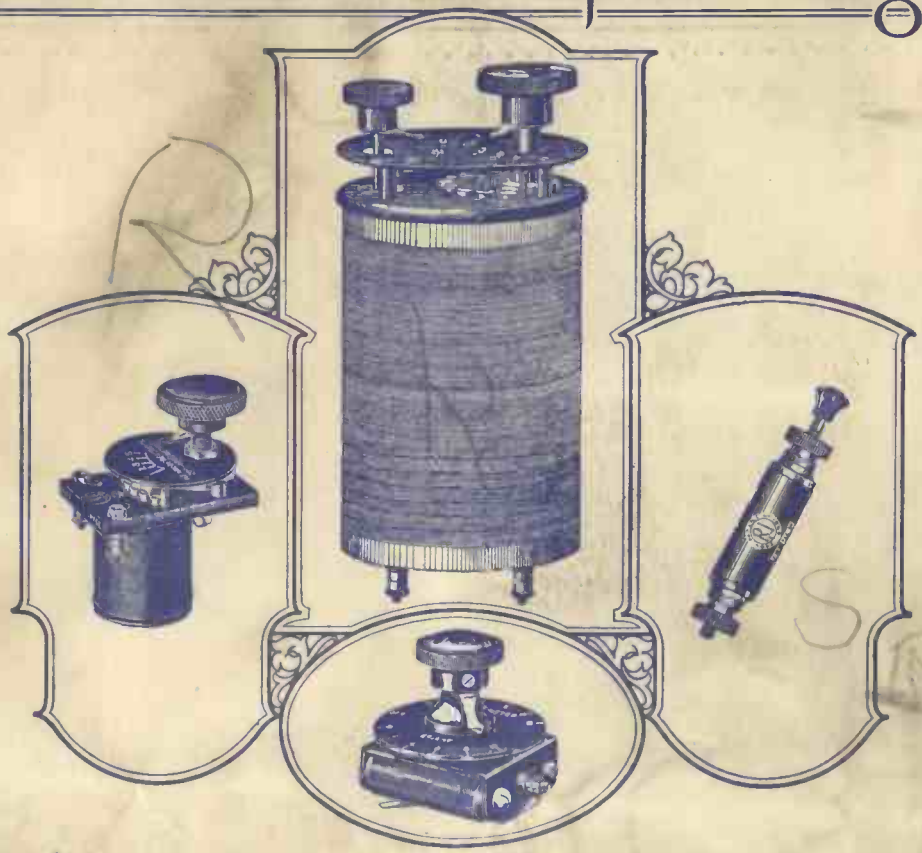

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