FREE BLUEPRINT OF LOFTIN-WHITE "TWO"

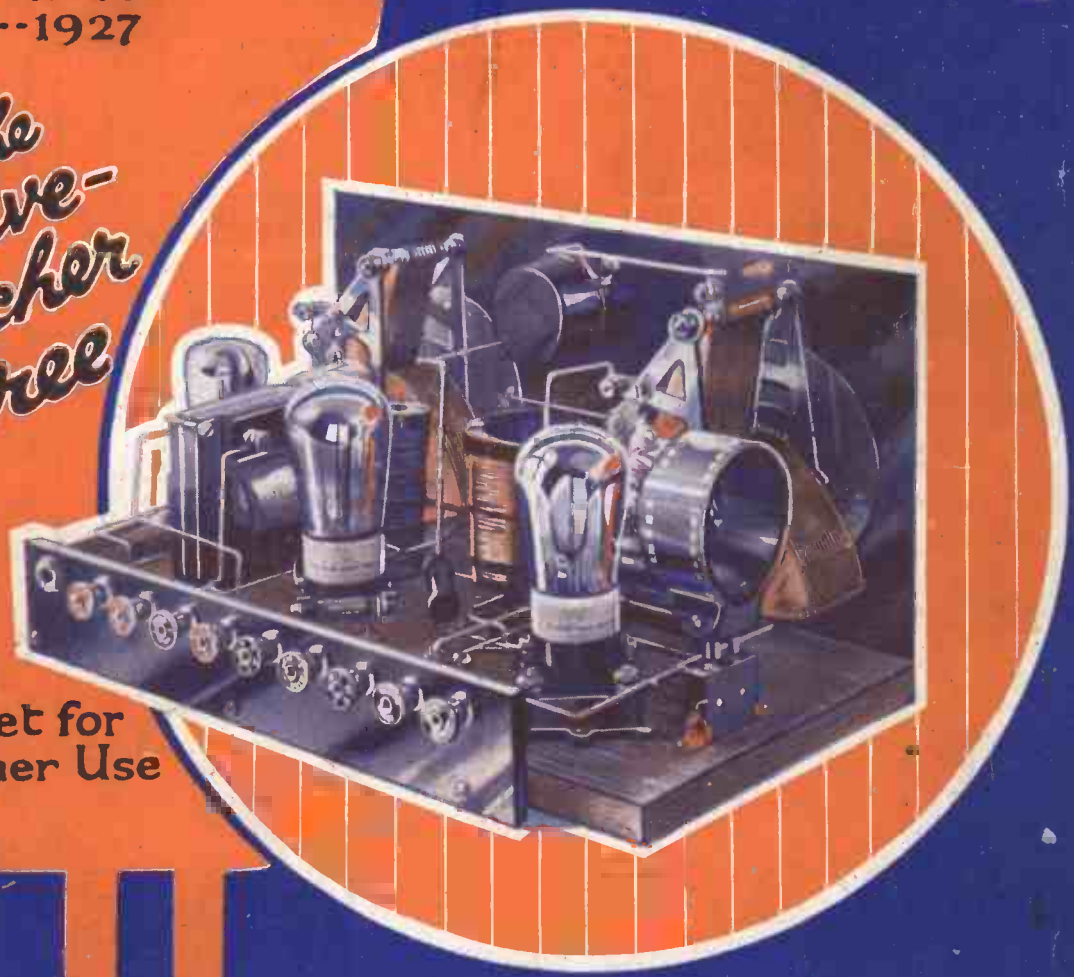
Wireless Magazine

Edited by Bernard E. Jones
Technical Editor: J.H. Reyner, B.Sc.(Hons) A.M.I.E.E.

VOL. 5 · NO. 30
JULY --1927

1/-

The Wave-catcher Three



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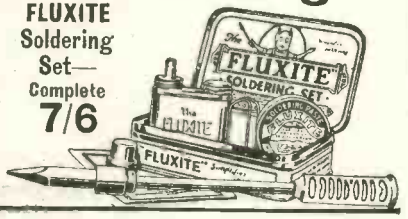

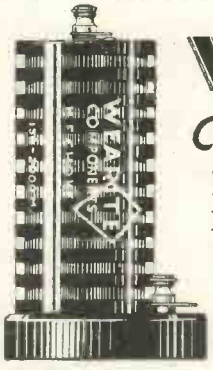

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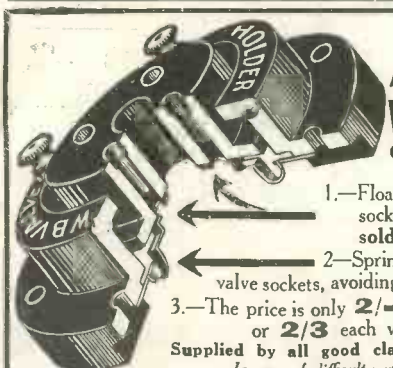

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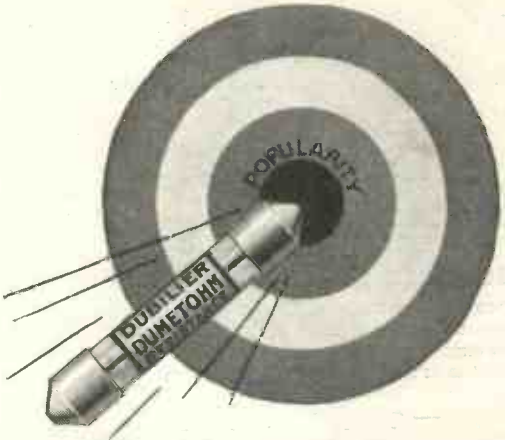

easily the most popular resistance in the country!

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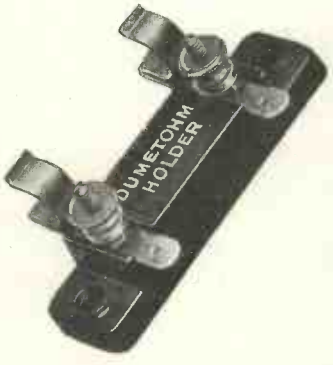

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¶ **It is a "stay-put" set for the man who likes simplicity and reliability in his broadcast receiver.**

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¶ **Included in the article is a graph by means of which the operator can find any station at will, irrespective of his aerial length.**

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On Sale Thursday, June 30th.

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JUDD

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is now contributing regularly and exclusively to the "Wireless Magazine" and AMATEUR WIRELESS.

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for July, 1927 :: Vol. V :: No. 30

Contents of This Issue

SETS DESCRIBED IN THIS ISSUE

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The Four PPPP's

PICNICS and photographs, portables and prizes! Alliteration lends me its artful aid in opening my monthly talk.

You will find our first article is a chat on the radio picnic, full of suggestions for those who would like to avail themselves of broadcasting when enjoying themselves in the country or by the sea. The ease with which the portable may be made a part of the ordinary picnic equipment is insisted upon, and I am hoping that readers will enjoy many such picnics this summer and tell me in due course of their own methods, ideas and dodges in taking their wireless with them.

Photographs of Reyner's Countryside Four will soon be coming in, and I trust that yours will be among them. You won't forget that there are cash prizes of £25 offered for these photographs? The brief statement on page 530 will tell you all that is necessary.

By the way, there was an unfortunate error in announcing the approximate price of the components of the Countryside Four, the price being nearer £11 10s. than the £10 originally stated. The members of staff responsible apologise humbly to all concerned.

In these early days of summer it is queer to be talking of winter, but it is a fact that already the possibilities and events of next winter are looming up and casting their shadows before them. There is a number of remarkable developments to be expected, and I am particularly interested in that Capt. Round should have devoted his monthly causerie or chat to a forward estimate which, coming from such an authority, is of greater value than prophetic utterances generally are.

I notice that he speaks of a new type of valve, in which the grid is shielded electrostatically from the plate, the object being to make the valve non-reactive inasmuch as it is the capacity between grid and plate that allows of the energy finding its way from the plate circuit back to the grid circuit and thus causing oscillation and interference.

It is very probable, says our authority, that the coming season will see the advent of valves of this type, and should they come, as I have an idea they will, they are sure to prove a "big thing."

To screen or not to screen, that is the question. Whether 'tis better to suffer the slings and arrows that reach us everywhere from everywhere or by opposing end them? Prof. Megohm has something to say on the subject this month. Provoked by the Imp—I mean the Amp—he discourses most learnedly but at the same time with a beautiful simplicity all his own, and, of course, comes to the conclusion that everybody ought to screen. There is another view, I believe, but I shall never get the Professor to see it. He is a learned but obstinate person.

The Loftin-White Two, described by Mr. Reyner this month, is made the subject of our free blueprint. What a marked interest there is in the Loftin-White circuits. Mr. Reyner was the first British experimenter to give them serious attention, and here in this existing little "two" we have a cheap set designed by a man who has an intimate knowledge of their peculiarities and vagaries.

Very specially do I wish to draw the attention of the constructor to the Revelation Four, designed, built and tested by members of the "W.M." Technical Staff. It is something far removed from the ordinary four-valver—it is first-grade, is straightforward and has but few controls; properly built and properly used it will accomplish a very great deal. My staff are enthusiastic about this set and believe that they have produced something which in its way is quite as good as last year's "star" set, the 1927 Five.

I expect there will be a big demand for the blueprint, and I have not the slightest doubt that very many hundreds of readers will build the Revelation Four for themselves, nor do I doubt that they can do so with the assurance of getting absolutely first-class results. It is just the set that will please the great majority of people and is easy to build and easy to operate.

Bernard E. Jones

Send along your photographs of the Countryside Four!

Just what is your feeling about radio picnics? Are you very keen about them or do you consider that they are not quite worth troubling about? Whatever your opinion, however, you will probably come across some interesting points in this article, which has been specially written by members of the "Wireless Magazine" Staff.

IT seems quite evident that, far from losing its appeal in the summer, wireless has rather an increased attraction because of the ease with which reception can be carried out under almost any conditions, indoors or out-of-doors.

Changes in Two Years

Two years ago there may have been some justification for the complaint that there was little to receive even if listening was attempted, but at the present time, owing to the increase in the number of stations operating and the extension of the normal B.B.C. programme hours, this objection no longer exists.

Indeed, almost every afternoon from three o'clock onwards it is possible in most localities to pick up a reasonably light programme for the space of two hours or so.

What Do We Mean by "Portable"?

Some amateurs may still raise the objection that it is too much of a business to carry a wireless receiver about out of doors, and immediately the word "portable" comes to mind. But just exactly what do we mean by "portable"? Do we mean a set that can be slipped in the waistcoat pocket or merely an entirely self-contained receiver—that is, a set with all the necessary batteries, aerial and loud-speaker enclosed in one cabinet?

The latter seems to us to be the more reasonable definition of the term, and if this is accepted there is an extraordinarily large number of such receivers available. That sets of this type are becoming increasingly popular is demonstrated by the fact that one manufacturer alone recently sold as many as five hundred such self-contained receivers during the course of a single week.

Mechanical Transport

But even if we did not care to use portable receivers there is little difficulty about arranging a radio picnic. Very few indeed of us nowadays think of attempting a picnic at all unless it is undertaken with the aid of a car, a bicycle, or some other form of mechanical transport.

This means that the question of weight can very largely be ignored, and it is possible for most picnickers to take even their ordinary home receivers with them on an outing. There is plenty of room in the average family car for a four- or five-valve set, and the question of erecting an aerial under picnic conditions is not a problem of any great difficulty.

Good Results with Short Aerials

From personal experience the WIRELESS MAGAZINE Staff knows what excellent results can be obtained with a normally efficient receiver by the use of a short length of insulated wire, say 15 to 25 ft. only, suspended a little above ground. Almost anywhere in the country there is some convenient tree or hedge to which the free end of the wire can be attached without difficulty.

Obtaining a suitable earth connection is an easier problem still, for in most cases a lead can be taken to some exposed part of the chassis, which will work as an efficient counterpoise earth. Alternatively, a short pointed iron bar or a brass stair rod will provide a satisfactory connection, especially if pushed into damp earth.

Car Battery for Filament Power

Again, if it is not desired to move the set from the car when the picnicking ground is reached, a little extra convenience is afforded by using the lighting and starter battery for supplying the power to the valve filaments.

Quite frankly our object in placing this article in such a prominent position is because we want to do all that we possibly can to encourage summertime wireless. The opinion is widely held that wireless loses interest in the summer months, but this seems to us to be one of those dangerous generalisations that are so often far from the truth, as is proved below.

We would suggest that it is worth the while of car owners who are also radio enthusiasts—and we believe that there are many such amongst WIRELESS MAGAZINE readers—to tap off the required voltage from their starter battery and arrange a permanent socket on the dashboard.

Little Practical Difficulty

There is little practical difficulty in carrying out this scheme. A length of twin flex can be connected to the required cells of the battery and the other end led to the dashboard, where a couple of terminals or some other form of connection can be fixed. The small amount of current taken from the tapped-off cells will not affect the complete battery in any way.

Permanent High-tension Supply

As regards the high-tension supply, it might also be worth while to fix a small shelf somewhere near the dashboard to accommodate a high-tension battery permanently. This would not cost a great deal, and the picnicker would always have the advantage that his car is equipped with battery power of which advantage could be taken without the slightest inconvenience.

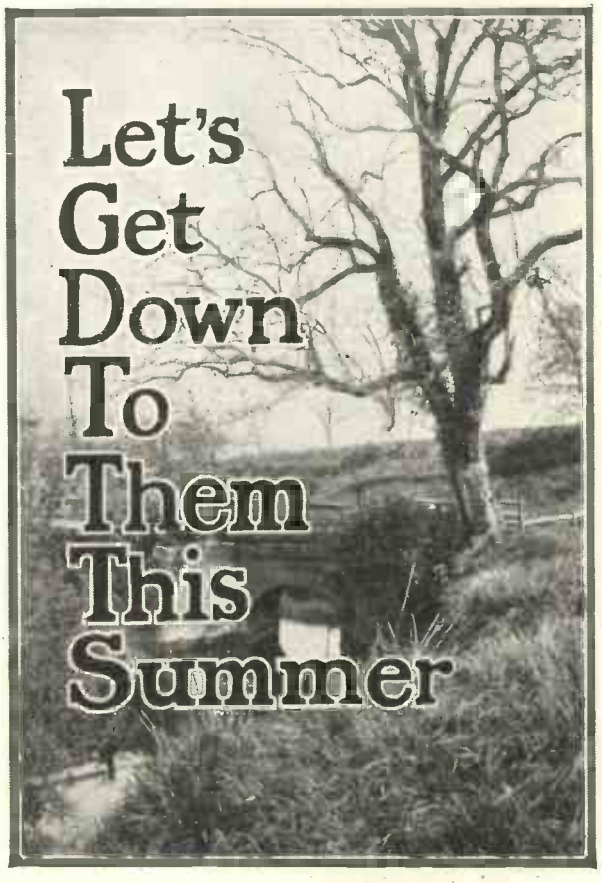
Of course, in the case of a completely self-contained receiver, no such problem presents itself, and the picnicker can undertake to provide entertainment at short notice without having any preparations to make whatsoever.

Although in the ordinary way completely self-contained sets are expensive to buy, this year readers of the WIRELESS MAGAZINE have within their reach an efficient four-valve receiver that can be constructed for a comparatively low figure. We refer, of course, to J. H. Reyner's Countryside Four which was described on page 395 of our last issue.

Efficient and Easy to Operate

Although, strictly speaking, this is not entirely self-contained because it does not incorporate a loud-speaker, it is extremely convenient to use, both from the point of view of efficiency and ease of control.

It also opens up a further possibility for the picnicker in that it provides him with an additional interest. Many times readers must have become a trifle bored at a picnic party because there was little to do. The fact of the matter is that we live at such a high pressure nowadays that we feel at a loss unless we have some kind of job to do.



Photographic Competition with Cash Prizes

Enjoyment of the Countryside Four, however, can be combined with photographic activity that may result in winning a cash prize of £15. This amount, as most WIRELESS MAGAZINE readers are already aware, is offered as first prize in a simple competition for pictures of the set in use. A second prize of £3, a third of £2, and five other prizes of £1 each, all in cash, are offered for the most happy and interesting pictures of the set in use, as explained on page 530.

The closing date for this competition, by the way, is September 3, so that readers still have plenty of time to build the set, have some enjoyable picnics, and win a welcome cash prize.

Clearing Up Debatable Points

We believe that these few comments will clear up many debatable points in the minds of our readers regarding the question as to whether radio picnics are worth while or not. We are certain that they will agree with us that wireless has an increased appeal in the summer because of the surroundings in which advantage can be taken of it.

Let us get down to those radio picnics right away!

How Will The Eclipse Affect Reception?

A Special Article by H. de A. DONISTHORPE

IT is doubtful whether many amateurs appreciate the fact that the total eclipse that will be witnessed in the North of England on June 29 may also be responsible for strange happenings as far as wireless is concerned.

Early Hour!

It is unfortunate that this infrequent event should take place at such an early hour in the morning—namely 5 a.m.—as, apart from being an inconvenient time, there are but few wireless stations to be heard except those employed on long wavelengths, for long-distance commercial work, outside the range of the broadcast receiver. This difficulty, however, will be overcome to a certain extent owing to the help of the B.B.C. engineers, who are going to provide special programmes during that period from their stations.

America has also expressed her willingness to co-operate by sending out special signals from her broadcasting stations, and their wireless amateurs, too, will take a prominent part in the tests that are to be arranged.

Strange Effects

Before actually detailing what may be expected as far as the wireless receiver is concerned, it is advisable perhaps to explain why strange effects are likely to happen at all.

Generally speaking, it may be said that wireless reception undergoes strange vicissitudes during the night or dark periods, with the result that signals from distant stations suddenly make themselves heard with extraordinary loudness and then fade away into oblivion. All listeners must have experienced this capriciousness of their receivers.

This phenomenon is due to a strange layer of the upper atmosphere, some 50 miles up, which has the property of reflecting or providing an additional path for wireless waves when they leave their origin for some distant receiving station.

Track of the Total Eclipse that will take place on June 29.

During the night or "darkness" the presence of this layer is most noticeable as during the day the ultra-violet rays of the sun adversely affect it and it is partially dispersed. During the night, therefore, signals from distant broadcasting stations are provided with an additional helping path which carry these signals to far-off receiving aerials.

Not Uniform

Unfortunately this upper electrical path or layer is not very uniform in its substance and neither is it permanent in its construction, with the result that the signals which one moment are carried along the path the next instant find that the path is different in character and acting as a hindrance to their progress, so that they lose their helping path and are lost themselves—thus "fading" takes place.

With the arrival of the sun's rays, however, normal reception once more takes place, by the wireless waves travelling along the surface of the earth over a limited distance

Period of Darkness

Now when the eclipse takes place a period of darkness or night occurs along a certain track, whilst a large area of the earth will be in semi-darkness, so in view of the foregoing remarks it is reasonable to suppose that some strange effects are likely to be experienced during the eclipse. The author witnessed the total eclipse of the sun in New York during 1924 and helped to collect some of the interesting data that was received from the broadcast listeners, the results of which were enlightening.

It is possible that some of the thousands of listeners of this country may desire to listen-in themselves in spite of the dreadfully early hour, and ascertain for themselves these effects on their wireless receivers.

Particulars will appear in the Press at a later date giving a full schedule of the stations transmitting, but at this moment it will suffice to outline the effects that may be noticed, as gained from the experience of the

New York total eclipse in 1924. The effects as far as listeners are concerned are likely to vary according to their relative positions to the path of totality and transmitting stations are concerned.

Detailed, the following are the four possible conditions :—

1.—When the listener and the broadcasting station are on the same side of the shadow of totality. Here an increase in the usual strength of the broadcasting may be noticed starting about twenty minutes before totality with a falling off about ten minutes afterwards.

2.—When the listener and the broadcasting station are on opposite sides of the shadow. Here there is a possibility of the usual strength of the signals falling away throughout the phenomenon.

3.—When the listener and the broadcasting station are both within the shadow the effect is likely to be most interesting as a rapid increase in signal strength over the usual strength is probable, coincident with the moment of totality.

4.—When the listener is in the shadow and the broadcasting station outside, there is likely to be a rapid falling off in the signal strength just before totality, with an increase very noticeable directly afterwards.

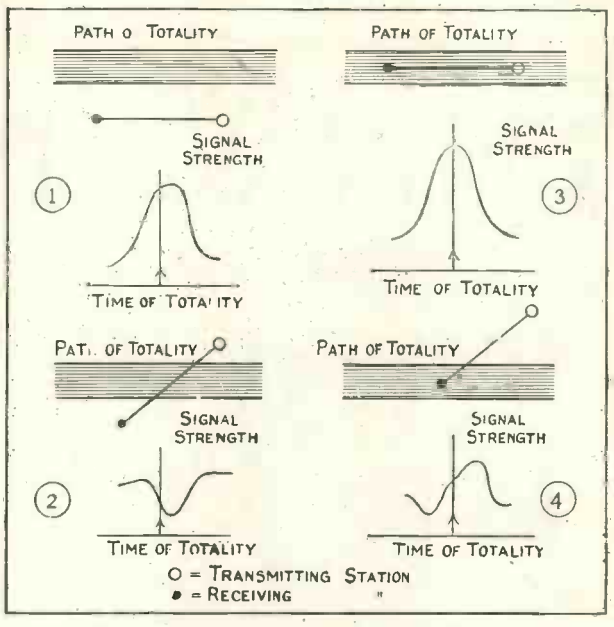


Chart Showing Variations Likely to be Experienced.

Watching Out

These, briefly, are the effects likely to be experienced, and those who are not fortunate enough to be able to travel to see the eclipse may care to watch out for these peculiar effects which cannot be marred by the weather as may be the case as far as the eye-witnesses of the totality are concerned.

In conclusion it is desirable to indicate one warning and that is to impress upon listeners to *refrain from causing their sets to oscillate* as this may cause interference to the scientists who will not have another opportunity to watch these effects in England for another hundred years.

THE Postmaster-General offers no objection to penny-in-the-slot listening machines as long as there is a licence for each machine. We hope that there will not be any penny-in-the-slot transmitting machines to disturb the ether.

THERE is a rumour that the B.B.C. authorities are on the look-out for a broadcasting station site in North Wales. It is also rumoured that Welsh is the language of Paradise.

Time Signals to be transmitted by the B.B C. during the Eclipse

Date	*Time (B.S.T.)*	*Station*	*Type of Signal*
June 27 June 28 June 30 July 1	0430 0500 0530 0600 0630 0700 0730 0800 0830 (each day)	London and Manchester London only	Six dot seconds, the sixth dot occurring at the time given in Column 2.
June 29	0430 0500 0530 0600 0615 0620	London and Manchester London and Daventry	Six dot seconds, the sixth dot occurring at the time given in Column 2.
June 29	0622–0626	London and Daventry	Single seconds continuously, missing each 29th and 59th second with an announcer calling the 5th, 10th, 15th, etc.
June 29	0630 0700 0730 0800 0830	London and Daventry	Six dot seconds, the sixth dot occurring at the time given in Column 2.

London and Manchester will transmit their call signs for one minute after each time signal.

Keep these tables handy for reference

Transmissions of Continuous Waves by B.B.C. during the Eclipse

Date	*Time (B.S.T.)*	*Station*	*Wave-length*	*Type of Transmission*
June 28 June 29 June 30	0300–0800 (each day)	Birmingham Newcastle	326.1 312.5	Continuous wave radiation, with no interruption, modulation or announcement, the wavelength varying continuously through a range of 10 metres, that is, 5 metres either side of the normal wavelength.
June 27 June 28 June 30 July 1	0430–0830 (each day)	London Manchester	361.4 384.6	Steady continuous wave radiation, with no interruption, modulation or announcement (except time signals).
June 29	0430–0830	London Manchester	361.4 384.6	Steady continuous wave radiation, with no interruption, modulation or announcement (except time signals) on Manchester ; but with some speech modulation on London to explain the time signals that occur between 0600 and 0630.
June 29	Various times between 0600 and 0830	Daventry	1,604	For transmission of time signals only.

Constant reaction coupling over the whole band of wavelengths has long been a desirable feature of broadcast receivers, and in this article will be found details of an efficient two-valver that possesses this useful property. A full-size blueprint of this set is given free with this issue to facilitate construction.

THE LOFTIN-WHITE TWO

Constant Reaction Coupling and Constant Sensitivity

Detector and Low-frequency Amplifier

Neat and Compact

Specially Designed, Built and Tested by J. H. REYNER, B.Sc. (Hons.), A.M.I.E.E., Technical Editor of the "Wireless Magazine"

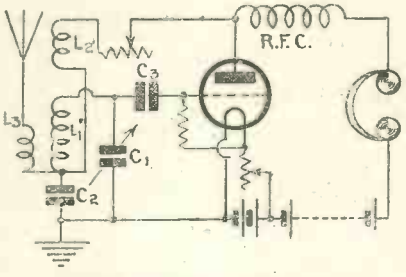
DETAILS were given in last month's issue of the new constant-coupling principle invented by Loftin and White, two American radio engineers. I have been experimenting for some time with this circuit and similar arrangements, and practical details have been given in the various MC receivers which have been described from time to time in *Amateur Wireless*.

"Mixed Coupling"

The significance of the letters MC is, of course, "mixed coupling," since the basic principle of the Loftin-White arrangement is the use of a combination of magnetic and capacity coupling in the right proportions.

Considerable interest has been aroused by my last article, and the suggestion has been made that some practical receiver incorporating this principle should be designed for the benefit of WIRELESS MAGAZINE readers. I consequently considered which of the various aspects of the question would be most suitable for presentation in a simple form, whereby the important properties of the circuit would be exemplified in a simple manner.

Now the various circuits described in the last article were all intended for use in high-frequency amplifier circuits, and it was shown how the use of a mixed coupling enabled the transfer of energy to be maintained at a uniform level over the whole scale. Secondly, largely because of this constant coupling principle, it was shown to be possible to stabilise the receiver by arranging that the feed-back through the valve was neutral in character, and therefore did not tend to promote self-oscillation.



Circuit suggested by Loftin.

It is quite practicable, however, to apply the principle to simple reaction circuits, such as one would normally employ in a one- or two-valve receiver, not having any stages of high-frequency amplification.

In such an arrangement, the constant-coupling circuit would manifest itself as a uniform sensitivity over the whole scale. A simple receiver employing a detector valve with, if necessary, one or more note-magnifying valves afterwards, is usually kept in a state of efficiency and sensitivity by the use of a reaction control. As is well known, this reaction control is by no means a constant adjustment, but requires alteration for every individual station tuned-in.

If, on the other hand, we could arrange that the sensitivity of the detector valve was the same over the whole of the scale, then any reaction adjustment which was provided would only have to be adjusted once and for all, in order to bring the receiver to a sensitive condition. After that, the receiver would remain sensitive throughout the whole of the tuning range.

Ideal Conditions

It will at once be recognised that this condition of affairs is the ideal for which the designer of simple receiving apparatus has been striving for some time. Here we have a receiver in which there is only one tuning control, and in which the reaction adjustment is not really a second control, but only serves to vary the strength of stations once they are tuned-in. It is, indeed, an

accessory and not a necessity in the operation of tuning.

Early this Year

Experiment shows that a receiver of this nature is quite a practicable proposition. Indeed, a set achieving these results by the use of the constant-coupled principle was described in *Amateur Wireless* as far back as January 22 of this year. Experiments have been made with a variety of circuits, but I have found no reason to depart from the original method adopted. This gave exceedingly good results at that time, and still continues to do so.

A circuit suggested by Loftin in some of his descriptions of the constant-coupling system is given on page 484. Here it will be noted that the valve circuit is normal in character, the tuned circuit being applied across the grid and filament. The anode circuit of the valve is supplied with high tension through a choke, and a high-frequency path is provided through a reaction coil and a fixed condenser to earth. This fixed condenser forms a part of the tuned circuit as is usual in the Loftin-White system.

Both Couplings

We thus have magnetic coupling between the coils L1 and L2, and a capacity coupling by means of a fixed condenser C2, and these two can be adapted to give a balance so that constant reaction effect is obtained over the whole range.

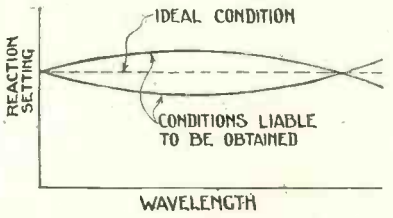
It will be observed that the fixed condenser is in series with the inductive leg of the circuit, and not in series with the capacity, as in the circuits given last month. This is done because it is necessary, in order to obtain the constant coupling, that the magnetic and capacity coupling shall both act in the same direction.

If, with a simple valve circuit of this nature, the fixed condenser is put in the capacity leg, and the magnetic coupling is then arranged to be in the right direction, the effect produced is that of counter-reaction—causing a decrease instead of an increase in the signal strength.

It is necessary, therefore, to reverse the direction of the magnetic coupling, and at the same time to alter the phase of the capacity coupling in order that it may go in the same direction as the magnetic coupling.

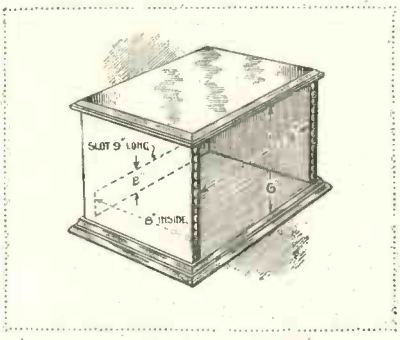
To produce this effect the fixed condenser must be connected in the opposite leg of the circuit when the voltage developed across it acts in the opposite direction.

Apart from this change the principle of this circuit is exactly as explained in my article last month. The value of the magnetic coupling and



Reaction Effects Obtained in Practice.

the size of the fixed condenser are so adjusted that they give equal effects in the middle of the scale. Towards the bottom of the scale the magnetic coupling exercises a greater effect but the capacity coupling exercises a proportionally smaller effect,



Cabinet for the Loftin-White Two.

maintaining the total reaction constant.

At the top end of the scale the reverse effect takes place, the capacity coupling predominating, while the magnetic coupling falls off in proportion, so that the reaction is once more constant.

We not only have to consider this balance between the two sets, however, but also the question of the combined effect in relation to the circuit in question. For example, we might obtain suitable values to produce a constant-reaction effect, but the total effect might not be enough to bring the receiver to the point of oscillation, or, conversely, it might cause it to oscillate continuously over the whole scale.

Additional Control

It is thus necessary to have some additional means of controlling the combined effects when produced. For this purpose Loftin inserts a variable resistance in the feed from the anode to the reaction coil, whereby the actual extent of the reaction may be varied at will.

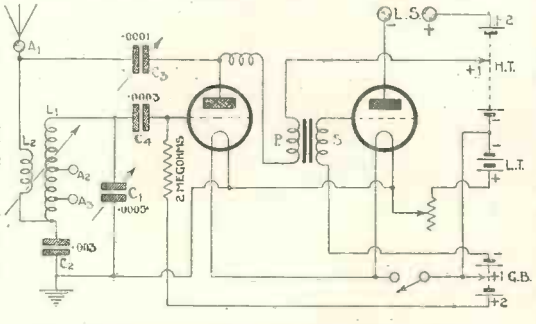
I found in my experiments that this was not altogether satisfactory, because it alters the phase of the current in the anode circuit to such an extent as to upset the operation.

There is a curious effect which can be obtained with constant-coupled circuits, particularly when they are utilised with aerials of differing characteristics. This is that the reaction demand at the top and the bottom of the scale is the same, but that in between these two points the reaction demand is not constant, but is either greater or less at the middle of the scale, so that a humped effect is obtained, as shown in the diagram.

Ingenious Solution

This is a peculiarly distressing effect because no ordinary variation of the values of magnetic or capacity couplings or both will overcome the trouble. Loftin himself has experienced the trouble and has evolved an ingenious way of getting over any difficulty of this nature which, however, is not easily applicable to a circuit of the character referred to already.

After some experiment, involving tests on a variety of aerials, it was decided to control the reaction effect by a variable condenser in series with the reaction coil, as is done in the ordinary Reinartz circuit. Proper use of this condenser, combined with the use of a really efficient high-frequency choke, enabled excellent results to be obtained, and it allows different aerials to be corrected for (see diagram on left).



Circuit Diagram of the Loftin-White Two as made by J. H. Reyner.

WM 20

FREE BLUEPRINT SUPPLEMENT TO THE "WIRELESS MAGAZINE," JULY, 1927.

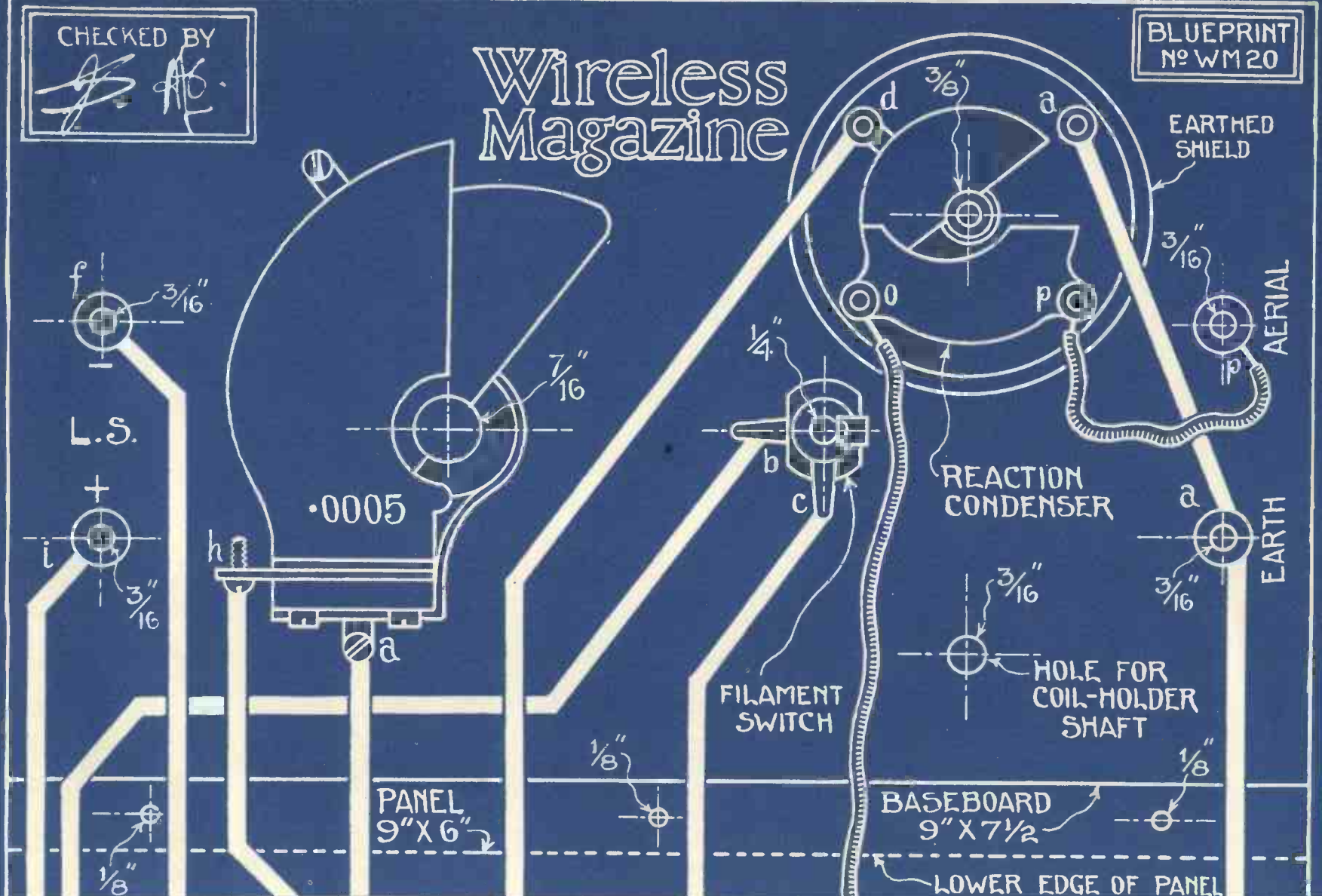
THE LOFTIN-WHITE TWO

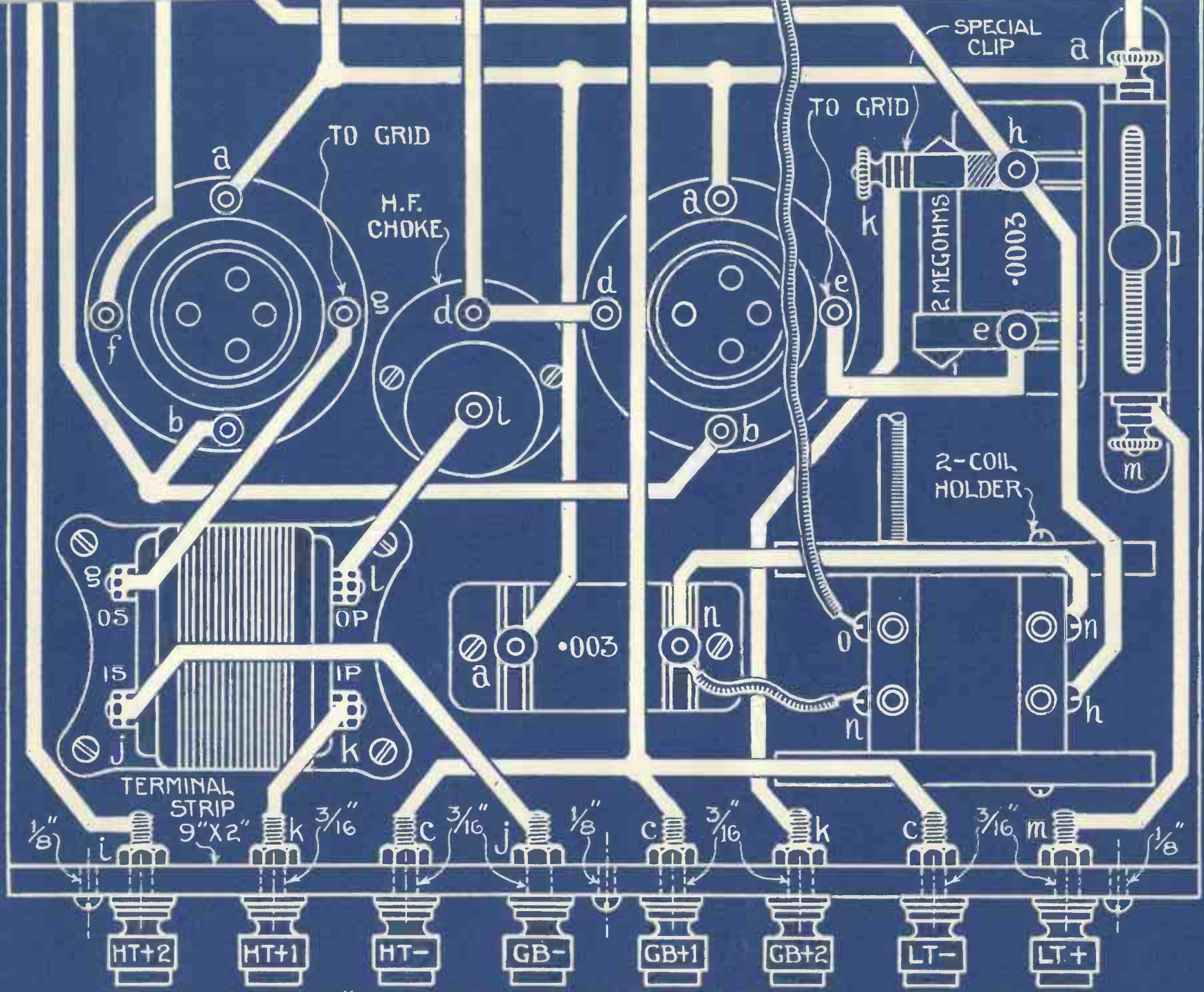
Full Size Layout, Wiring Diagram & Drilling Guide

CHECKED BY

BLUEPRINT Nº WM20

Wireless Magazine





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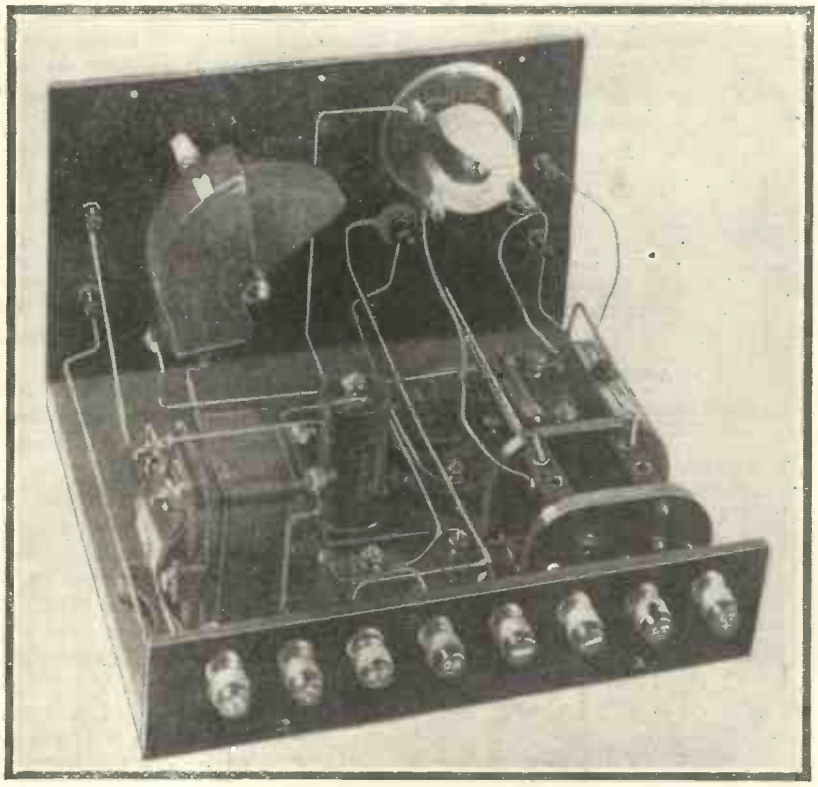
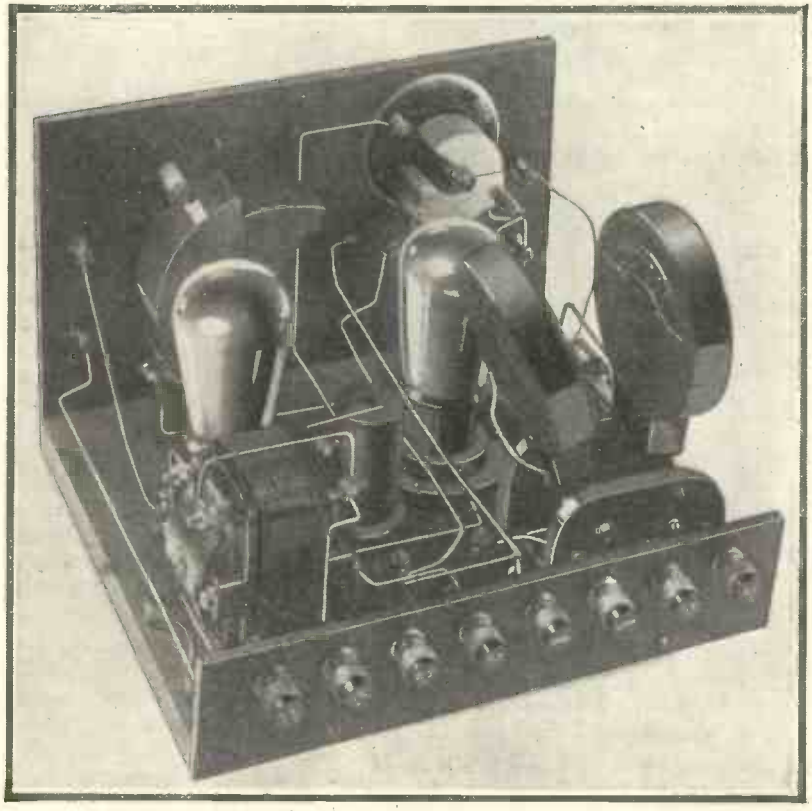
The Loftin-White Two *(Continued)*



Photograph of the Loftin-White Two.



Loftin-White Two with Valves and Coils in Position.

Circuit Adopted

The final circuit is as shown on page 485. The capacity coupling condenser is made fixed and has a value of .003 microfarad. The magnetic coupling, L_1 and L_2, is made variable, a simple two-way coil holder being employed for the purpose. Plug-in coils have been used to enable the largest possible number of constructors to take advantage of this very efficient circuit.

The value of the coupling is adjusted to give the desired degree of constancy in conjunction with the reaction condenser C_3, after which all tuning is carried out on the condenser C_1. Quite a number of stations can be picked without any use of the reaction control.

Components Needed

Following is a list of the components required for building the Loftin-White Two :—

Ebonite panel, 9 in. by 6 in. (Becol).
Terminal strip, 9 in. by 2 in. (Becol).
.0005-microfarad variable square-law condenser (Igranic-Pacent or Ormond).
Dial indicator (Bulgin).
Two-way coil holder, long-handled type (Lotus).
L.F. transformer, ratio 4 to 1 (B.T.H.).
H.F. choke (Wearite).
.0001-microfarad variable condenser (Peto Scott or Ormond).
2 antimicrophonic valve holders (Whiteley Boneham, Hoare, Lotus).
Calibrated rheostat (Burne-Jones).
.003-microfarad fixed condenser (Dubilier).
.0003-microfarad fixed condenser with attachment for separate grid leak (Dubilier).
2-megohm grid leak (Dubilier or Lissen).
On-off push-pull switch (Benjamin or Lotus).
No. 60 coil, preferably tapped (Lissen or Star).
No. 30 coil, and possibly No. 25 and No. 35 as well (Lissen or Star).
12 terminals marked :—Aerial, Earth, L.T.+, L.T.−, H.T.+1, H.T.+2, H.T.−, G.B.+1, G.B.+2, G.B.−, Loud-speaker +, Loud-speaker − (Eastick).
Cabinet and baseboard, 7½ in. deep (Artcraft).

The actual components used in the original set and allowed for in the free blueprint are in each case mentioned first.

To facilitate the construction of this set a special full-size blueprint layout, drilling guide, and wiring diagram is given free.

Free Blueprint with This Issue

It was decided to keep the layout as small and compact as possible, and in order to achieve this it was necessary to adopt a slight variation of the usual arrangement. The tuning condenser is placed on the right of the panel, while what we may term the non-essential controls are all grouped on the left. Thus we have the operating spindle of the coil holder, the reaction throttle condenser, and the on-off switch on the left-hand side.

Baseboard Components

On the baseboard we have the two plug-in coils on the left at the back of the board, while the L.F. transformer is placed on the right at the rear, the two valves being about the middle of the baseboard as will be seen. This method of grouping enables plenty of accommodation to be found for every component required.

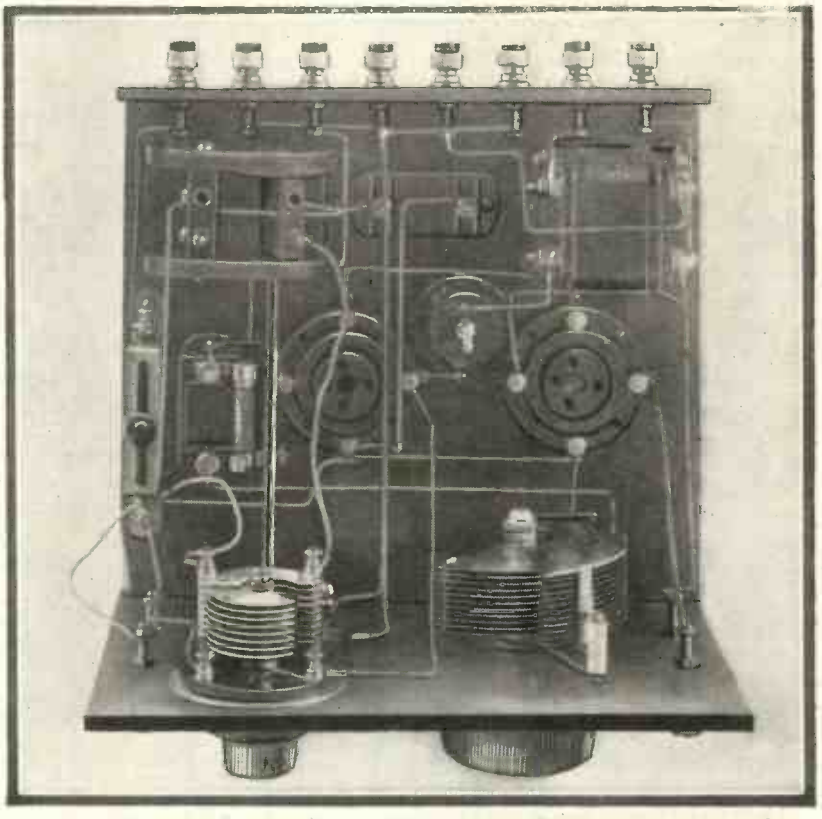
Owing to the compact size there are one or two points about the construction upon which a little advice can be given. The mounting of the components on the panel is, of course, straightforward, the only difficulty being that of ensuring that the hole through the panel for the spindle of the two-way coil holder is at the correct height. The height given in the free blueprint applies to a baseboard ½ in. thick, the hole itself being 1 in. above the top of the baseboard.

Mounting Components

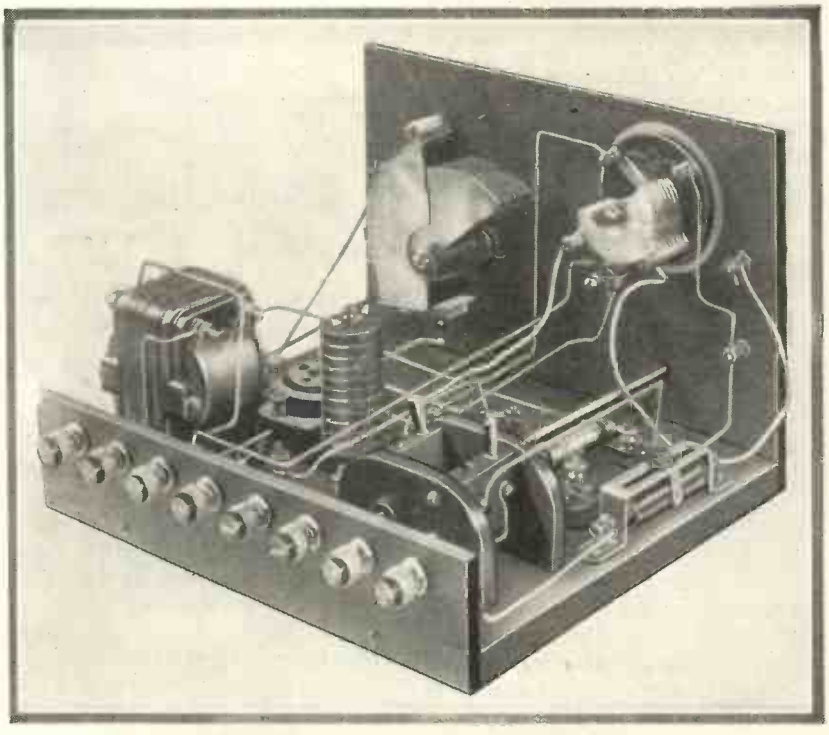
Next lay out the components on the baseboard in the positions shown, and screw them all down in position. If the layout is copied exactly no difficulty will arise. It is advisable to insert valves in the valve sockets with the coil in position in the coil holder in order to ensure that the moving coil has plenty of room to move without fouling any of the other components.

A movement of 30 or 40 degrees is ample in order to obtain the necessary variation. In most cases the moving coil will be quite close to the centre coil.

Having laid out the components in this manner a pencil mark should be made on the baseboard round the two-way coil holder in order to mark out its normal position, after which it can be moved as some of the wir-



This Photograph of the Loftin-White Two, as made by J. H. Reyner, clearly shows the Layout of Components on the Baseboard.



Another Photograph of the Loftin-White Two.

The Loftin-White Two *(Continued)*

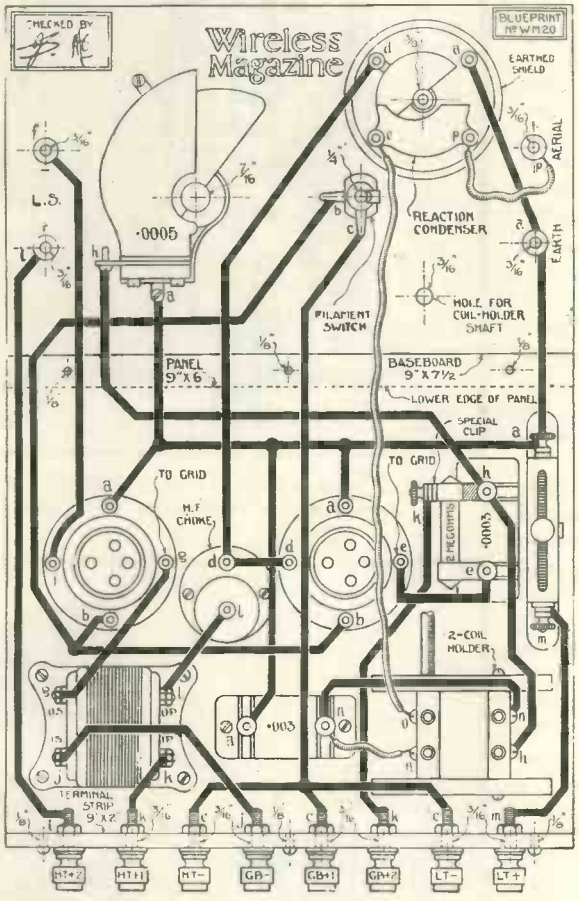
ing is found simpler with the coil holder not in position. The terminal strip can then be fixed on the back, and all the wiring, with the exception of that of the coil holder, may be finished.

Clear Space

The purpose of the pencil mark is to ensure that none of the wiring shall cross the position that is to be occupied by the coil holder. When the wiring has been completed thus far the coil holder may be re-inserted in position and the wiring finished.

The full-size blueprint given free with this issue will greatly facilitate wiring. A glance will show that each terminal point is marked with a small letter of the alphabet. All points marked with like letters should be connected together—with one wire or as few wires as possible. First of all connect up all those points marked *a*, then all those marked *b*, and so on through the alphabet.

Having completed the wiring the receiver can be put into operation. A detector valve should be employed for the first stage, and a suitable L.F. or preferably a power valve for the low-frequency stage. The fixed coil should be a No. 60, while the moving coil should be about No. 30. It may be found, according to local conditions, that a No. 25 or a No. 35 gives better results, but that is a matter for trial. At any rate, it is best to start off with a No. 30 coil, and adjust the coil holder until the two coils are fairly close together.



Reduced Reproduction of the Free Blueprint of the Loftin-White Two given with this issue.

Oscillating

Now tune to a point in the middle of the scale and adjust the tapping on the detector H.T. until the circuit oscillates with about half the reaction condenser in.

Try the amount of reaction required at the top and bottom of the scale respectively. If more reaction is required at the top of the scale then it indicates that too much magnetic coupling is present, and the coil should be separated slightly. If, on the other hand, the circuit oscillates more easily at the top and requires more reaction at the bottom then there is too much capacity coupling and the magnetic coupling should be tightened somewhat. For the preliminary experiments the aerial should be connected to the point A_1, on the circuit diagram, which point is the spare terminal on the fixed plates of the reaction condenser.

It is now advisable to gauge the selectivity of the receiver. With the aerial in this position the selectivity will not be very high, but the signal strength will be good. If it is required to obtain a greater selectivity then a tapped coil should be employed in the grid circuit, and the aerial should be connected to one of the tappings of this coil.

Make up your mind what order of selectivity you will require, remembering that the more selective you make the receiver the less will be your signal strength. It is quite a good idea not to worry about the selectivity, and carry out all the adjustments with the aerial in the first of the three possible positions until the handling of the receiver has been mastered.

Balancing

Having chosen a suitable point for the aerial it is now possible to go carefully over the receiver and to balance it up. This consists in careful adjustment, first of the coupling between the two coils and secondly of the detector H.T. tapping in conjunction with the reaction condenser until the reaction setting is practically dead constant over the whole of the scale.

It will be found quite easy to obtain dead constancy over 80 per cent. of the scale, there being a tendency towards self-oscillation in the first 20 or 30 degrees of the dial, but complete constancy is more difficult to obtain.

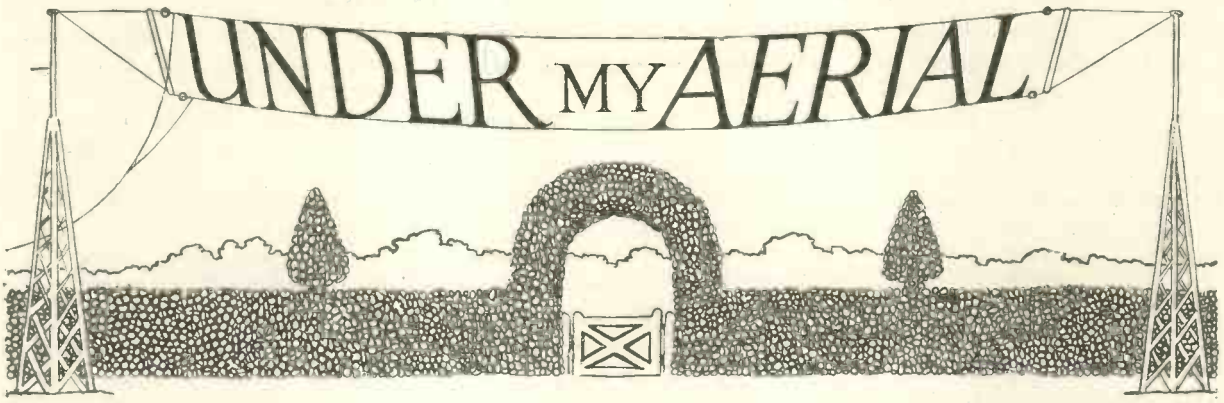
Constancy Control

The reaction condenser not only serves as a control of the reaction, but also as a fine adjustment of the constancy of the coupling. This is quite understandable since the reaction feed through the condenser will vary with the frequency, and this really gives quite a pleasing smooth control over the arrangement in general.

Obtaining a simple balance is a very easy matter and five or ten minutes will suffice for this, after which quite a number of stations can be tuned-in on the tuning dial without touching the reaction whatever. The receiver will be found to rest on the point of oscillation in a most pleasing manner. The first setting that one obtains is usually not quite satisfactory in that it is slightly inconstant, and that it may perhaps require a little more oscillation in the middle of the scale, or may perhaps

(*Continued on page* 542.)

HALYARD'S Chat on the Month's Topics — *Sketches by GLOSSOP*



Summer Wireless

"DO you know, George, I am beginning to think that wireless is even more enjoyable in the summer than in the winter?" I said to my old wireless friend an evening or two ago.

We were seated in comfortable deck-chairs in my garden. A loud-speaker, connected by a long twin-flex lead to a three-valve receiver indoors, stood on a small bamboo table beside us. The evening was a perfect summer evening, and we had spent a full hour listening to an excellent programme from 2LO.

George took his pipe out of his mouth and assumed that D.X. look of his which indicates deep thought. After a while he spoke.

"Yes, summer wireless is certainly enjoyable, but, like the heavy smoker's pipe, it has its diagreeable drawbacks."

"You're thinking of those distant stations you cannot reach out to in summer, George, those distant stations which come in so easily in winter. Against that, you can place the charm of being able to sit out in the garden and listen to the local

Summer wireless.

station as we have done to-night. It has been a grand wireless evening, George."

"So it has, but there are some obvious disadvantages about summer wireless which do not apply to winter wireless."

"I fail to see them, George."

"So do I, but I can smell them."

"Smell them, George?"

"Yes, smell them, sir. The chief disadvantage I am aware of at the moment is the copious emission rate of a near neighbour's decaying cabbages. Why don't you get him to switch 'em off at night, or insulate them with a barrier of night-scented stock?"

The trouble with George is that his nose is as sharply tuned as the rest of him.

Bitten

Do you make a special point in the summer time of warning your wireless friends against forgetting to earth their aerials when they go away for their holidays? I have always done so, and I have just been badly bitten for my pains.

Bitten.

A wireless relation of mine went off yesterday morning to the other end of the country for a fortnight's holiday. This morning I had a letter from him saying he was afraid he had forgotten to earth his aerial before he left home, and would I please see to it for him.

The earthing switch in this particular case happens to be in an outbuilding built on to the back of the house. Here is what was in the letter:—

"The lock on the outbuilding door is out of order, so I bolted the door, climbed through the window and screwed the window up with a couple of screws. The heads of the screws are covered with bits of putty. You will soon find them. Please cover up the screw-heads again when you have screwed up the window."

I carried out my instructions to the letter. As you would expect, the earthing-switch was in the "safe" position all right.

Wireless Dentistry

What do you think of this now? Wireless is being used in America to alleviate human suffering in that torture chamber common to all civilised countries, to wit, the dentist's surgery.

According to reports received on this novel use of wireless, it appears that dental operations with local anæsthetics can be much more easily and quickly performed when the patient is listening-in with a pair of phones. The stimulating effect of the wireless music, so it is said, minimises or even completely obliterates the mental shock which the patient usually suffers on such occasions.

I expect you are wondering why it is that our English dentists do not use wireless as a shock nullifier in their surgeries. I am, because it so

Wireless dentistry.

happens that my dentist happens to be one of my near wireless neighbours and friends.

Yes, my dentist is a great wireless enthusiast and, because of his excellent knowledge of music, he is able to get more out of our wireless transmissions than the less musical listener like myself.

I must ask him why it is he has

Under My Aerial *(Continued)*

never tried this new dodge of charming away a patient's fears by wireless music. When I go to see him professionally, which isn't very often, thank you, he talks to me all the time about wireless, and that keeps me quieter than I should be if he talked to me about anything else.

Portable Weather

Did you notice that, just at the time when our favourite wireless periodi-

Portable weather.

cals gave us the first of the season's new portable sets, the weather was of the type we usually associate with the middle of winter?

It amused me considerably to find myself seated in a comfortable chair before a roaring fire reading about the Countryside Four and the Motorist's Foursome while, outside, a wintry wind howled a threat of snow in the further outlook.

I was jolly glad when George came in that night, for there is something really warm and comforting about my optimistic technical adviser. He is a certain antidote for the vilest weather.

"George, old man, don't you think we ought to telephone to the Weather Clerk about it?" I asked as my ever-welcome visitor took off his fur coat. "It's too bad, you know, his turning on this cold stuff just when our wireless papers are turning out descriptions of their first portable sets. We ought to be having warm, spring weather now."

"Balmy breezes with occasional loopy lulls, poet's weather, in fact," said George, as he held the palms of his hands to the cheerful blaze of the fire.

"What's the reason of it all, George?" I asked.

"Oh! just another of the Weather Clerk's pranks," he replied. "I expect somebody told him that wireless folk had begun to talk about portable sets for outdoor work so, nasty like, he telegraphed to the weather factory for a spell of portable cold-storage stuff from the Greenland icy mountain depot."

George says the chances are that, when you read this, you will be sweltering under a spell of portable hot weather from the Sahara Desert, but he says you mustn't grumble, it's all in the game, and this is the best climate he's ever lived in since he's never been abroad.

June 29

Have you bought a new alarm clock for June 29, or are you going to depend on your old one to waken you up in time for the eclipse?

If you are like me, you will need an alarm clock. If you are like George, you will need an earthquake to waken you.

These total eclipses of the sun are interesting things from the point of view of wireless. Perhaps you remember that there was a total eclipse of the sun in America on January 24, 1925. During that eclipse, American wireless experimenters took careful

An inconvenient hour.

observations and made some important discoveries.

It is our turn this year and we must see to it that we do our share of this interesting work.

The 1925 eclipse in America took place at the convenient hour of 9 a.m. Our eclipse will take place at 6.23 a.m., an inconvenient hour, perhaps, but one that need not deter us provided we get off to bed early enough the night before.

My mathematical friend, who professes to a certain knowledge of astronomy, tells me that wherever a wireless experimenter may be situated in the British Isles he ought to get some curious reception results at the time of the eclipse.

The path of the total eclipse extends from Carnarvon to Hartlepool. Judging from observations made in America during the 1925 eclipse, an experimenter receiving a broadcast station on the same side of the Carnarvon-Hartlepool line as himself should note an increase of signal strength during the eclipse. An experimenter listening to a broadcasting station on the opposite side of that line to himself should note a decrease in signal strength during the eclipse.

An Expedition

I have just been talking to George about the eclipse. George suggests that we should make an outing of it and travel in the old car to some old place on the old Yorkshire Pennines where we could see the total eclipse.

"How many wireless sets could we take with us, George?" I asked.

"Quite a couple, at least one each," he replied.

"When should we start, George?"

"The day before the eclipse."

"And where should we spend the night?"

"On our chosen site."

"And where would that be, George?"

"The top of a very high hill, Colonel."

"Is the old car big enough for us both to sleep in, George?"

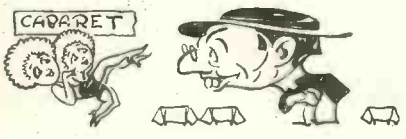
"Not if we fix up the wireless sets in it ready for use the next morning as I propose to do."

"Couldn't we put the wireless sets outside the car?"

"No, Colonel, not unless you want somebody to pick up a receiving station instead of a transmitting station the night before the eclipse."

"Where should we sleep then, George?"

"Amongst the heather, or maybe the bracken, or more simply the grass. You've still got your Army



An expedition.

valise and flea-bag. Bring them along. I'll bring mine. A couple of old soldiers like ourselves ought to enjoy a night in the open, especially if it's wet. We'll call ourselves the Eclipse Wireless Expeditionary Force—Colonel Halyard, commanding officer, other ranks, one."

Would you care to go with George on this expedition instead of me?

Halyard's Chat on the Month's Topics

High Designs

My meteorological friend, he of the weather forecasts, is most interested in an attempt being made by the French military wireless authorities to ascertain something of the effect of the upper atmosphere on wireless waves as they travel from transmitting station to receiving station.

The method used by these French wireless experts is to attach a small wireless transmitting set to a captive balloon, and send the balloon up to a height of ten miles or thereabouts. This balloon transmitter sends out signals automatically and these signals are received at a ground station. Signals are sent out at the same time from the ground station and are received by an automatic receiving set attached to the balloon.

By a comparison of the signals sent out by the balloon transmitter and received on the ground with the signals sent out by the ground station and received by the balloon receiver, it is hoped to obtain valuable information as to the effect of the upper atmosphere on wireless waves.

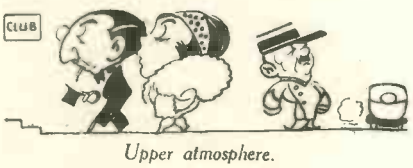
George heard me discussing these French upper air experiments with my meteorological friend and his first remark was :—

"What an aurora the news of these experiments will cause in America."

"Aurora, George?" I asked.

"Yes, auro ı, American contraction for wireless furore, you know. Say, bo, how's this for a headline for an American paper when the news gets through to the other side :—TRACKING OLD MAN HEAVISIDE TO HIS LAYER.

If George could live up to that



Upper atmosphere.

standard he would easily qualify for a lucrative post as chief headliner to an American newspaper, wouldn't he?

Extinct Apparatus

Have you ever tried to compile a list of wireless parts with which you were familiar some time back and which are now extinct? I have been trying to compile such a list, and I have found it a very interesting task.

I started off with aerials. Can you name a type of aerial popular a few years ago and now scarcely ever seen? I have one such aerial on my list, the ribbon aerial.

At one time aerials made of copper ribbon were in use everywhere. I can remember a neighbour of mine putting up a ribbon aerial for use with his crystal set. I can remember how that aerial twisted and turned about in the slightest breeze. It did not seem to swing gently as a wire aerial does, but it always seemed to be shivering and shaking.

The idea behind the ribbon aerial was that with the greater surface area results would be better than with the wire aerial of smaller surface area.

However, either the large capacity of the ribbon aerial or its tendency to tear in a strong wind, or some other disadvantage it was found to possess, caused it to be dropped in

Extinct apparatus.

a double sense, and now we see it no more in our gardens and backyards.

Other things which seem to me to have passed away into oblivion are the carborundum crystal, the old slider coil, the tapped loose coupler in which the smaller cylindrical coil moved in and out of the larger cylindrical coil, the variable condenser with semi-circular plates, and the general-purpose valve.

If you cannot make up a list of apparatus with which you were familiar a year or more ago, and which is now obsolete, how would you like to look round your set and say which pieces of apparatus in that set will be obsolete a year from now?

New Valve Name

On both sides of the Atlantic valve manufacturers have given a great deal of their attention lately to the design and manufacture of valves having what has come to be known as a hi-mu value.

This new and somewhat intriguing term in valve nomenclature is, like the sausage, by no means as mysterious when you come to dissect it as it on first sight might appear.

Hi, of course, merely requires the addition of the two silent, and, as the simplified spellers have it, the two superfluous letters g and h, to make the familiar word "high." Mu? Yes, I did get as far as that with my Greek . . . alphabet—μ, pro-

A new valve name!

nounced mew, not moo, is a letter of the Greek alphabet. It is used in wireless as the symbol for the amplification factor of a valve.

These new valves, with the high amplification factor, have been specially designed for use in receiving sets employing resistance-capacity amplification. One American firm is advertising hi-mu valves with a mu of thirty. In England we can obtain hi-mu valves with mu values up to and even exceeding forty. An ordinary valve, by the way, has a mu value between five and twelve, say.

What I like most about these new valves, however, is this simplified spelling touch in their name. Compare hi-mu valve with high-frequency-amplifying valve, detector valve, low-frequency-amplifying valve or power valve, and you at once see the simplicity in the spelling of the new name.

Say, though, how did the designer of the first of these new valves manage to resist the temptation to call his new product the high-mugh valve?

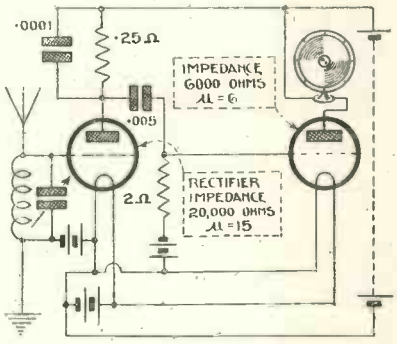
HALYARD.

You Are Looking Out for the Best All-round Four-valver? Then turn to page 497 and read about the Revelation Four!

Captain Round's Causerie

Some Peeps into Next Autumn's Developments

SOME months ago I reviewed the progress of broadcasting during 1926. I want to glance forward in this article and try to estimate what the coming season's developments will be. "What will be the favourite receiving circuits?" is the first question one asks one's self.



A plate-bend rectifier driving power valve directly, showing various quantities and valve types.

Although the fight has been quite prolonged between transformer and resistance-capacity couplings, there seems to be no doubt that low-frequency amplification will be carried out in all the better receivers by either resistance-capacity coupling or by some method which is more or less equivalent and which gives equal amplification of all the required frequencies.

R.C. versus Transformers

Resistance-capacity coupling has undoubtedly had rather a hard fight, chiefly on account of the fact that the amplification per stage obtainable until recently has been very considerably below that given by a transformer, but the modern valves with their low impedances and high amplification factors have at last overcome that difficulty, and now there is not much difference between a transformer and a resistance amplifier in noise-producing capacity.

There are still some troubles with the R.C. coupling which do not occur with the transformer, such as great susceptibility to distortion when using high-tension batteries which are not in very good condition, and there is also some considerable difficulty when working off D.C. or A.C. mains, but these troubles are balanced by others in the transformer-coupled amplifier.

The resistance amplifier is generally less consumptive of high-tension battery power than the transformer amplifier, although the last valve, of course, is just as bad as ever; but in these days of better and better power valves our battery-supply question is, if anything, worse still.

To accompany the resistance amplifier there has been a general tendency, which I think will be maintained, to use other methods of rectification than the grid-leak-condenser method, and, so far, the favourite scheme seems to be the plate-bend rectifier, which is eminently suitable for connecting up by R.C. coupling to either the power valve or through an intermediate low-frequency stage to the power valve.

If correctly used the plate-bend rectifier is capable of fully driving a power valve without the introduction of an intermediate valve through resistance-capacity coupling, which I do not think is true of the grid-leak rectifier, but in general it is better to use two low-frequency stages after the rectifier. However, I think both in amateur-constructed sets and in commercial sets which we shall see this winter there will be examples of single and double amplification with R.C. coupling.

It is probably in high-frequency amplification that we are likely in the near future to see the greatest improvements. For the amateur reaction is still undoubtedly of enormous value. He is usually capable of using it, and using it correctly, but reaction should at all costs be avoided in commercial receivers if it is possible to do so, and there lies the great difficulty that I think we shall now overcome.

Great Sensitivity

Many sets of great sensitivity will be on the market this winter without any adjustable reaction being present, and these sets will be of moderate price, although I do not think it will be possible to reduce the price just yet to what could be done with reaction.

High-frequency amplification is being attacked from several directions. Improved neutralising circuits are being constructed so as to give greater amplification per valve with stability. Other inventors are attacking the problem by phasing methods, which I think will only have a short vogue.

Probably the most powerful method of all is that which may possibly come into use this winter, and which already we have seen accounts of in the Press. This method employs a new type of valve which is for all purposes inherently quite non-reactive.

Unfortunately, any method which involves new types of valve is liable to be some considerable time before it gets properly on to the market, so that I am not going to prophesy too

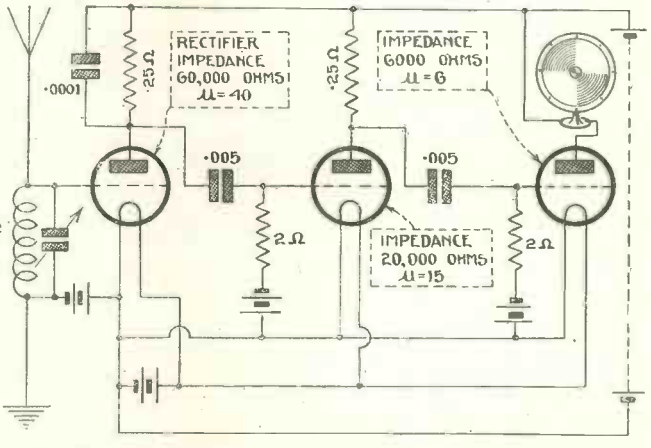


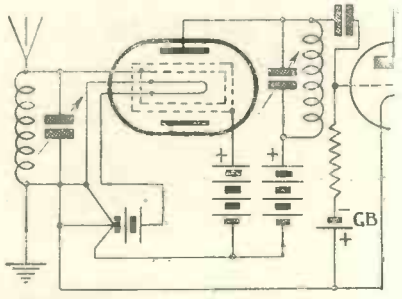
Plate-bend rectifier driving power valve through an intermediate stage showing various quantities and valve types

strongly about the success of the method this year.

Electrostatic Shields

A very long time ago, actually during the War, it was suggested by several people that it might be possible to shield the grid electrostatically from the plate inside the valve. It is the capacity between the grid and the plate of a valve which tends to carry the energy back from the plate circuit to the grid circuit and thus cause oscillation trouble. Neutralising methods are really Wheatstone Bridge schemes for balancing the effect of this capacity out, but if the capacity can effectively be removed this balancing will become unnecessary.

Some three years ago I published



Circuit for high-frequency magnification with a shielded-grid valve—a new method of some importance.

results of experiments, using a four-electrode valve made in a tubular form, a valve known as the FE1, and these experiments indicated how cascade high-frequency amplifiers could be built in which no neutralising was necessary by using the second grid of the valve as an electrostatic shield between the first grid and the plate.

More recently Hull, in America, has published the results of very extensive experiments on similar circuits, but in which more elaborate precautions were taken in the construction of the valve to eliminate the unwanted capacity, and with these valves he was able to obtain, by cascading, very big magnifications.

It is very probable that this coming season will see the advent of valves of this type, and I am sure they will open out new fields for the experimenter and will give a new weapon to the commercial constructor.

What we are looking for is something which will amplify our high-frequency currents in an extremely simple way with plenty of amplification so as to relieve us from the necessity of using reaction with its attendant troubles, and from the necessity of "sweating" our low-frequency stages too much.

The designs of receivers in England are limited (I often think) by something rather like the formula with which one designs a yacht, a purely arbitrary formula. I wonder, if one was to measure it in money, whether Daventry's long wave has not been a serious mistake. A station in the normal band of wavelengths of several times the power of Daventry would have cost more than Daventry, but would have been just as effective.

The design of English receivers has been all along hampered by this necessity of the second range. The second range has added extra expense to the construction of the receiver, it has raised the price to the home consumer, worried the designer, and prevented our competing against the Americans and others in the foreign trade.

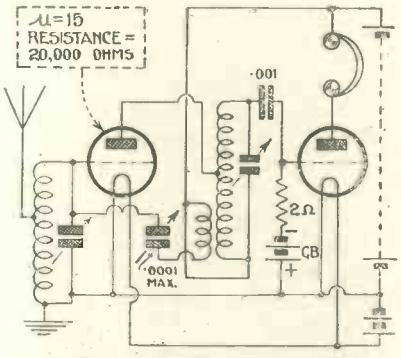
From the point of view of the advancement of broadcast reception, by which I mean the cheapening and standardising of good receivers, these long waves are undoubtedly a mistake.

Various other troubles come into our designs which do not exist in the United States, but these are gradually vanishing, and, aside from the double range of wavelengths, which is going to hamper us for a very long time in the production of simple receivers, they are gradually being eliminated.

Loud-speakers

The loud-speaker situation in the coming season will probably be a little easier. Of marketed loud-speakers up to the present time, in my opinion, there have been very few which really stand a critical test. Satisfying, certainly, in a way many of them have been when you have got used to them, but unfortunately if you ever have the chance of hearing a better one, your satisfaction goes.

The problem is a very involved one. The efficiency of a loud-speaker is unfortunately just a little bit too small. If it was only about four times as good, everything would be so much easier. We have to run our power valve at the limit of the volts and milliamperes given by the maker to work the loud-speaker with a satisfactory volume, and even then it is not as loud as a good gramophone, and all the time we are using



A simple neutralised circuit—one stage to anode-bend rectifier.

up dry battery power at a tremendous rate.

£10,000 a Kilowatt Hour

I have calculated out that the sound power in the air that we get from a loud-speaker costs us from dry batteries about £10,000 per kilowatt hour! For some time to come we shall have to dodge the issue, because, so far, a much more efficient loud-speaker does not seem to be in sight.

The methods of dodging the expense of dry batteries by using the power mains are becoming quite popular, and will become still more popular this winter. In fact, I expected this change to power working long before, but probably the lack of standardised current in England has been against the designer too much.

Many sets for complete running from direct-current mains will be on the market, and many amateurs are constructing these sets. Alternating current, a little more complicated undoubtedly, is, however, not an insoluble problem, particularly since the introduction of the independently heated cathode valve.

One thing, however, is quite evident to me, that the power valves which we now have on the market are still not powerful enough when we have unlimited supplies of current from the mains. One has to spend too much money to get a valve capable of standing 240 volts and 30 or 40 milliamperes (which is the sort of current and voltage I like to have available in a power valve). I hope

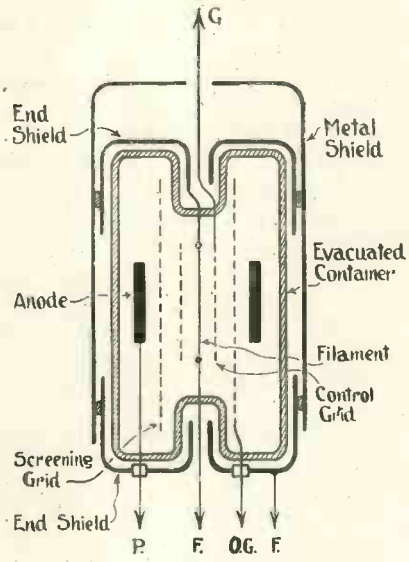
Captain Round's Causerie *(Continued)*

to see, if not this year, then early in the coming year, valves as good as the LS5 at a price and filament current within our means. They are badly wanted because the more power you can put into your last valve (and get out of it) the surer you are of getting good strength without distortion.

Single-knob Control

There is a general tendency towards single-knob control in some of the better receivers, but the art is not quite stabilised yet, chiefly owing to the two ranges of wavelengths we have to contend with, and, of course, also due to the fact that of necessity such single-knob control tends to raise the price of a receiver, and even the cheaper, independently controlled receivers are still above the prices suitable for the general public. Some new ideas will have to come forth from our inventors in this direction of single control before the problem is really well solved.

I wonder what the tendency will be in the direction of aerials? Are frame aerials or small indoor aerials in the end going to replace the unsightly outdoor aerials mainly in use now? There will be considerable advances in this direction in the coming season, but I do not think the problems of big magnifications have yet been sufficiently cheaply solved to warrant a hope it will be all frame reception in the near future, but what I do think is that we have probably arrived at the stage where receivers will be available and popular for receiving up to thirty or forty miles at full strength (and that at the moment is the limit of range of good quality) with an indoor aerial or frame, and, of course, those who require greater distances will be able to use an aerial if they want to.



Arrangement of the Hull electrostatically shielded valve

Cheaper and Better Apparatus

Generally, I think we shall see a tendency to better and cheaper production with less gadgetty circuits and with more reliability, but there are several problems still to be solved before the wireless set is as simple as a gramophone.

Early Morning Broadcasts!

Transmissions for Enthusiastic Teutons

THE early morning broadcasts from the Hamburg and Frankfort group of transmitters appear to cause considerable disillusion to some listeners, inasmuch as perhaps after a night of vain searching for America they suddenly pick up at daybreak speech and music which leads them to believe that they have attained the summit of their ambition. For the benefit of those radio fans who may have been disappointed on some of these occasions a few notes regarding what is actually being done in these German cities at these unearthly hours may save unnecessary searching.

Gramophone Records

Daily at 6.45 a.m. B.S.T. both Cassel and Frankfort-on-Main broadcast physical exercises, which in the intervals are alleviated by a gramophone record or so. You cannot mistake this transmission, as you will hear a big voice detailing the particular "jerks" which are to be carried out, followed by a repeated count of "eins, zwei, drei, vier," and interspersed with the injunction to breathe slowly ("langsam atmen").

Waistlines

Whether the instructions are conscientiously carried out by Herr Dr. Schmidt or his obese colleague, Herr Architekt Braun, is neither here nor there; the station gives them for their benefit, and if they are not followed woe betide their waistline!

Now Hamburg, Kiel, Hanover and Bremen do not worry so much about the figure of their citizens. They consider that their listeners are much more interested in setting their watches at 6.55 a.m. B.S.T. and in receiving thirty minutes later a weather forecast and first news bulletin.

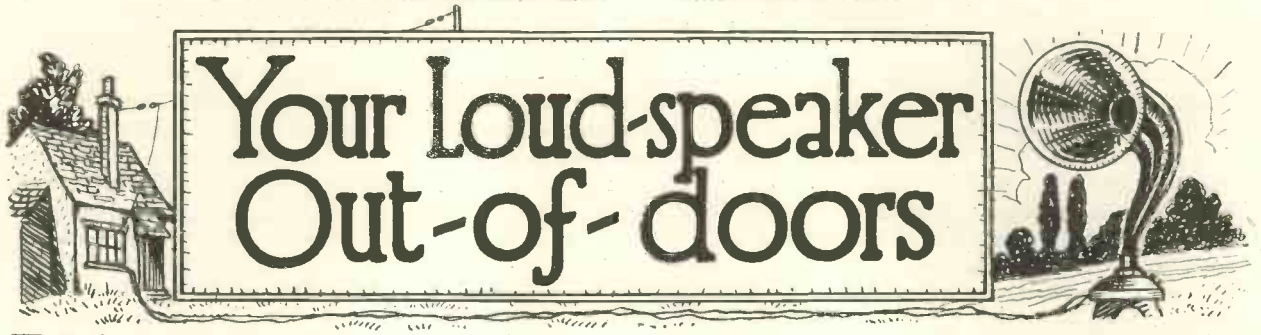
Novel Time Signal

The time signal, curiously enough, is given in quite a novel fashion, as, after due warning with a gong, the station puts on a gramophone record, in the course of which the announcer indicates each *full* minute. Usually the transmission is ended through the medium of the gramophone with a flourish of trumpets and a martial melody performed by a hefty brass band.

J. G. A.

B.B.C. OFFICIALS are feeling the strain of overwork. They are at their offices early and late, and when they do go home they take homework with them. It is always hard work to prepare TALKS.

You Can Take Advantage of Wireless All the Summer by Taking



Your Loud-speaker Out-of-doors

FAR from any falling off of the public interest in wireless the number of licences in force is increasing steadily month by month. Therefore it is safe to say that we shall have more out-of-door wireless this summer than ever before.

Getting into the Open

For nobody wishes to spend more time than is absolutely necessary inside the house during the summer months, even to listen to the broadcast programmes. The problem of getting out into the fresh air and at the same time listening to broadcasting will be solved by some people by the use of portable sets, while others will be content to take their loud-speakers out into the garden.

It is a fact that broadcasting loses nothing by being heard in the open air. When a loud-speaker is used inside a room there is nearly always a slight reflection from the walls and ceiling, and interference is set up by the sound-waves travelling in different directions. This gives rise to a certain amount of distortion which may be serious.

Most often, of course, the distortion due to interference of this nature is very slight and not noticeable when one has become accustomed to it. At the same time if the loud-speaker is moved out-of-doors any such interference will be entirely absent and the reproduction will have a peculiar purity which has to be experienced to be appreciated.

Portable Sets

Portable sets this summer will be more really portable than they have ever been before. The recent introduction of valves with very high amplification factors will enable the same results to be obtained with fewer valves, while the latest type of resistance-capacity coupling gives practically the same results as can be obtained by using transformers with, of course, a great saving in weight.

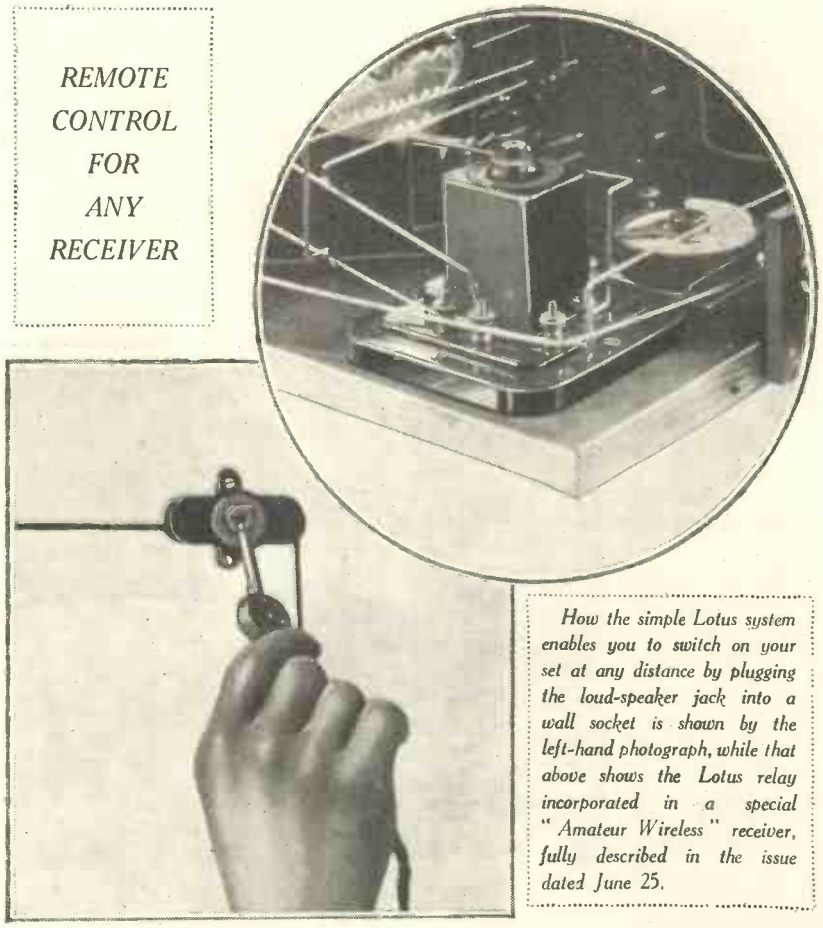
But it is not necessary to build a portable set in order to enjoy wireless reception in the open air. As already mentioned many people will be satisfied to use their present sets, merely moving their loud-speakers into the garden. There is nothing difficult in doing this—the very simplest method being merely to increase the length of the loud-speaker leads until the instrument can be placed where desired.

Of course, it is better to make a permanent job of the extension leads—to take them round by the skirting-board or picture rail—and then one will not always be tripping over them. The wires themselves, of course, must be well insulated from each other and, more particularly, from earth.

It must be remembered that in nearly all sets the negative end of the H.T. battery is connected to earth, whereas the loud-speaker terminals are on the positive side of the H.T. battery. Should one of the extension leads, therefore, be allowed to come into contact with an earthed object there is a danger of the H.T. battery being short-circuited.

If well-insulated wire is used, however, there is little danger of this happening, but in order to make

REMOTE CONTROL FOR ANY RECEIVER



How the simple Lotus system enables you to switch on your set at any distance by plugging the loud-speaker jack into a wall socket is shown by the left-hand photograph, while that above shows the Lotus relay incorporated in a special "Amateur Wireless" receiver, fully described in the issue dated June 25.

Your Loud-speaker Out-of-doors *(Continued)*

doubly sure a 1 : 1 ratio telephone transformer can be used between the set and the extension leads. Or, alternatively, the usual filter circuit consisting of L.F. choke and large-capacity fixed condenser may be used. It is particularly desirable to employ some such safeguard when the H.T. supply is being derived from the lighting mains of the house.

A convenient way of allowing for a number of alternative positions for the loud-speaker is to connect up a number of jacks or electric-light wall-sockets, placing one wherever it is desired to use the loud-speaker. All the jacks or sockets, of course, are wired in parallel and the loud-speaker leads are connected to a jack-plug or electric-light plug which can be inserted in any of the jacks or sockets.

Of course, one must go into the house in order to tune the set to any particular station, but once this has been done the set can be switched on and off from the place where the loud-speaker is installed if some form of remote-control device is provided to switch the filament current of the set on and off at will.

The Lotus remote-control system is a good example of this type of arrangement and the illustrations show how it is installed. A number of four-point jacks are wired in parallel, each jack being placed in one of the positions where the loud-speaker is required. Two of the contacts of each jack serve to put the loud-speaker across the output terminals of the set when the loud-speaker plug is inserted in the jack. The other two contacts of the jack control, through a neat little relay, the filament current of the set, switching this on when the plug is inserted and off when the plug is withdrawn.

A complete outfit including a relay, two wall jacks, two jack plugs, and 21 yards of four-strand insulated wire (each strand of which has a distinguishing colour) costs 30s., and allows of two positions for the loud-speaker. Further alternative loud-speaker positions may be provided for at an extra cost of 7s. 6d. each.

The relay has six terminals arranged in three pairs. The L.T. battery is connected to one pair, another pair is joined to the L.T. terminals of the set, and the ends of two of the strands of the four-strand wire are connected to the remaining pair of terminals. These two strands are connected to the filament control contacts of each jack.

The remaining two strands of the wire go to the output terminals of the set and to the loud-speaker contacts of the jacks.

The system is very convenient in operation, as one loud-speaker may be used in as many positions as there are jacks, or any number of loud-speakers, up to the number of jacks, may be used at the same time. Once the set has been tuned-in to a station the insertion of one loud-speaker plug in any of the jacks switches on the filament current of the set and allows that loud-speaker to be used.

The connecting up of other loud-speakers in no way affects the working of the first, and the set will continue to operate them all.

TWO BROADCAST FAVOURITES

Slade's impression of Flotsam and Jetsam

Anybody who wants the best possible straight-circuit four-valver following modern practice should build the Revelation Four. It is a receiver that will undoubtedly take its place amongst the "classics." Read the following article for full details—and tell your friends about it!

The REVELATION FOUR

A Modern Straight-circuit Receiver Specially Designed, Built and Tested by the "W.M." Technical Staff

Great Selectivity

Ease of Control

Enormous Range

Sufficient Volume

Adaptability

SINCE the inauguration of the WIRELESS MAGAZINE special full-size blueprint service, it has become evident to us that there is a great demand from listeners for good four- and five-valve sets capable of receiving a large number of broadcasting stations at full loud-speaker strength—and that with reasonable simplicity of operation.

High-class Receiver

The Revelation Four is an attempt—and a successful attempt, we believe—of the WIRELESS MAGAZINE Technical Staff to produce a really high-class four-valver that is capable of "delivering the goods." It is a "revelation" of what four valves, incorporated in a straightforward circuit following current practice, and with a minimum of variable controls, can accomplish.

Readers will have no doubt of its capabilities if they will turn to the test report given on page 550. All the stations listed were received in half-an-hour the same evening, and all were received at loud-speaker strength.

For all-round adaptability and efficiency we are sure that, for the same number of valves, the Revelation Four cannot be improved upon, and just as the 1927 Five is a "classic" amongst five-valvers, so, we are convinced, will this receiver become a "classic" amongst four-valvers. Whether we are right or wrong in this assumption will be proved by WIRELESS MAGAZINE readers themselves.

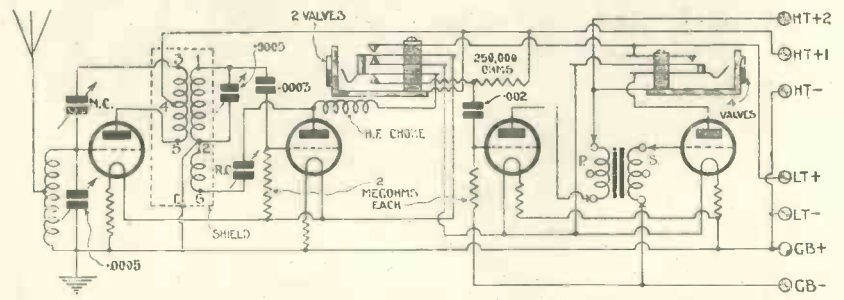
Special Features

Points to which we would especially draw constructors' attention in the Revelation Four are the following:—

1. **Selectivity.**—The centre-tapped aerial coil (which in effect gives an aperiodic aerial coupling) and the split-primary high-frequency amplifying method give this receiver a high degree of selectivity. It is able not only to receive, but also to "cut out," a point of almost as great importance.

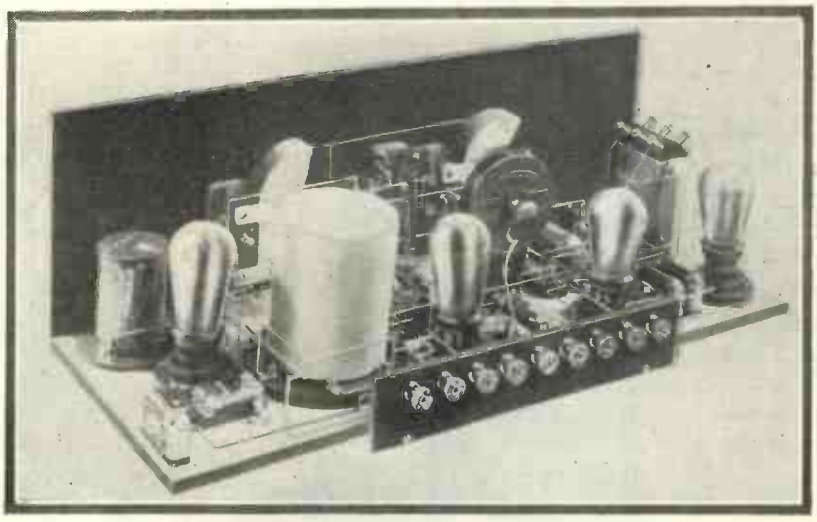
Moreover, the use of a screened high-frequency transformer obviates the possibility of any undesired pick-up of the local station in the high-frequency side of the receiver to a very large extent indeed.

2. **Ease of Control.**—There are only four variable controls in the whole receiver.



Circuit Diagram of the Revelation Four.

The Revelation Four *(Continued)*



View of the Revelation Four with Coils in Position.

Of these the neutralising condenser can be left unaltered for reception over a wide range of wavelengths when once set.

Call-signs or names of broadcasting stations can be marked at the right settings on the special tuning dials when once they have been logged, thus facilitating re-tuning them in at any time.

The small reaction condenser in the centre of the panel presents no difficulty to even an inexperienced operator, and need not, in the ordinary way, be adjusted until after the two tuning condensers.

3. **Range.**—The inclusion of one efficient stage of high-frequency amplification and the incorporation of Reinartz reaction on the detector valve ensure an adequate range with any normal aerial-and-earth system.

4. **Volume.**—As great a volume as is desired in most homes, with no sacrifice of purity, can be obtained from the two stages of low-frequency amplification incorporated.

Any type of low-frequency amplifying valve can be used in the first stage with almost equal efficiency by virtue of the tapped transformer used.

5. **Adaptability.**—The receiver is equally suitable for use by the "long-distance man" or for general service in the family. It is selective and powerful without being in any way "difficult."

Jack switching is provided so that either two (high-frequency amplifier and detector) or four (as before, with the addition of the low-frequency stages) valves can be used as desired, the filaments of the unused valves being automatically switched off. When there is no plug in either of the jacks all the filaments are off.

Before starting to build this receiver send to Blueprint Dept., "Wireless Magazine," 58-61, Fetter Lane, E.C.4, for full-size blueprint, No. WM24, post free for 1s. 6d.

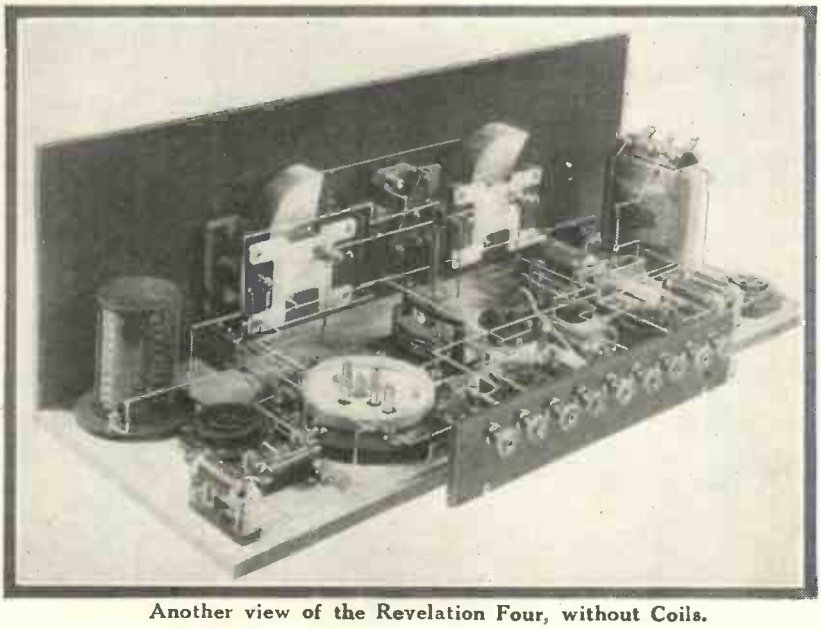
To the more technically minded a glance at the circuit diagram will prove of interest. Apart from the particular features already mentioned it will be seen that a high-frequency choke is included in the plate circuit of the detector valve to prevent any high-frequency pulsations from filtering through to the low-frequency circuits, with the possibility of causing interference in some cases.

As is the case with all good modern sets, provision is made for reception on both the lower and upper broadcasting bands of wavelengths. This is accomplished by utilising a plug-in aerial coil and a six-pin plug-in high-frequency transformer.

Improving Selectivity

In order to obtain good selectivity it is essential to use a tapped aerial coil, which gives a form of aperiodic aerial coupling. When the set is used at a distance greater than 10 miles or so from the local station an ordinary centre-tapped coil will be satisfactory, but in cases where bad local interference is likely to be experienced we recommend the use of a coil of which it is possible to tap off *less* than half the number of turns it contains.

If use is made of a coil such as utilised in the original receiver, a flexible lead should be taken from the aerial terminal and connected to the



Another view of the Revelation Four, without Coils.

Another "Classical" "Wireless Magazine" Set

plug supplied with the coil. When a coil is changed it will then be necessary to remove this plug and insert it in the socket in the other coil when the latter is placed in the holder. In the case of coils provided with more than one tapping a flexible lead should again be employed, this time provided with a spade terminal; this should be connected to both of the coil tappings in turn until the best degree of selectivity is obtained.

We would emphasise that where extremely bad interference is experienced a double-tapped coil used in this way will give better selectivity than a centre-tapped coil.

Common high tension is supplied to the high-frequency and detector valves; this makes it convenient to use two valves of the same type in both stages.

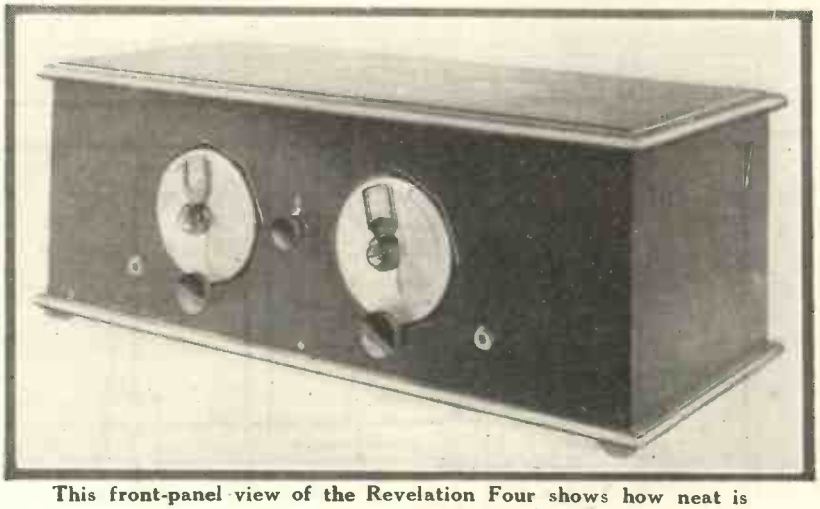
In a similar way the two low-frequency valves are provided with a common supply and, again, these two valves can also both be of the same type—that is, preferably semi-power or power valves. In the usual way it might be undesirable to use such a valve in the first stage, but this objection is removed by making use of a tapped low-frequency transformer with which it is possible to obtain any one of nine transformation ratios.

L.T. Control

Fixed resistors are provided to limit the current passing from the low-tension battery to the valve filaments to the right value. This practice obviates a number of controls with practically no sacrifice in efficiency if the correct values are obtained.

An objection frequently made against the use of fixed resistors is that the value cannot be lowered to compensate for a drop in battery voltage as that occurs, but surely when such an appreciable drop in voltages does take place it is time that the accumulator was recharged?

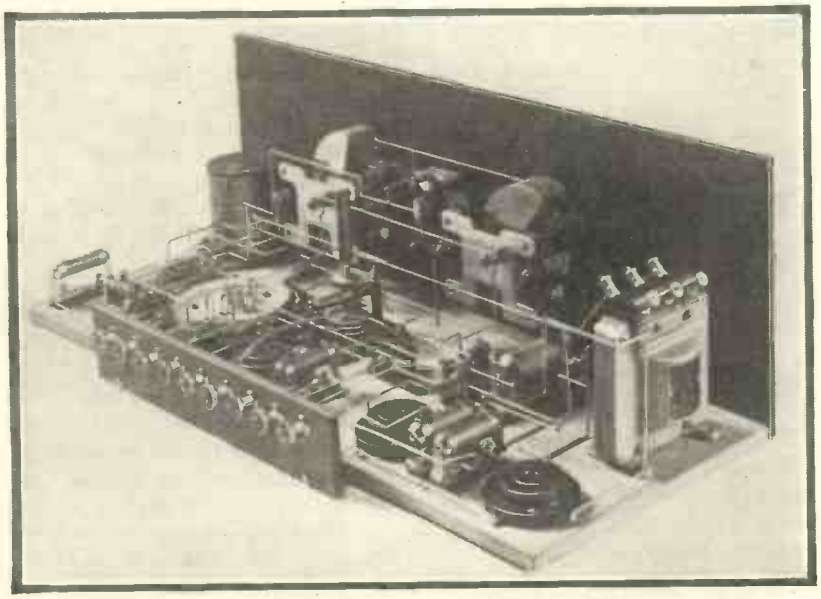
A few words may at this stage be said regarding the layout of the Revelation Four. Readers of the WIRELESS MAGAZINE will agree with us, we think, when we point out that it is particularly neat. It follows rather unorthodox lines, as far as the baseboard layout is concerned, for the sake of efficiency.



This front-panel view of the Revelation Four shows how neat is the general layout.

In order to keep the leads in the high-frequency circuits as short as possible, and at the same time provide an attractive front-panel layout, the high-frequency valve is placed second on the right (looking from the back of the panel), while the detector is at the extreme left. This allows of the aerial coil and six-pin split-primary transformer being placed close to their respective tuning condensers.

The resistance - capacity - coupled and the transformer-coupled low-frequency amplifying stages are third and fourth from the left respectively, this arrangement allowing of the metal of the transformer being kept well away from the high-frequency side of the receiver.



View of the Revelation Four, showing layout of components.

Components Needed

Most of the components are so spaced that alternative parts can readily be accommodated should the constructor desire to make use of apparatus that he already has on hand, but in all cases it is strongly recommended that only the components used in the original WIRELESS MAGAZINE receiver should be employed. A list of these components, with possible alternatives, follows:—

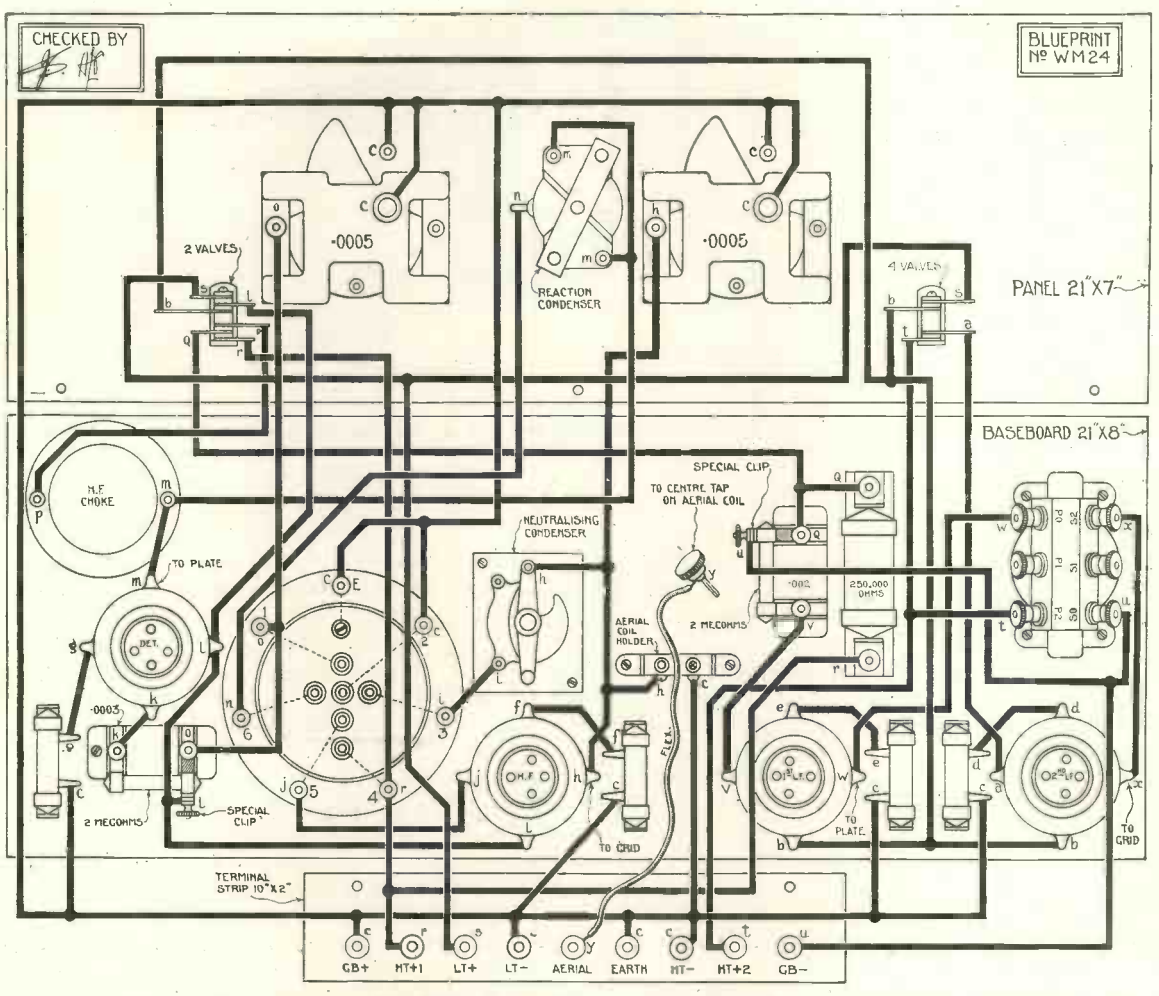
Ebonite panel, 21 in. by 7 in. (Becol).

2 .0005-microfarad variable square-law condensers (Ormond or Igranic-Pacent).

2 vernier dials (Ormond).

Single-coil holder (Lotus or Magnum).

The Revelation Four *(Continued)*



Layout and Wiring Diagram of the Revelation Four. This can be obtained as a full-size blueprint for 1s. 6d., post free from this office. Ask for No. WM24.

Six-pin screened split-primary transformers for both wavelength bands and six-pin base (Lewcos or Copex, Colvern).

Nos. 50 and 200 tapped plug-in coils (Lewcos or Lissen).

High-frequency choke (R.I.).

Neutrodyne condenser (Peto-Scott or Magnum).

4 antimicrophonic valve holders (Lotus or Precision).

4 fixed resistors with holders (Tempyrites or Magnum, Peerless).

Reaction condenser (Ormond or Peto-Scott).

2 2-megohm grid leaks (Dubilier or Lissen, Mullard).

.0003-microfarad fixed condensers with special insulated grid-leak clip (Dubilier).

3-point jack (Igranic or Formo).

5-point jack (Igranic or Formo).

3 1-in. brass wood screws (Economic-Electric).

Loud-speaker plug (Igranic or Formo, Lotus).

Headphone plug (Igranic or Formo, Lotus).

.002-microfarad fixed condenser with special insulated grid-leak clip (Dubilier).

250,000-ohm wire-wound anode resistance with holder (Varley or Dubilier).

Tapped multi-ratio low-frequency transformer (R.I.).

9 terminals, marked :—Aerial, Earth, H.T.+1, H.T.+2, H.T.−, L.T.+, L.T.−, G.B.−, and G.B.+ (Eastick).

Cabinet with 8 in. baseboard (Becol).

Terminal strip, 10 in. by 2 in. (Carrington).

Blueprint Available

In order to facilitate construction there is available—as is the case with all WIRELESS MAGAZINE receivers—a full-size blueprint layout, drilling guide, and wiring diagram. This is No. WM24, and can be obtained from the Blueprint Dept., WIRELESS MAGAZINE, 58-61, Fetter Lane, E.C.4, for 1s. 6d post free.

Although many constructors will find this blueprint very helpful it is not absolutely necessary, and all the essential details are clearly indicated in these pages.

The preparation of the panel will present no difficulty, each of the variable condensers and the jacks having a one-hole fixing arrangement. In all it is necessary to drill ten holes—three for the condensers, three to accommodate screws to fix the panel to the baseboard, and two for the jacks, and two for fixing the dials.

When these components have been fixed into position on the panel it is desirable to fix the latter to the baseboard and lay the rest of the parts out

Full-size Blueprint Available

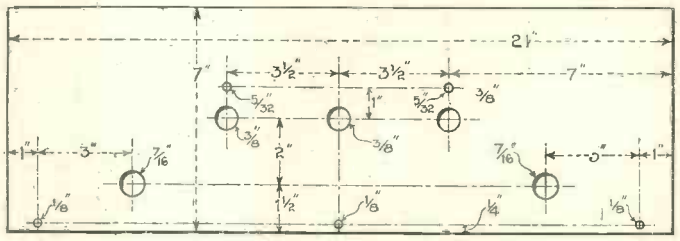
on that. The arrangement adopted by the WIRELESS MAGAZINE Technical Staff is clear from the photographs and blueprint (or layout diagram), and will only with a great deal of difficulty be improved upon.

As soon as all the components have been securely screwed down wiring can be started. For this purpose it is strongly recommended that some such insulated wire as Glazite be used, as this practice greatly lessens the chance of an accidental and disastrous short-circuit from taking place.

Wiring Up

No difficulty should be experienced in the wiring if the blueprint or layout diagram is followed carefully. It will be noticed that each terminal point is marked with a small letter of the alphabet; this indicates the order in which wiring should be carried out Thus, all those points marked with like letters should be connected together with one wire, or as few wires as possible. First connect up all those points marked *a*; then all those marked *b*; and so on through the alphabet.

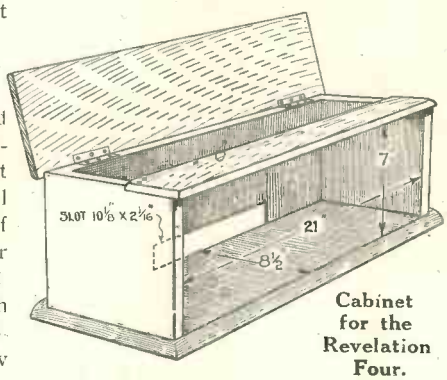
It will be seen from the photographs that the wiring is well spaced and that the only suggestion of



Panel Layout of the Revelation Four.

" bunching " is around the jack that puts two valves in circuit.

As soon as all the wiring has been



Cabinet for the Revelation Four.

completed a rough test can be carried out in order to get the receiver calibrated for a number of broadcasting stations. But here a word or two regarding the choice of suitable valves is desirable.

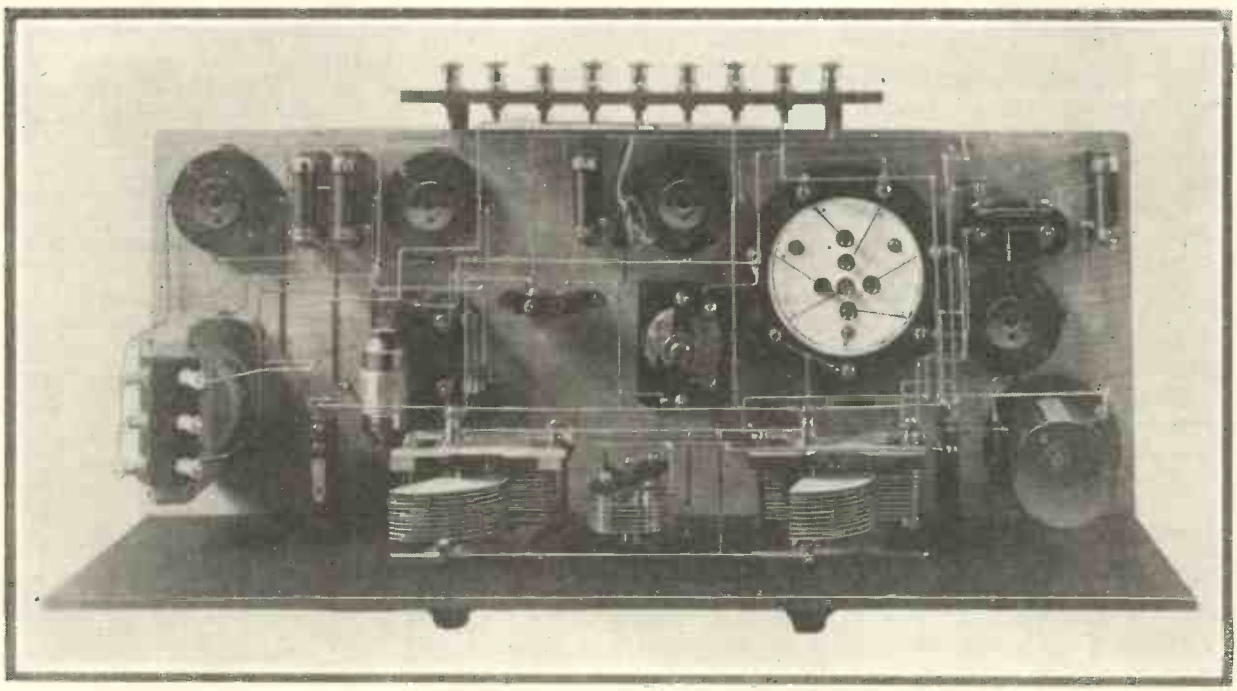
For ordinary use there is little to choose between valves requiring different filament voltages, although, within limits, there is an advantage to be gained by the use of 4- or 6-volt valves because of their greater filament emissions. In general it may be recommended that 4- or 6-volt valves should be used, but 2-volt valves will be found almost as satisfactory and certainly more convenient in cases where there is any difficulty regarding facilities for accumulator charging.

Saving Trouble

It will save trouble if two valves of the same type are used for the high-frequency and detector stages, and another two of a different type for the low-frequency stages.

As the detector is coupled to the first low-frequency valve by means of the resistance-capacity system, it is desirable that it (the detector) should have a high amplification factor, that is, something over 30.

(*Continued on page* 550.)



Plan view of baseboard of the Revelation Four.

Maggie Oscillates—and Howls

By RICHARD CAROL

I HAD been regardin' the fire for some meenits, reflectin' inter alia, as they say, on the awfu' price o' coal, when suddenly I looked up an' took my pipe tranquilly oot ma mooth.

"Maggie," I says, "I ha'e been thinkin'."

"Yer an awfu' man for takin' up new crazes," says she.

I ignored her inferior sarcasm.

"I was thinkin', Maggie, o' auld Janet Dalrymple. Ye mind," I adds, wi' a far awa look in ma eye, "she was awfu' guid to me when I was a bit bairn."

"Was she?" says Maggie.

"Ay," I says, wi' a reflective shake o' the heid, "she was that. I mind the times she gied me jujubes an' had me in for a bite wi' her, Maggie, when I'd no' had ma supper for why I'd done some wee thing that had annoyed ma faythe. Ay, she was a' what ye would call a sympathetic body. She'd ha'e made an awfu' guid mither, would Miss Janet—but mebbe, now I come to think on't, she micht ha'e changed too. It's queer what gettin' mairrit does for a body, Maggie. Ay, it's *gey* queer."

"When ye've no' got a guidman ye can afford to be kind," says Maggie, "but it's *ma* experience that if ye're kind to yer guidman ye get trampled on—ay, Sandy McNab, trampled on."

"Mebbe ay, mebbe no," says I, soothin'ly, "but there's nae denyin' Miss Janet was awfu' guid to me, an' I was jist wunnerin' if it wouldna be nice to gi'e her a birthday present."

"Ay," says Maggie, withoot lookin' up.

Thus encouraged, I continued to unfold ma plan.

"I've got a guid few odds an' ends o' wireless components, Maggie, an' I was jist thinkin' I micht put them a'tegither an' mak' her a twa-valve wireless set."

I stopped to regard her enthusiasm.

"Ay," she says.

"Weel, ye see, Maggie, what I was thinkin' o' was this. It maun be awfu' lonely for her now, her bein' an auld body an' no' bein' able to get aboot muckle, what wi' the rheumatisms which are awfu' bad the winter time an' her eyesicht which is a bit wake now. It's real sad, Maggie, when ither folks is enjoyin' theirsels, an auld body like that wi' rheumatisms an' wake eyes should be a' by her lane wi' naethin' to cheer her up. An' wi' a twa-valve set she could jist turn it on an' hear the concerts an' the music. An' ye see, Maggie, wi' her eyes bein' wake, she'll no' be able to read the papers an' hear a' aboot the foreign exchanges an' the latest price of gooseberries an' fat sows an' the latest details o' murder cases an' sic like entertainin' items. Maggie, it would gi'e her a new interest in life, a' that."

"Ay," says Maggie, "ay."

"Ye dinna sound exackly enthusiastic ower ma idea?" I enquiries in a disappointed intonation.

"Weel," says Maggie, layin' doon ma pants which she'd been darnin', "it's an awfu' nice idea yours, Sandy; but I dinna think ye've gi'ed it sufficient thocht. To my mind, it's gaun to cost ye an awfu' lot o' siller."

"Och no, Maggie," I says. "I tellt ye I was jist gaun to put it thegither oot o' a collection o' odds an' ends I've colleckit."

"An' what aboot the loud-speaker?" says she. "Can ye mak' that oot o' odds an' ends?"

"No' exackly," I says.

"An' her licence?" adds Maggie, noddin' her heid an' emphasisin' wi' her darnin' needle. "Are ye intendin' to present her wi' that? Ye ken fine she canna afford to buy it hersel now."

"She can use an indoor aerial," I says dootfu'.

"What!" cries Maggie. "You the postmaister o' Clumtochty an' sayin' a thing like that. Sandy, I'm surprised at ye."

"Weel," I says, "mebbe no' mebbe no'. Nae doot ma reminiscences o' the jujubes carried me awa'. How would it dae to gi'e her a crystal set now? That would eliminate the loud-speaker, an' I've got an auld pair o' phones that Mistress McPherson gi'ed me to prevent her guidman tryin' to get KDKA when she was wantin' music, an' we could spend the siller on a licence."

"Ay," says Maggie, "ay."

I observed her close for several meenits. I could see she was cogitatin' deeply the way she kept jabbin' the darnin' needle into ma pants—the ones she had been darnin', ye unnerstan'.

"What are ye worryin' aboot?" I hazards at length.

"I was jist wunnerin'," says she, "if wireless is a guid thing to put in the hauns o' an auld body like Miss Janet. Now, Sandy, thae mystery plays, wi' their pistol shots an' daggers an' things micht startle her an' gi'e her sic a fricht she would dee withoot regainin' consciousness—which would be a puir way o' repayin' her for her jujubes, would it no'?"

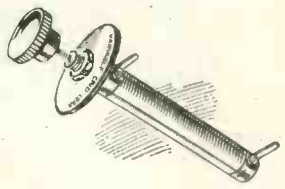
I sucked ma pipe in deep meditation.

"Ye're richt there," I says. "I never thocht o' that."

"An' then, Sandy," she continues, "the news nowadays is awfu' depressin'. If it's no' a murder in

Things To Know About

Variable Grid Leaks



ALTHOUGH the resistance of the grid leak is not usually very critical it is sometimes of advantage to use a leak the resistance of which is variable.

A common form of variable grid leak is illustrated here and the resistance is varied by turning the knob.

Usually the resistances of variable grid leaks are variable from about half a megohm up to about five megohms.

gruesome circumstances it's a revolution, an' if it's no' a revolution it's an earthquake. An' these are awfu' things to put into the heid o' a timid auld body like Miss Janet."

"Ay," I says, "ye're richt. The warld's in an awfu' state the noo."

"Sae mebbe, Sandy," she proceeds as if I'd never spoken, "it would be better to let her pass oot o' this life withoot troublin' her wi' a' thae misfortunes an' upsets, jist to let her slip awa' in peace an' tranquillity."

"Ay," I says, "it would be an awfu' peety if she slipped awa' twa-three days aifter we'd gi'ed her the set an' it gaed to her relations, wha wouldna appreciate it. But I'll tell ye, Maggie. I'll gang ower wi' the cart an' fetch her here on her natal day an' she can hear the music, etsaytera, on oor set. Aifter a', Maggie, she's an auld body an' winna eat muckle, an' she was awfu' kind wi' her jujubes when I was a bit bairn. Ye'll no . . . say no . . . Maggie?"

Maggie looked ay me awfu' queer.

"Sandy," she says, lookin' doon again, "I'm feart . . . I'm feart I didna think. Ay, Sandy lad, let's hae her ower for her birthday, an' if she likes the wireless ye'll mak' her a set. Sandy, Sandy, it's bad enough no' ha'ein' ony bairns round ye, but to ha'e nae bairns an' nae guidman . . . puir auld body."

"Maggie, Maggie," I says, an' ma airms crept roon her an' she buried her heid in ma weskit.

Then she lookit up at me an' smiled.

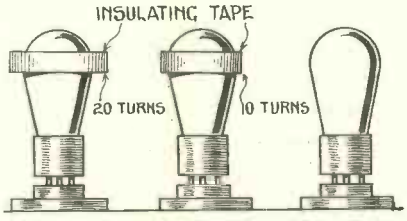
"I'm happier now, Sandy," she says.

An' then if the feckless wumman doesna gang an' wipe her eyes on *ma* pants.

Curing Microphonic Noises

DESPITE the use of sprung valve holders microphonic noises occur in many sets in which the vibrations from the loud-speaker can reach the valves. The detector valve is generally the starting point of the trouble, which is amplified by following low-frequency amplifying valves.

To cure the trouble layers of in-



Tape on Valves.

sulating tape may be wrapped tightly round the glass bulb of the detector and L.F. valves, as shown in the illustration.

In order that the natural vibrating frequency of each valve is varied a different number of turns should be put on each individual valve.

G. F. S.

Keeping the Insulators Dry

ALTHOUGH, taking things all round, reception conditions appear to be better in wet weather than in dry, it must not be forgotten that leakage from the aerial is far more likely to take place when everything connected with it is damp.

It is, in fact, well worth while to provide some means of keeping the aerial insulators dry during a rain-storm. Many simple and easily-applied methods suggest themselves. If a couple of egg-type insulators are used at the end of the horizontal span, for instance, a piece of ebonite tube into which the insulators will just fit tightly may be obtained.

This tube should be passed over the insulators, and should be long enough to project slightly, and so keep dry the insulators and the first couple of inches of the aerial wire.

The brass rod of the lead-in tube may be removed and the tube itself bent into a quarter of a circle after being warmed. The rod can then be bent to match and afterwards replaced inside the tube. The tube should be so fixed in the window frame that the outside end points upwards, and this end can be provided with a metal cone which will keep the greater part of the insulator dry during wet weather.

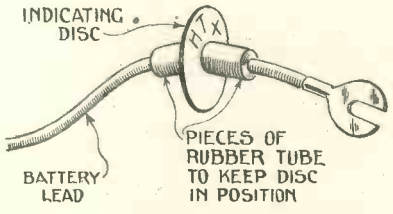
B. F. L.

Send in Your Photographs of Reyner's Countryside Four and Win £15 in Cash!

Marking Battery Leads

VALVES are frequently burnt out by inadvertently connecting the battery leads to the wrong terminals. The chance of doing this may be minimised by placing terminal indicating discs of the correct colour and lettering on the end of each lead, as shown in the illustration.

To prevent the discs from slipping



Method of Marking Battery Lead.

along the wire small pieces of tightly fitting rubber tube should be placed on each side of the disc.

If the indicating discs are made at home from cardboard a coat of shellac varnish may be given after printing on the required wording in order to preserve the cardboard label from dampness or acid fumes.

S. M. L

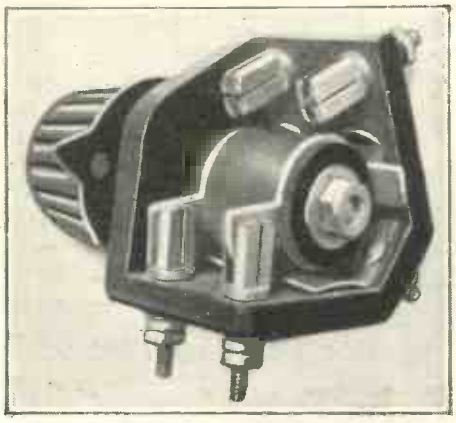


Fig. 1.—Well-made D.P.D.T. Switch.

SOME FRENCH RADIO COMPONENTS

Reviewed by a Special Correspondent

WHEN the doctor ordered me to the South of France I decided to do the trip in easy stages, staying a day or so in each of the principal towns *en route*. I wanted to thoroughly explore the French radio shops, the idea being to fish out something really new in radio.

Disappointed

I might say that I was rather disappointed, for I could find nothing in the nature of a sensational development, such as we get at home once in a while.

Fig. 2.—Neat Baseboard-mounting Resistance.

In design and appearance I found most of the usual components somewhat inferior to those at home, but there were a few which struck me as being rather novel, and these I purchased, with a firm resolve to test their efficiency. I made a wise choice, as was afterwards proved. The components I mention are shown in the accompanying photographs.

I fell in love at first sight with the D.P.D.T. panel-mounting switch shown in Fig. 1; this is very carefully designed, and extremely well made. Then I struck the baseboard-mounting anode resistance shown in Fig. 2. This can be mounted on any odd corner of the baseboard, or screwed to one of the panel supports, no bare metal clips being necessary. This, I thought, was rather *chic*.

The most novel French-made valve holder I could find certainly deserves mention; this is shown in Figs. 3 and 4, where it will be seen that the sockets (of very thin sheet brass) are covered with ebonite sleeves, and that the body consists of a flat ebonite washer which is joined, *via* four rubber arms, to a small metal base, the latter being screwed to the baseboard.

Fig. 4.—Rubber Arms and Fixing Disc.

Thus we have a pliable rubber support between the holder and the baseboard, which not only acts as an extra insulating medium, but effectively carries out its intended purpose—that of taking up vibration and preventing "pongs."

Variable Grid Condenser

Figs. 5 and 6 show a variable grid condenser, this being designed for use in conjunction with a variable grid leak. The idea, of course, is not new; as a matter of fact I thought it rather ancient, considering the modern policy of eliminating as many controls as possible.

The mechanism of the device is simple. The anti-capacity handle (no, it isn't *quite* long enough) is swivelled to the centre of the ebonite cap by means of an internally threaded bush which engages the centre stud shown in Fig. 6, the holes in each end of the cap sliding accurately over special stud-terminals.

Thus when the handle is unscrewed a turn or so, the moving plate, which is of spring sheet brass, forces the cap upwards, or in other words the capacity of the condenser is increased or decreased by tightening or loosening the cap.

French Coils

Fig. 7 shows the average French plug-in coil compared with an ordinary Igranic coil of the same inductance value. This particular make of coil is most popular in France, and although the block is of hard wood, instead of the customary ebonite, it functions quite well. There are a few other coils of more elaborate design, but in general they are much larger than our own. I rather admire the method of placing both pins on the block.

My quest o'er, I came to the conclusion that England is miles ahead in the component or *pièces détachées* market. French manufacturers seem to regard small components as necessary evils which must be stocked

Fig. 3.—"Anti-pong" Valve Holder.

for the benefit of those few amateurs who are obstinate enough to build their own sets. Complete sets are the mode, and here I must say that I saw some very fine models.

I present a single example in Fig. 8 which shows a five-valve

"super-neutrodyne" receiver complete with batteries and loud-speaker, the latter being housed in the lower cabinet, which is about 4ft. long and 3ft. high, and fitted with a solid marble top about 1in. in thickness. The complete outfit forms a most handsome piece of furniture.

O. J. RANKIN.

THINGS HEARD

From Hamburg ("Norag")

Nationalist songs and choruses.

Three talks on the value of Nationalism.

A talk deprecating the possibilities of the League of Nations.

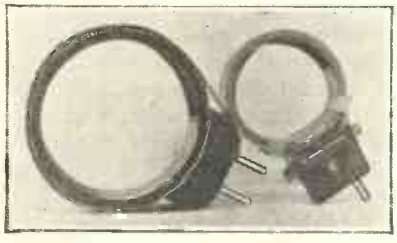


Fig. 7.—Comparison of Two Coils.

The scarcity of any but national music.

Silent hints about the lost trade of Great Britain.

The amount of patriotic items in the programmes.

From Stuttgart

A stuttering announcer.

A stuttering talker.

An orchestra that went all to pieces. The conductor seemed to lose control.

A conductor who conducted his silver band with his voice and not with his hand or baton.

The tremendous echo of the studio, caused partly by the old-fashioned microphone used.

A real love scene—not in the programme.

From 2LO

Greenwich and Big Ben time signals superimposed over a Russian rhapsody when Russian relations were being discussed in the House of Commons.

Twelve minutes' "fill-up" music that did not fill up.

A soloist too far away from the microphone.

Poor humour.

Fig. 5.—Variable Grid Condenser.

Good wit and epigram.

An "unrehearsed" choral selection.

Cheers after *The Last Laugh* which spoiled the effect.

An evening programme which contained four men who could not sound their r's. It should have been called the "R-less programme."

The thunderous cough of an announcer.

From Bratislava

A children's choir.

A beautiful boy soprano voice.

A wonderful duet of young girls.

Children's talks of high standard.

The youthfulness of the announcer's voice.

From Udde Valla

A series of talks on the making of butter.

Butter prices.

The orchestra conductor's pats with his baton.

A butter week broadcast.

The butter atmosphere of the studio. It was a relief to hear an occasional word about Udde Valla porcelain.

From Casablanca

Weird noises from a weird orchestra.

Yells.

The most unusual vocal music representing a storm.

Imitation of wild animals. The snake, lion, hyena, and elephant were most effective.

Dances and their accompaniments. The accompaniments came through clearly and left the dances to the imagination.

The drowsy nature of the songs.

Strange tongues.

From Radio-Paris

A long-winded and long-worded announcer.

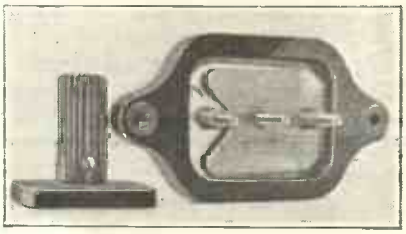


Fig. 6.—Parts of Grid Condenser.

An orchestral conductor who talked all the time.

A violinist who stopped playing.

A C_3 soprano soloist.

From Daventry

Cheers.

A short-story writer who could not read a story he ought never to have written.

Five items in the following order:

"A thief in the night"—Duet.

"Be a sport"—Talk.

"Don't tell mother"—Sketch.

"The whole town's talking"—Sketch.

"The best man"—Song.

Someone in the studio manicuring.

E. B. R.

Fig. 8.—Example of French Receiver Design.

A Survey of Recent Developments

Jottings on the Month's Progress

Long-wave Shuffles

THE Geneva people are again tackling the question of overcrowding on the longer wavelengths. Königswusterhausen has recently moved down to 1,250 metres, whilst Hilversum has moved up to 1,060 metres. Other minor shufflings have taken place at Langenberg, Moscow, and Warsaw.

A newcomer in this field of the broadcast waveband is the high-power Swedish station, Motala, working on 1,305 metres. At the present time there are roughly thirty European stations broadcasting on the upper wavelength scale between 1,000 and 4,000 metres.

In other words, thirty stations have to be sandwiched into a belt which, expressed in frequencies, extends only from 75 to 300 kilocycles. As the minimum separation necessary to prevent overlap is laid down at 10 kilocycles, it is obvious that some extremely fine juggling will be required to give each station sufficient elbow room.

* * * * *

American Broadcasting Reform

Plans for a general reorganisation of the existing broadcasting system are at present under review by the American authorities. Transmitting stations in the U.S.A. are grouped in four divisions. Class A includes stations of 750 watts or more. Class B takes in those rated between 250 and 750 watts. Class C those between 100 and 250 watts, whilst stations rated below 100 watts are placed in Class D.

At present there are 127 A stations, 207 B stations, 176 C stations, and 222 D stations, all of which are working within a band of 90 metres. It is proposed to reserve 48 individual channels, separated by one metre for the A stations, and to allot these to the best equipped. The rest will have to reduce their power to the B rating.

The allocation of the remaining wavelengths is as follows: 26 one-metre channels for B stations, 10 for C stations, and 6 to D stations. With these smaller powers the problem of overlap is not so difficult. It will be solved mainly by giving identical allotments, and ensuring a sufficient geographical separation between different stations using the same wavelength.

* * * * *

Concerning Mica for Insulation

In a recent paper on mica Mr. G. V. Hobson points out the growing importance of this mineral, particularly in the electrical industry. There is no other natural substance, or artificial substitute, that possesses the same perfect cleavage, transparency, lack of colour when in thin sheets, flexibility, toughness, and resistance to temperature changes, or chemical decomposition. Finally it has exceptionally high electrical insulating properties.

Commercial mica is usually either of the potash or magnesian varieties, known respectively as muscovite or phlogopite. Indian ruby mica is found to be the best dielectric for condensers, whilst silver amber is widely used for separating the commutator segments on D.C. dynamos and motors.

* * * * *

Chess by Radio

The recent chess contest between the Parliamentary experts at home and in Australia proved rather a fiasco, the match being abandoned owing to prolonged delay between the moves. The trouble was not, however, due to any fault in the beam wireless service, but was caused by a breakdown in the local line connecting Canberra to the transmitter.

A similar effort recently staged by two well-known Canadian amateurs met with greater success. The Dartmouth (N.S.) Chess Club played at St. John's, Newfoundland, to a draw in forty-six moves, taking two hours and a half for the game. Moves were dispatched by radio and received by Major Borrett (1DD), and Mr. Reid (8AR) respectively.

* * * * *

Empire Broadcasting Link

The recent successful broadcast transmission to Australia and the East Indies, carried out by the Philips experimental station at Eindhoven in Holland, raises the question as to the possibility of establishing a high-power, short-wave station as a broadcast link between the Mother Country and the Colonies

Speeches of Imperial interest could be recorded either by gramophone or telegraphone, and broadcast at suitable intervals to suit the geographical time of the various parts of an Empire on which the sun never sets.

A twenty-four hours' service would apparently be necessary, but this is a small matter in view of the larger issues involved. There would be little difficulty in providing a suitable service of news and programmes of general interest to a circle of listeners whose lives are spent far away from the hub of Empire.

* * * * *

Television

Referring to the possibilities of Transatlantic television, Dr. Dellinger, Chief of the Radio Section of the American Bureau of Standards, points out that all the scientific and engineering elements necessary to bring about practical television are known.

It only remains for competitive organisations to spend sufficient money to work out the practical details.

He adds that there is no reason in the world why it should not shortly be possible for audiences in Europe to see as well as hear prominent speakers in the United States, and vice versa, using the existing London-New York wireless telephone service as the connecting link.

B. A. R.

What Listeners Owe to the Ingenuity of—

O.C. NOISES

When you have been listening to a broadcast play you must have wondered how all the "off noises" are produced. Well, in this article the "Wireless Magazine" Special Commissioner lets listeners into some special secrets and explains how the B.B.C. can make any required noise.

MY question had been a simple one. "Given the fact that the evening wireless menu calls for a storm, what ingredients would you use?"

I was sitting in a new studio recently built in the basement of the B.B.C. headquarters. It was not my first visit to this floor of the building; on previous occasions I had freely perspired in these same rooms—the Savoy Turkish Baths had been a regular haunt of mine!

The Purveyor-in-chief of Noises to the B.B.C. thoughtfully lit his cigarette.

"Rain? Hail? Wind or thunder? On land or at sea?" he asked laconically.

"I should enjoy a storm at sea," was my answer, "if on land!"

Recipe for a Storm!

"Right," said O.C. Noises. "Here's the recipe. Take a sufficiency of number 1 and a dash of number 48, with a sprinkling of 45. Beat up 1; add to 2 a modicum of 47 and 48, and flavour with 45 according to taste. To this a dose of compressed air, and short blasts of 7. Dish up on a thunder sheet; blend thoroughly, and serve up as required. This should be sufficient for three million listeners!"

In truth it sounded more like a lesson in cookery, and at any moment I expected to hear the rustle of pages in Mrs. Beeton's famous book.

"Your instructions are explicit, but . . . ."

He rose and signalled to his assistants. The rumble of thunder was heard in the distance; the wind rose. From a gentle breeze it gradually gained strength; the sea, which began by lazily "plopping" against the sides of the steamer, splashed harder, and now and again "packets" of water leaping her bows fell crashing on the poop, then swirled and feverishly ran out through the scuppers with a swoosh and a hiss. A loud peal of thunder; the rain started to fall in torrents; the wind howled and whistled through the rigging; to the din was added the clatter of heavily booted men on her iron deck. She was making heavy weather.

"A short gale," I remarked, "but a merry one."

"Absolute realism cannot be attempted. It would not be convincing. If a play is produced in which one scene is enacted during a gale, the storm, although it would in reality,

O.C. NOISES

Mr. Alfred Whitman of the British Broadcasting Corporation.

cannot rage all the time. It must be suggested to the listener in a way which allows his imagination to accept that the wind is howling and that the steamer is shipping heavy seas during the whole course of the incident. If the scenic sounds obscured the dialogue—a fact which would happen in a real gale—we should not create illusion, but merely produce irritation in the listener's mind.

"It is essential that the 'noises off' necessary to act as a frame to the dialogue should suggest rather than portray. The actual mind picture *must* be left to the imagination of the hearer. The main principle underlying the use of effects is that they are used with a view to imparting to both scene and action an *atmosphere* of reality, but do not constitute an *attempt to depict it.*

Real Thing

"If the latter were the case success could only be achieved by the use of the real thing, and in most instances, to attain this effect, the noises would be so overpoweringly loud that the voices of the actors would be drowned.

"In the course of everyday life we actually hear but a small percentage of all noises which go to make the general sounds captured by the human ear; that amount is restricted to spot noises which may be prominent in a background of hum or buzz subconsciously registered by the brain, but not consciously heard.

"Walk into a railway station—what happens? At the outset you are temporarily deafened by a medley of noises, such as the shrill escape of steam under pressure, whistles, the shunting of trucks, the rumbling of luggage trolleys on stone platforms, the cries of the newsboys, and so on.

Individual Effects

"At first, in order to make yourself heard you feel impelled to shout; soon, however, these component sounds fall into the background as your ears become attuned to them; the general feeling of overpowering noise passes off, and in its place the ear registers only individual effects as they occur in your immediate neighbourhood.

"For this reason, were it necessary for artificial sounds to represent faithfully what is taking place, the general noise would merely annoy

O.C. Noises *(Continued)*

and puzzle the listener. What must be aimed at is to reproduce effects not as they actually are, but as they are usually registered by the ordinary spectator."

"But if, as you say, the real sounds must not be reproduced, by what means can a true effect be obtained?"

Into the Toy Shop

O.C. Noises took me into his toy shop, leading out of the dramatic studio. Imagine a room, some twenty feet square, crowded with numberless weird contraptions of all sizes and shapes. Leaning against the sides were ranged a dozen or so large compressed-air cylinders, and dotted all over the walls and floor a generous collection of drums of all sizes, sieves, small boards covered with sandpaper, curious models of which classification was impossible, mediæval looking engines driven by motors, electric fans, peculiar stringed instruments which would have been prized by Central African natives, steam syrens, a large galvanised water tank, a shower bath, three or four large pieces of sheet iron hanging from the ceiling, ratchets, large cycle pumps, and the many much-worn and second-hand objects which are usually associated with a marine store dealer's stock of odd junk.

This, as a matter of fact, constitutes the "noise kitchen," over which Mr. Alfred Whitman has presided since 1924. It was to his ingenuity that were due the sound-effect accompaniments which made the London success of such films as *Armageddon, Scaramouche, The White Sister,* and other productions in which the public was induced to visit the cinema to *hear* a film as well as to *see* it.

Too Delicate "Mike"

Effects of a primitive kind have been used for some considerable time, and many are the stage plays in which imitative sounds have been employed to heighten the interest of the piece, but most of the methods suited to the theatre cannot be employed with so delicate an instrument as the microphone.

Mr. Whitman therefore has been compelled to devise an entirely fresh system of producing sound effects for radio transmission. For this purpose many hours have been, and are still being, spent in first-hand study of the subject, and it was even found necessary, on one occasion, to travel from London to Rugby on the footplate of the locomotive attached to the Scottish Express in order to register the whole gamut of sounds heard during the run.

For such dramatic plays as *The White Château,* or similar great war incidents, Mr. Whitman's practical experience as an artillery officer has provided him with sufficiently vivid impressions in this direction!

My interest had now reached its highest point. Although of mature years, I felt I could have spent quite a pleasant hour playing with these many toys. I was taken back to the days of the nursery and the clockwork engine. I wanted to see the "wheels go wound!"

"Now, coming back to your home-made gale, according to recipe," I suggested.

Ingredients

"Here," replied Mr. Whitman, "you will find the ingredients. We suggest the sea by means of this drum. Just a single handful of large shot, skilfully rocked so that it travels over the parchment surface. If I move it quickly, a loud roar is produced; if more slowly, a gentler wave sound follows. Try to recall some of these noises. Take the deep sea—*woo-oo-ooah-roooo-ar-r-r*—or the wave breaking on the beach, CRASH-*ee-hen*-CRASH-*ee-hen*-CRASH, followed by a slobber as the water slowly rolls up the sands. By means of this drum we can reproduce the short crash of breakers, the idle trickle of wavelets, or the long swash of a deep sea roll."

"Could you not better achieve this by the use of real water?"

"A liquid in close proximity to the microphone is very useful for certain situations. We can imitate the slap-plash of waves against the side of a ship by means of this tank of water; a combination of this effect with a light background from the shot drum is quite successful."

"Why not make use of real sea effects?"

"For the sole reason that they may not be at our disposal when required. On certain occasions we have installed a microphone on the seashore at Plymouth and conveyed the sounds to Savoy Hill by landline. The trouble is that when the sound of breaking waves is required the sea may be dead smooth, and we should be compelled to fall back on this studio for artificial effects. Curiously enough, in two instances when, in fact, listeners were hearing the real thing, we were told that the sounds were not as *natural* as when they were of home manufacture!"

Improving on Nature

This apparent improvement on nature is one which has led to considerable study, and it is a remarkable fact that in order to imitate certain sounds it is not possible to utilise the materials with which, in nature, these noises are produced. For instance, were it necessary to illustrate a tea-party and to convey to listeners the clatter of cups and saucers, the actual "clink" made by the contact of such crockery, picked up by the microphone and amplified, would more closely approximate the clash of steel sheets and would not in any way convey a correct mind-picture to the listener.

Many of the examples given to me tended to demonstrate that, if anything, sound effects were reduced to their bare minimum; in most instances they were carried out on a miniature scale, and although sounding lifelike through headphones and loud-speaker, were sometimes barely audible at their source in the studio. As an example the loud, slow and dignified tick-tock of a grandfather's clock was produced by a small metronome.

Winds to Order

"And this?" I queried.

"Is a wind machine, which to a great extent does not differ from those used in theatres. By means of it we produce sounds from a light wind to a storm, and can give the effect of sudden gusts. To this small syren whistles can be added; they produce the high-pitched scream familiarly associated with gales and typhoons. The small ones are blown in the ordinary way, but for long blasts of steam syrens or foghorns,

By Our Special Commissioner

as there are limitations to the human lungs, we use compressed-air cylinders for the purpose.

Twanging Whine

"Now for that peculiar twanging whine so commonly heard in tropical storms or the whistle of the wind through the rigging, our office vacuum cleaner is the ideal thing. Suitably modulated and varied, it will give sounds of various tones. It also represents the *crescendo* or *diminuendo* moan which accompanies the starting and stopping of a lift. Again, the hiss given by compressed air from these cylinders, as I open the tap, is a good imitation of steam escaping under pressure. It is a useful addition in storm and gale effects."

"I heard torrents of rain, thunder, the fall of waves on the deck of the steamer."

"For rain a drum was used, with light shot; for gusty rain this prepared piece of cardboard, held so closely against the vanes of an electric fan as to cause these paper strips to flutter in the breeze. Thunder? This large iron sheet, which was softly or violently rattled. Much can be done with it.

"Those were the ingredients of your storm; the sounds were taken singly, mixed, or superimposed; it is due to the correct blending of the entire combination that the true effect was reproduced."

I spent two hours in that toy shop! I have merely glossed over the origins of some of these sounds which are conveyed to you through your loud-speaker when you hear plays, sketches, revues, or other similar entertainments. To understand the study required by these noise effects you must try to visualise a theatre in which there is a continuous performance with an ever-varying programme.

O.C. Noises must be prepared at any moment to illustrate for your benefit anything from the opening and closing of a door, the click of a typewriter, the ring of the telephone to the starting of a locomotive, a bustling street scene, an explosion in a coal-mine, or a bush fire.

Take, for instance, those Pickwick scenes in which mail-coaches figure very extensively. It is essential that the noises should be imitated as naturally as possible. The fussy departure from the inn, the jingling of the harness chains, the rumble of the wheels; then the slow walk of the horses through the cobbled street (*CLOP* and *CLOP* and *CLOP* and *CLOP*), the crack of the whip, the canter down the main street (*CLOP, clop, CLOP, clop, CLOP, clop*), and finally the break into a gallop on the loose open road, to the creaking of the coach springs, the rattle of harness, and the encouraging shouts of the old coach-driver.

Admittedly, to see one of the assistants on all-fours in the "toy shop" holding in his hands a pair of cocoanut shells, which he strikes alternately on a brick or on a gravel-filled pan to secure the sounds of the horses' hoofs, may cause disillusion, but close your eyes to this scene and without difficulty you will follow the mail-coach on its way.

According to the surface chosen by the operator, he can give you the effect of a macadamised road, a cobbled street, or a loose and dusty country lane.

Galloping Horse

Again, on another occasion, should you find yourself behind the scenes at the time a radio play is being produced, it may be difficult to take the drama seriously when, hearing the anguished maiden's cry of "Unhand me, villain! I hear the sounds of a horse. May heaven speed Sir William!" you see the method employed to simulate the noise of this gallant's wild dash to the rescue of his lady-love, who is in great trouble.

But when the two studio transmissions are superimposed upon each other the mixture is a perfect one, enabling you to visualise a thrilling incident forming part of a stirring drama.

Noise Needs

You must, however, bear in mind that, notwithstanding the great part played by sound effects in the presentation of dramatic entertainments, these noises are merely used as a scenic background—the stage scenery of the theatre, or to link up the dialogue and incidents; they act in most cases as do the sub-titles of films, in order to give continuity to the story. It is necessary that they should form part of the plot, and yet should remain subservient to the dialogue; they must not be too prominent, except at moments when great stress is to be laid on a particular incident.

For the reasons laid down you will realise that in order to create a

HOW NOISES ARE PRODUCED

Quite frankly, this is not a wireless picture. It was taken behind the scenes at a theatre and shows how the elaborate "noises off" for the production of "The Ghost Train" were made. Some of the instruments are specially made ones.

O.C. Noises *(Continued)*

perfect mind-picture this particular portion of the dramatic studio must be under perfect control. Team work alone enables this to be done; every man has his particular job, and for the production of a show such as *The Military Tattoo* (studio version), *The White Château*, or other plays in which scenic effects abound, the entire broadcast is worked to a time schedule.

Seven Studios

In some of these elaborate radio transmissions it was found necessary to utilise some seven different studios, to which were added microphones at other points of the building. Take, as an example, the Tattoo, a reminiscence of Wembley, performed on November 10th, 1925. Although as a listener you could actually feel the presence of infantry, cavalry, artillery, tanks, and aeroplanes, these various members of the fighting services were suggested entirely by sound effects, the only troops actually in the studio being the musicians and buglers. Yet it was possible to visualise Aldershot's extensive plains and cheering crowds as the different bands and units contributed their quota to the performance.

On this occasion the two spectators whose intimate dialogue you overheard were placed in a studio with the musicians and some twenty supers to act as the cheering crowds were in another; in every instance their cues were given by electric signals, indicating clearly the moments in which they were to take part in the show.

Mixing the Noises

All studios were linked up with one another in such a manner as to enable the individual controllers to hear what was taking place not only in each section, but also what was actually being broadcast as a whole. Partial control took place in individual studios, and again in the central engineering room, in which the separate components, suitably amplified, were finally fed to the transmitting station.

By this clever piece of organisation it was possible to put over the explanatory dialogue, to bring in the military bands, the noises of the marching infantry or galloping artillery, and the cheering of the crowds, checking or increasing each component as desired, to blend into a perfectly finished and convincing sound picture. Such a result can only be accomplished by an efficient organisation and much careful work, and equally careful rehearsing must be undertaken before a production is broadcast to the listening public.

An effect which may only last some few seconds, but which is considered essential to the development of the plot, may have caused hours of thought before rehearsal previous to its being passed as a finished product. Many are the attempts made at imitating noises; the judging of them as such is done in the course of the experiments. By the time the rehearsal comes round it is only necessary to decide as regards their fitness and their volume in regard to speech and other constituents of the play.

Out of Sight

To gauge their effects the producer goes to the engineers' control-room or to some other place far from the studio, for the appearance of things invariably affects the opinion formed. Should you see a tin bucket you would feel convinced that it *must* possess a metallic sound. Of course, you may not hear it, but your eye suggests it to your brain, and it is almost impossible to get away from this suggestion. As a listener in your own home you receive the combination of speech and sound. If your loudspeaker conveys to you both a story and a picture; if in your mind's eye you really see what the author has tried to depict, the radio play is a success.

It must be patent to all that already great advance has been made in the presentation of sound effects; their possibilities, as applied to the production of radio plays, are by no means exhausted. The broadcast drama is a practical form of entertainment, and the B.B.C. dramatic section is fully alive to its further development.

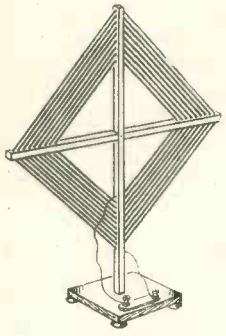
Always Listening

"Believe me," said O.C. Noises, "there is more in sound effects than might at first be imagined. Personally, I am always studying them. I listen to noises wherever I may be—at all times, whether at home, in the street, country, 'bus, tube, boat, or train; and I practise their reproduction as often as possible."

If on one of your daily trips to the West End you should happen to be seated opposite a young man wearing a worried look, who, with pursed lips, is endeavouring to copy the sound of an Underground inspector clipping your ticket, look at him twice; perhaps it is Mr. Alfred Whitman in the throes of an inspiration—and, again, perhaps it is not!

Things To Know About

Frame Aerials



A DRAWING of a frame aerial, which replaces the overhead wire, earth connection and tuning inductance of the ordinary aerial system is shown above. It is merely connected across the aerial and earth terminals of the set where the aerial-tuning condenser, of course, is in parallel with it.

When waves from a transmitting station reach one side of the frame before the other side currents which differ in phase are induced in the windings and consequently differences of potential are set up between the two ends of the frame.

Therefore reception is strongest when the frame points directly towards the station being received and becomes weaker as the frame is rotated through a quarter of a circle.

When the plane of the frame lies directly at right-angles to the line joining sending and receiving stations the signals from the former will be inaudible, so that the frame aerial can be used for finding the direction of a transmitting station.

Neat in appearance and efficient in performance, the Wave-catcher Three is a set that will undoubtedly appeal to many constructors who want a good straightforward receiver that can be built for a reasonable price. As is the case with all "Wireless Magazine" sets, a full-size blueprint is available for the help of constructors.

THE WAVE-CATCHER THREE

A Straightforward Set Specially Intended for Summer Use

Designed, Built and Tested by the "W.M." Technical Staff

Completed Wave-catcher Three.

NO, this title is not meant to imply that the receiver to be described is a special marine model for use on the seashore; the waves referred to are those produced in the ether by broadcasting stations, and this set has been specially designed to catch them—and to hold on to them.

It is, of course, a special WIRELESS MAGAZINE design, and will be found of particular value in cases where it is desired to obtain the greatest range with the minimum number of valves. The components used include some of the latest to be put on the market; altogether the set is a good example of a straightforward three-valver following modern practice.

Popular Need

Experience has shown us that a very large number of listeners has need of a three-valve set of this type employing one high-frequency amplifier, a detector and one low-frequency amplifier. The high-frequency valve gives adequate range for the reception of almost all the more important European stations, while the note magnifier brings a sufficient number up to loud-speaker strength.

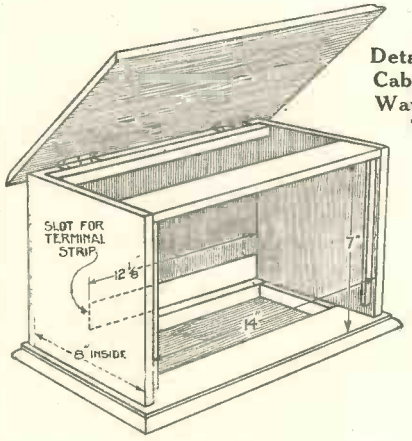
A glance at the circuit diagram will show the general lines of the receiver. The high-frequency amplifier is neutralised on the split-primary principle and the efficiency of the circuit is further increased by the application of a form of Reinartz reaction to the detector valve. This arrangement gives an easily controlled form of reaction and enables a wide range of wavelengths to be covered without the need of changing three or four coils each time.

Plugging-in the loud-speaker automatically switches on the valves, while the withdrawal of the plug switches them off again. Fixed resistors are used to control the filament current, this practice saving three variable controls with very little difference in efficiency.

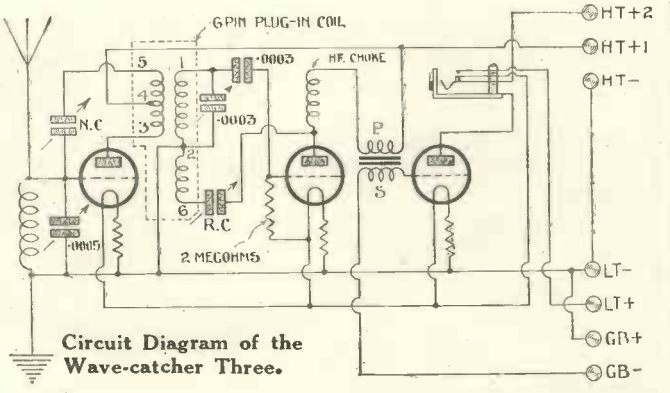
In the original set made up by the WIRELESS MAGAZINE Technical Staff two of the new Ediswan low-loss variable condensers were used for tuning the aerial and transformer-secondary circuits respectively. Each condenser incorporates an elaborate geared fine-adjusting device and in operation they are found to give very critical control—a feature that is most desirable when searching for the distant stations.

Handsome Appearance

The double knobs of these condensers give a handsome appearance to the front of the panel, as can be seen from the accompanying photograph. The two small knobs are for the neutralising and reaction condensers respectively (see also photograph above).

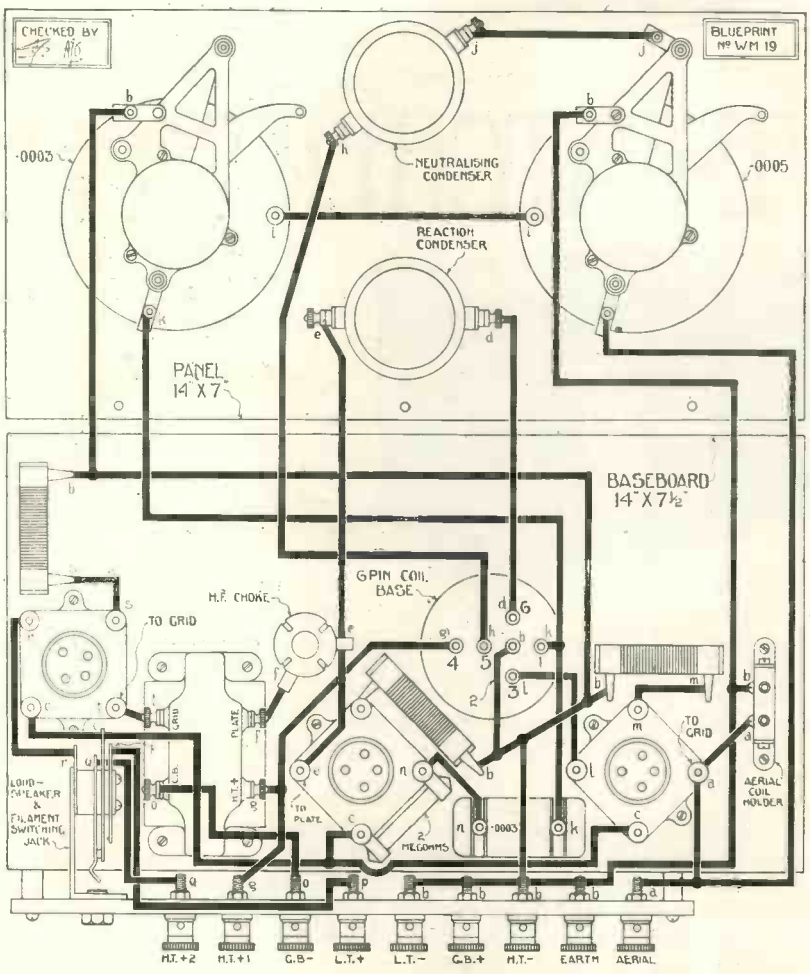


Details of Cabinet for the Wave-catcher Three.

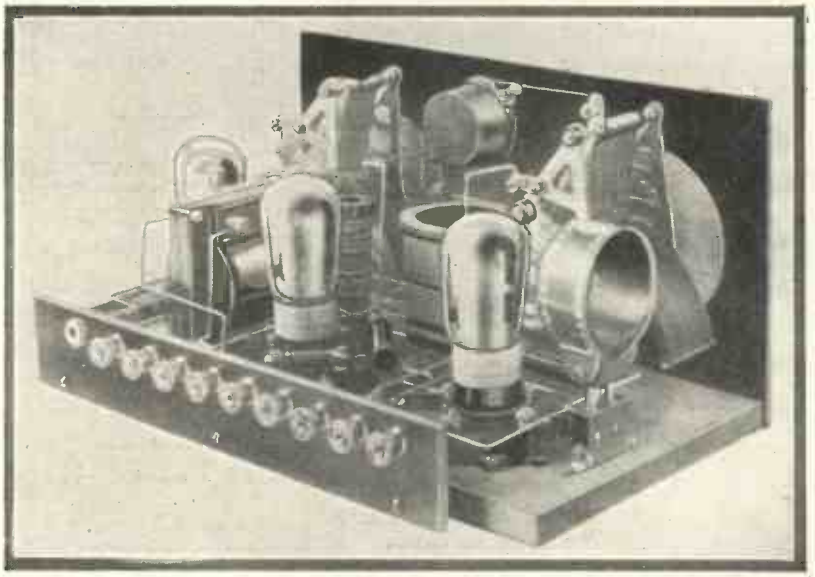


Circuit Diagram of the Wave-catcher Three.

The Wave-catcher Three *(Continued)*



Layout and Wiring Diagram of the Wave-catcher Three. This can be obtained as a full-size blueprint. Ask for No. WM19.



Wave-catcher Three with Valves and Coils in Position.

Components Needed

A complete list of the components required to build the Wave-catcher Three follows :—

Ebonite panel, 14 in. by 7 in. (Becol).
.0005-microfarad variable condenser with vernier (Ediswan or Ormond).
.0003-microfarad variable condenser with vernier (Ediswan or Ormond).
2 dial indicators (Bulgin).
2 antimicrophonic valve holders (Benjamin or Lotus).
Antimicrophonic valve holder with 2-megohm grid leak (Benjamin or Lotus).
Neutralising condenser (Igranic or Ormond, Peto-Scott).
Reaction condenser (Igranic or Ormond, Peto-Scott).
3 fixed resistors with holders (Burne-Jones or Peerless).
H.F. choke (Varley or Cosmos, Wearite).
Single-coil holder (Lotus or Burne-Jones).
Six-pin split-primary transformer and base (Colvern).
.0003-microfarad fixed condenser (Dubilier or Cosmos).
Four-point jack and plug (Igranic).
Terminal strip, 12 in. by 2 in. (Becol).
L.F. transformer (Ferranti A.F.3 or B.T.H. 4 : 1).
9 terminals :—Aerial, Earth, H.T.+1, H.T.+2, H.T.−, L.T.+, L.T.−, G.B.+ and G.B.− (Eastick).
Cabinet and baseboard (W. and T. Lock).

It should be noted that the particular components used in the original set and allowed for in the layout are in each case mentioned first.

All the essential details for building this receiver are given in these pages, but the constructor is recommended to obtain a full-size blueprint layout, drilling guide, and wiring diagram from this office. This costs only 1s. post free, and greatly facilitates the building of the set : address your application to Blueprint Dept., Wireless Magazine, 58-61, Fetter Lane, E.C.4, and ask for blueprint No. WM19.

Drilling the Panel

When all the components have been obtained work can be started on the ebonite panel. This should have seven holes drilled in it—four for the four variable condensers and three to accommodate screws for attaching it to the baseboard. As soon as these holes have been drilled the four condensers can be fixed into position.

Next the rest of the components can be placed in position on the baseboard. It is recommended that a coil

A "W.M." Set for Summer Use

should be placed in the six-pin coil base to ensure that it will clear the .0005-microfarad variable condenser (seen on the right of the panel from the back). The holder for the detector valve, which incorporates clips for the grid leak, should be placed in such a position that the latter can be easily changed if desired.

Fixing Panel

As soon as all the baseboard components have been mounted the terminal strip and front panel should be screwed to the baseboard; wiring can then be started.

A glance at the wiring diagram will show that each terminal point is marked with a small letter of the alphabet. This indicates that all those points marked with like letters should be connected together. That is, all those points marked *a* should first be connected together with one wire or as few wires as possible; then all those marked *b*; and so on through the alphabet until the wiring is completed.

Before the set can be tested it is necessary to insert coils, valves, and fixed resistors into their respective sockets. Assuming that reception is first to be tried on the lower band of broadcast wavelengths, and that use is to be made of an average aerial-earth system, plug an ordinary No. 40 coil into the single-coil holder, and a short-wave split-primary transformer into the six-pin base.

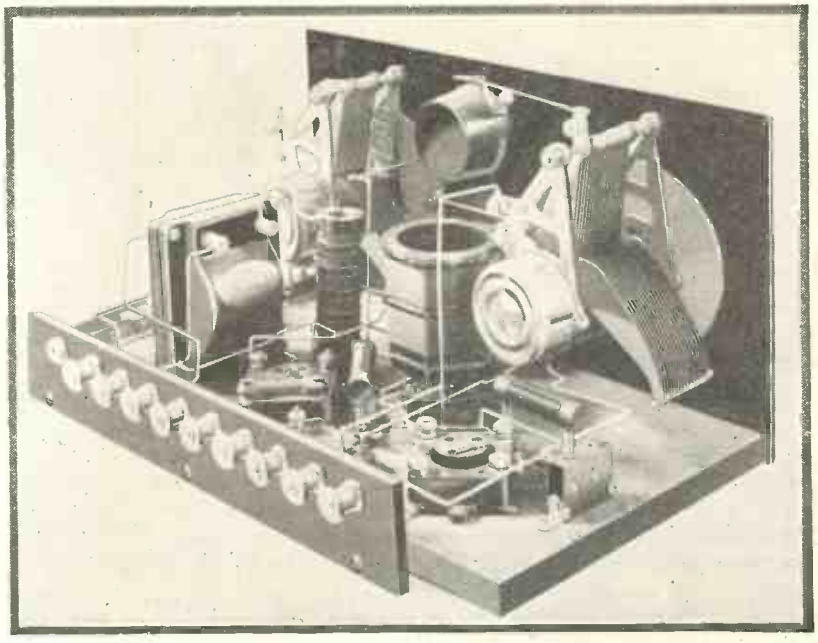
Suitable Valves

The valves used should be of types suitable for (1) high-frequency amplification, (2) detection, and (3) low-frequency amplification respectively. If the high-frequency valve employed has not too high an impedance (say not more than 30,000 ohms), then a similar valve can be used in the detector stage. Both high-frequency amplifier and detector, it will be noticed, are supplied with the same high-tension voltage. The last valve should be a fairly low-impedance valve (in the neighbourhood of 5,000 to 7,000 ohms, say), of the semi-power type.

It is immaterial what voltage valves are used provided that suitable fixed resistors are obtained for use with the battery to be employed.

Having placed the valves, coils and resistors in position, the batteries should be connected up. H.T.+1 should, in most cases, be at a potential of between 60 and 80 volts, and H.T.+2 should be connected to the highest tapping on the battery—anything up to 120 volts. In this case a bias of from 6 to 9 volts should be applied to the grid of the last valve.

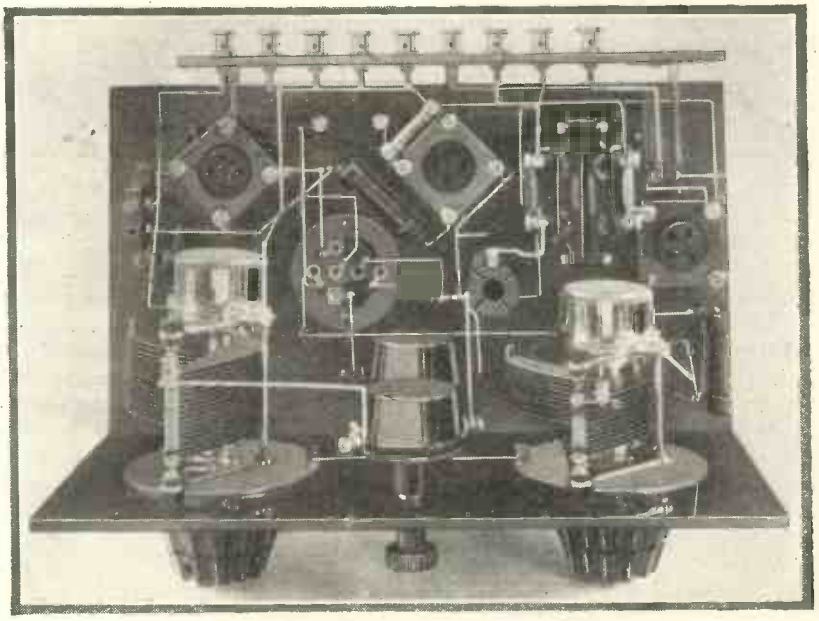
These figures are only approximate, and the manufacturers' recommendations should always be followed when they are available.



Layout of Components of the Wave-catcher Three.

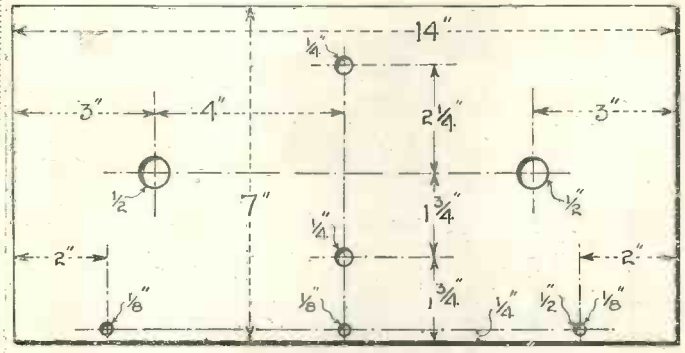
H.T. for Long Waves

When receiving on the long waves (say above 1,000 metres) it will probably be found that the high-tension voltage on the high-frequency amplifier and the detector can be increased with a consequent improvement in signals. The H.T.+1 tapping



Plan View of the Wave-catcher Three.

The Wave-catcher Three *(Continued)*



DIMENSIONED PANEL LAYOUT OF THE WAVE-CATCHER THREE
This diagram will not be needed if a full-size blueprint is used.

should in any case be varied until the best results are obtained for each particular station.

To operate the set plug-in the loud-speaker and adjust the reaction condenser until a noise is heard that indicates that the set is oscillating—this noise is best described as a rustling or breathing sound. Now turn both of the large variable-condenser knobs until signals are heard, and readjust the reaction condenser.

Neutralising

As soon as a transmission has been reasonably well tuned-in the high-frequency valve can be neutralised. This is accomplished by removing the fixed resistor (behind the high-frequency valve holder looking from the back of the panel), and manipulating the neutralising condenser (that is, the top one on the panel) until signals become inaudible or are reduced to their weakest tuning point.

When this occurs the resistor can be replaced and the set used in the ordinary way. It may be necessary to re-neutralise, however, when the coil and transformer are changed for reception on the higher band of wavelengths.

Provided that this preliminary test is satisfactory—and if the instructions have been carefully followed there is no doubt that it will be—the set can be permanently placed in its cabinet. When ordering this from the manufacturers it should be noted that the slot for the terminal strip does not extend the whole length of the back.

For reception within five miles or so of a local station it is recommended that a tapped aerial coil should be used. In this case the aerial lead should not be connected to the aerial terminal but direct to the tapping on the coil.

Should difficulty be experienced in getting the receiver to work efficiently constructors may care to try a different high-frequency choke; increasing the inductance of this component may considerably improve reception.

When you have built the Wave-catcher Three write and let us know what *your* catch has been. We are confident that if properly operated it will give satisfactory results with a reasonably good aerial-earth system.

More About "Daventry Junior"

OF importance at the moment from the standpoint of British listeners are the experiments which are being conducted at Daventry in connection with the new station, already known in some quarters as "Daventry Junior." This station, if it performs its tests satisfactorily and meets with the approval of the Postmaster-General, will form the nucleus of that much-bruited scheme of "fewer stations—higher power."

It is operating on a wavelength below 400 metres.

We gave in these columns, as long ago as March, a description of the motives underlying the erection and purposes of the new Daventry. It was expected that the station would by then have been operating; but delay occurred through the anxiety of the engineers to test the apparatus before installing and thus avoid dismantling and readjusting.

Then the station was later expected to be ready for testing at the end of April. The engineers were only a matter of seven days out in their calculations. Considerable progress was made in the constructional work; but it would perhaps be too hazardous to venture a prophecy regarding the date that the station will be providing a regular service.

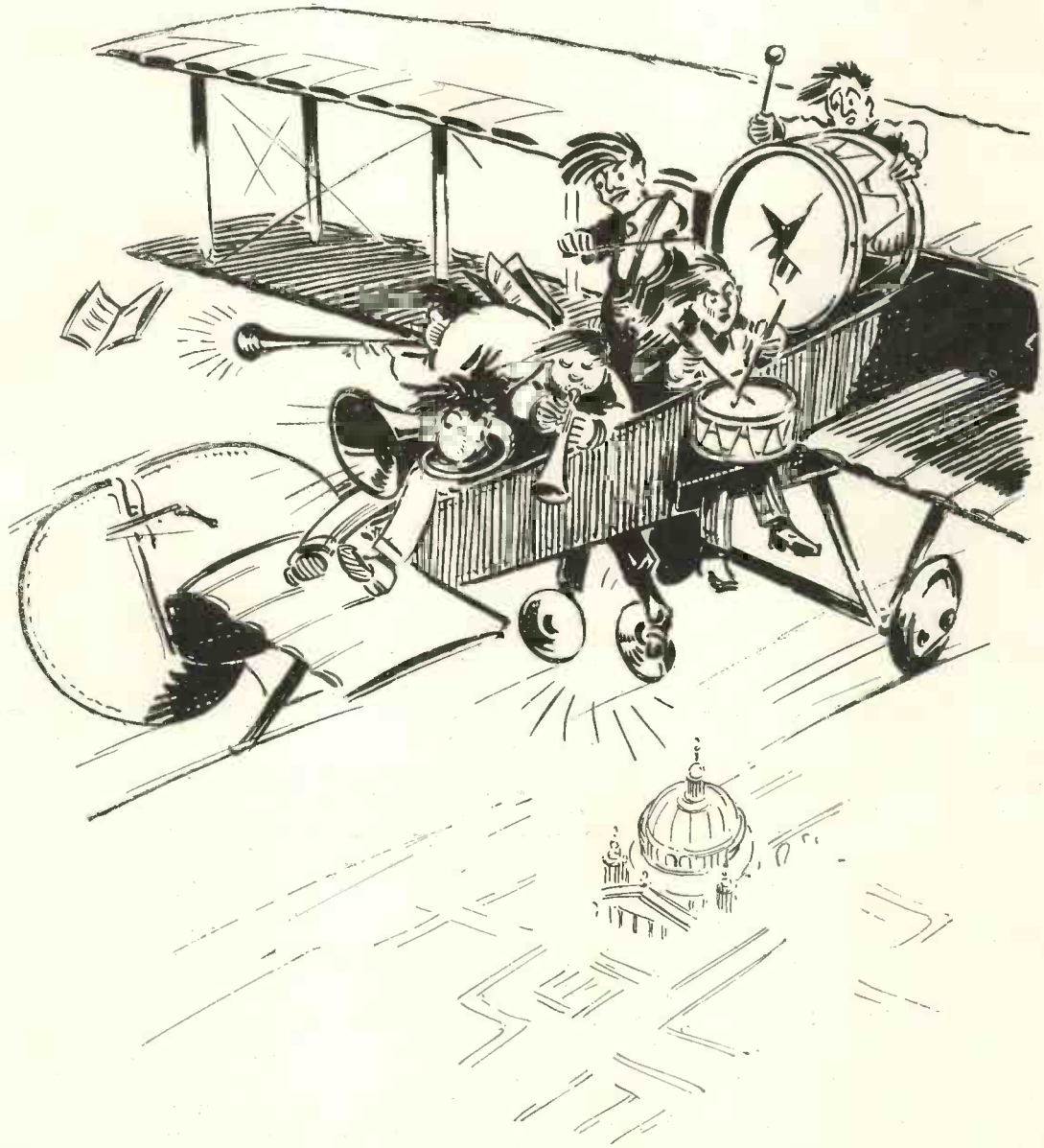
The engineers, with their usual caution, have fixed it as November next, but perhaps they may spring a little surprise on listeners in that connection. In the meantime the B.B.C. does ask that the work of testing should not be impeded by interference due to searching of the ether in order to pick up 5GB's signals.

Given the opportunity of carrying out these tests without interference, the B.B.C. will probably be in a position to provide listeners with something in the nature of an alternative service from the new station at a comparatively early date.

B. B. C.

Wireless Terms Travestied:

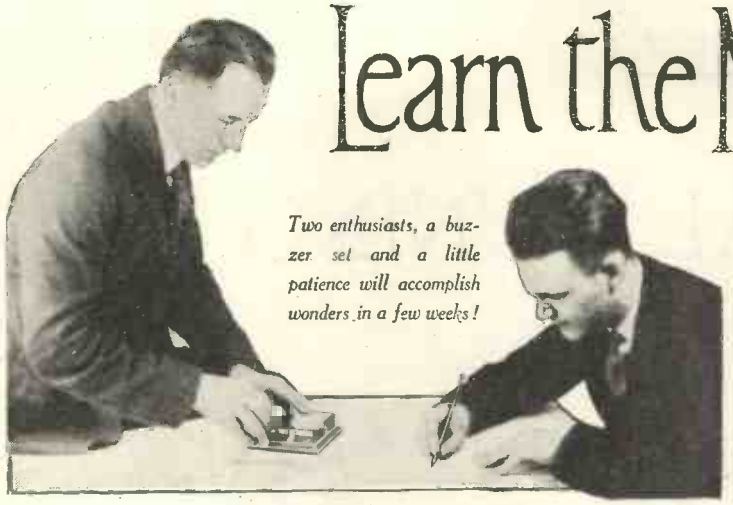
AERIAL TUNING



"The Imperial Air Way"

You Will Get Much More Fun Out of Radio If You—

Learn the Morse Code!



Two enthusiasts, a buzzer set and a little patience will accomplish wonders in a few weeks!

When broadcast reception begins to pall, a spell of listening to the chatter of shipping is one of the most fascinating of diversions says our Contributor

A. DINSDALE

BROADCASTING is but a small fraction of the total amount of communication carried on by means of electromagnetic waves. Both above and below the normal broadcast wavelengths there is a constant volume of telegraph traffic continually passing to and fro at all hours of the day and night. Just above the broadcast wavelengths, on 600 metres, there is the shipping traffic, and just below there are hundreds of amateurs and, nowadays, some commercial stations.

Fascinating Diversion

When broadcast listening begins to pall, a spell of listening to the chatter of shipping is probably one of the most fascinating of diversions. All classes of ships, from tramps to liners, can be heard on 600 metres at all hours, and by means of a list of call-signs they can be identified, and they can often be heard telling some station where they are bound and what port they have just left.

Away up above 10,000 metres, for those with long-wave receivers, there are the high-power giants, spanning oceans and continents as easily as you or I can speak across a room. There is a new thrill to be got out of your receiver in picking up and identifying the various foreign stations working on these enormous wavelengths and powers, and sometimes there is a news bulletin to be had for the copying down.

Exploring New Fields

For anyone who wants to explore these new fields, however, or aspires to become a transmitting amateur, the first essential is that a thorough knowledge of the morse code be acquired. This has always been the snag which has prevented hundreds of people from being able to view wireless from an entirely new angle and get far more fun out of it.

Acquiring a thorough knowledge of the code may be divided into three processes: Memorising the code, learning to receive, and learning to transmit. The last is not necessary unless the reader aspires to become a transmitting amateur, but it is always useful, if able to receive the code, to be able to transmit it as well; it is only a mechanical matter of practice.

Simple buzzer set as supplied by the Economic Electric Co., Ltd.

Having developed a sufficient interest in the mysterious long and short buzzes or whistles which he has heard on his broadcast receiver, the listener will probably proceed to hunt up from somewhere a list of the signs of the morse code. This he will find to be made up of long and short marks, called dots and dashes, all marshalled before him in bewildering array.

How is he to start memorising all this? Should he begin at A and wade straight through the list, or should be pick out groups of letters the symbols for which are similar? Whichever way he juggles with it, he will find he has undertaken a very confusing task, and at this stage nobody can help him. It is worse than trying to memorise poetry or the lines of a play, for in these cases there is a context to help him.

Probably the beginner's greatest difficulty is that of co-ordinating the printed list of signs with what he hears. For instance, he sees by the list that A is represented as .—, and he has to memorise this as "dot dash." B is shown as —..., and he memorises this as "a dash and three dots."

None of these representations tally with what he hears on his receiver; what he hears is a series of buzzes or whistles which are variable in length. The letter A as it sounds in the receiver is not a bit like .—, nor does it sound like "dot dash."

What the letter A really does sound like is "dit dah," so why not start right off by learning the code from the *sound* of it rather than from what it looks like on paper? After all, in practical work the morse code is never *seen* (except in telegraph offices where automatic transmitters and receivers are used); it is always *heard*.

Represented by Sounds

The accompanying list of the morse-code symbols has, therefore, been made out on this principle. Each letter is represented as nearly as possible by its sound. Thus A is "dit dah," B is "dah dit dit dit," and so on. This may appear silly, or even childish. It may be; but childish things are usually the simplest, and the easiest way of

learning anything is that which is designed on the simplest lines.

It is significant that commercial operators of even the longest experience use this method of code representation in conversation amongst themselves when they wish to illustrate a yarn by an exact representation of the manner in which such-and-such a station sent so-and-so.

Memorising

To return to the memorising job. Cut out the code as printed here, paste it on a card, and carry it about with you. In the evenings listen-in to morse transmissions with the card handy, and see if you can pick out a letter or two here and there. In a very short time you will find that you will have most of the list memorised, and have to refer to the card less and less frequently.

Never mind the numbers and punctuation signs at first; get the alphabet off by heart, and the rest of it can be added later as occasion arises.

Having memorised the code and learnt how to identify occasional letters here and there out of the jumble of dits and dahs audible on your receiver, the next job is to learn to read correctly the signals passing through the ether, so that complete messages can be copied down.

No Royal Road

This is undoubtedly the most difficult and most tedious task of all. It may as well be clearly stated right here that there is no royal road to success. There is one way, and one way only, to learn to read morse at commercial speeds, and that is by months of constant practice. The more time you can devote to it the quicker you will learn, but even half an hour's practice a day will get you there eventually.

It will, of course, facilitate matters greatly if the beginner can find an expert telegraphist to send to him on a buzzer, but this is not always possible. It is of little use to get another beginner to do the sending; his morse will be ill-formed, and only render the deciphering of it more difficult. A skilled telegraphist will send correctly formed and spaced morse, and at speeds suitable to the beginner's progress, from dead slow to very fast.

Most readers, however, will be in the position of having to fend for themselves without the services and guidance of a telegraphist. The only thing to do then is simply to tune-in some wireless signals, take paper and pencil, and make an effort to write down as much as possible of the messages going through.

This is admittedly difficult. It may even sound impossible, especially after a few attempts have been made, but commercial operating speeds *can* be acquired that way, for that is exactly how the writer of this article learned to receive at high speed.

The erratic and intermittent transmissions of ships on 600 metres are probably the most difficult signals to practise on, for there is so much jamming, all sorts of speeds and styles of sending prevail, and so many abbreviations are used that to the beginner they will appear as meaningless groups of code letters.

Nowadays, however, there are available several standard transmissions at comparatively slow speeds, and they provide excellent practice for the learner. To receive these it is recommended that the reader rig up a single-valve reaction receiver employing interchangeable honeycomb coils, so that all wavelengths can be covered.

Practically all transmissions on long waves are now made on C.W., so it will be necessary to use the receiver in a just-oscillating condition in order to heterodyne the incoming C.W. and render it audible in the phones. Unless the set is oscillating the incoming C.W. will be inaudible, like the carrier wave of a broadcasting station when received on a non-oscillating broadcast receiver.

One of the most suitable and convenient of standard transmissions for the beginner to receive is the first part of the weather report, which is sent out twice daily for the use of shipping, at 0900 and 2000 G.M.T. The Air Ministry station in London transmits this on a wavelength of 4,200 metres, using the call sign GFA.

The first part of the report is the one which is most suitable for the beginner to practise on, for it is sent very slowly. This gives in plain language a general indication of the pressure distribution over Europe and the Atlantic.

Figure Groups

After sending this section, GFA speeds up considerably and sends a series of figure groups, which, when deciphered, give the weather data for certain fixed observation stations. Following the figures comes the forecast for all the coastal districts of the British Isles, sent at the same speed (about 20 words per minute) as the figures.

The entire transmission takes from ten to fifteen minutes, according to its length, and then, after an interval of three minutes, from fifteen to eighteen minutes past the hour, the

CHART OF THE MORSE CODE

Letters

A	Dit	dah		N	Dah	dit	
B	Dah	dit	dit dit	O	Dah	dah	dah
C	Dah	dit	dah dit	P	Dit	dah	dah dit
D	Dah	dit	dit	Q	Dah	dah	dit dah
E	Dit			R	Dit	dah	dit
F	Dit	dit	dah dit	S	Dit	dit	dit
G	Dah	dah	dit	T	Dah		
H	Dit	dit	dit dit	U	Dit	dit	dah
I	Dit	dit		V	Dit	dit	dit dah
J	Dit	dah	dah dah	W	Dit	dah	dah
K	Dah	dit	dah	X	Dah	dit	dit dah
L	Dit	dah	dit dit	Y	Dah	dit	dah dah
M	Dah	dah		Z	Dah	dah	dit dit

Numbers

1	Dit	dah	dah	dah	dah	6	Dah	dit	dit	dit	dit
2	Dit	dit	dah	dah	dah	7	Dah	dah	dit	dit	dit
3	Dit	dit	dit	dah	dah	8	Dah	dah	dah	dit	dit
4	Dit	dit	dit	dit	dah	9	Dah	dah	dah	dah	dit
5	Dit	dit	dit	dit	dit	0	Dah	dah	dah	dah	dah

NOTE.—0 is sometimes abbreviated to one long dash, Da-a-ah.

Commonly used Punctuation Signs

Commencing Sign	Dah dit dah dit dah
Period	Dit dit dit dit dit dit
Comma	Dit dah dit dah dit dah
Question Mark, or Repeat Sign	Dit dit dah dah dit dit
Finishing Sign	Dit dah dit dah dit
End of Work	Dit dit dit dah dit dah

Learn the Morse Code! *(Continued)*

whole message is repeated. During the repetition the learner can check up his effort at reception and make corrections. He will then have the latest weather forecast.

Another transmission which is eminently suitable for beginners to practise on is the British Official news bulletin sent out by the great new station at Rugby. Using the call sign GBR, this station transmits on a wavelength of 18,745 metres, sending out news messages at 1200 and 2000 G.M.T. The latter message is repeated at midnight. On Sundays the midday programme is omitted.

Each message generally consists of 500 to 700 words, and takes from thirty to forty-five minutes to transmit. The transmission is done automatically, so that the formation and spacing of the symbols of the morse code are perfect—a point which is of great assistance to one just learning to receive.

Slow and Deliberate

The speed of transmission is generally quite slow and deliberate. At first the beginner will get but little of it. He may spend the first few weeks without being able to write down more than an odd disjointed letter or two here and there. There is no reason to be discouraged at that. The writer spent months in that stage before he discovered standard transmissions upon which to practise.

The important thing to bear in mind is that as soon as a letter is identified, *write it down*. You may cover sheets and sheets of paper with disjointed letters. Never mind; it isn't the waste of paper that it appears to be.

Presently you will find yourself able to write down more than just a disjointed letter or two. First a couple of consecutive letters will appear, then short words such as "and" and "the," etc., will appear complete. It may take you but two or three weeks to reach this stage, or it may take you three or four months. Keep at it till you reach it, for by then you will have broken the back of the job.

From that time on it is but a matter of regular practice. If you concentrate on one transmission it is better, for you become familiar with the characteristics of it. Half an hour with GBR every evening will improve your reception in the quickest way possible.

After the beginner has sufficiently mastered the job to be able to get whole words correctly here and there the learning process becomes absorbingly interesting. There is the satisfaction of noting the steady improvement, the increasing number of correctly received words, the interest of the news itself as gleaned from the correctly received fragments here and there, till finally the glorious day dawns when the entire message has been received word-perfect!

Then you can take out your watch and find out what your speed of reception is. The number of letters received in one minute divided by five represents your speed in words per minute. For purposes of speed calculation a word is considered to consist of five letters.

There is one great mistake invariably made by beginners when learning to receive, and that is their habit of attempting to guess something they have missed. *Don't do it!* If you miss something, let it go. If you attempt to guess you will, ten to one, guess wrong; and while you are guessing and trying to write down the result, your attention will be diverted and you will miss a lot more.

Even if it is only a letter or two in the middle of a word, leave a space and carry on. You will get more of the message down correctly that way, and have the satisfaction of knowing for certain that it *is* correct.

Practising daily on any signals which were audible (and there weren't many in those days), and particularly on the only standard transmission available at the time (Cleethorpes weather report), the writer was able, unaided, to acquire a reception speed of twenty-five words per minute in the space of about twelve months. Twenty words per minute is a good commercial speed, and quite fast enough for most purposes.

In learning to send, a telegraph key and a buzzer are necessary. Half an hour's practice on this every day should enable most people to send respectable morse at a speed of twenty words per minute in from six to twelve months. There are many points which require to be watched, however, for faults in style are easily acquired at the beginning which are extremely difficult to eradicate afterwards. The would-be transmitter would be well advised to apply to his local wireless society for expert guidance in his initial efforts.

Word of Warning

It is advisable here that a word of warning be given to those who would learn to be able to read wireless telegraph messages. When received, the contents of such messages must not be divulged to any person, or made use of in any way, unless the messages in question are addressed to CQ, which means "All stations." Such messages as GFA weather or GBR British Official press can be divulged to others, for they are public property and addressed to CQ, but messages specifically addressed to a definite addressee or destination may not be divulged.

For further information on other symbols used in the morse code, or on the abbreviations and commercial procedure used by ships and land stations, the reader is referred to the P.M.G. Handbook for Wireless Telegraph Operators, published by H.M. Stationery Office, and obtainable through any bookseller, price 1s. 3d.

In conclusion, it might again be stated, and in the most emphatic manner possible, that there is no short cut to proficiency in morse reception, in spite of certain claims to the contrary. The man who is really intent on learning to receive at commercial speeds will plug away at it steadily day after day, for that is the one and only way to reach the desired goal.

Gramophone Records

It might be added, however, that during the initial stages, before the student is sufficiently familiar with the code to tackle actual transmissions, he will gain much useful assistance from morse-code gramophone records, which are obtainable through any dealer. These records give graduated lessons, from dead slow, beginner's speed, up to fast exercises, complete with jamming and atmospherics.

Half Hours with the Professor

5.—A Chat on Screening.

"NO," said the Professor, "I am afraid it is no good. We shall have to screen the high-frequency stages, unfortunately."

Young Amp nodded wisely to himself as if agreeing with the Professor's dictum. Obviously, there was nothing else for it but to screen, whatever that meant, if the Professor said so. He watched Megohm furtively, wondering whether he could ask for more enlightenment.

'The whole circuit is too critical," went on the Professor to himself. "I do not see any other solution." He looked in a puzzled manner at the collection of apparatus on the bench in front of him, going over in his mind the details of the circuit.

"Won't It Work?"

Young Amp, however, had been serious for too long. "Won't it work, papa?" he croaked in a mock agonised tone. The Professor looked at him sharply, and then laughed.

"No, young man," he said, "your diagnosis is correct, it certainly will not work, but I think we will give it a rest for a time and await an inspiration."

"Do you think that screaming will be any good?" queried the young hopeful.

"Do I think what?" asked the Professor in astonishment.

"Well," said the boy, "what you said just now, anyhow!"

The Professor burst out laughing. "Screening, my boy, screening—shielding, in other words."

"My mistake," was the response. "Still I am not very much wiser. Could you tell me where I could read about the subject?" he added slyly.

"Well," said the Professor, falling into the trap, "there is not very much in it. Surely you know the basic principles of screening?"

The boy shook his head and tried to suppress his eagerness until he had the Professor really started.

"Humph," said the Professor, cogitating. "Well, we can put the matter in a nutshell, like this. In order to obtain full amplification in a high-frequency stage, it is necessary to make sure that all the energy passes through the stage as we want it, and nowhere else. We provide circuits for the currents to follow, and we base our calculations on the assumption that they do follow these paths. Unfortunately, there are such things as stray fields, produced by the coils and condensers, as a result of which some of the energy gets lost."

"But," interrupted the Amp, "have all coils got to have a field?"

"Yes," said the Professor, "there is always a field. If a coil had no field at all, it would have no inductance." The boy looked puzzled, and the Professor, noting this, waited for the inevitable question. "What is troubling you, my boy?" he asked at length, as the Amp still seemed to be trying to find a solution to the problem.

"I was wondering," was the reply, "how a fieldless coil could work, because if it had no field, then it would have no inductance."

"That is a very good point," agreed the other, "and your difficulty is due to the fact that the term 'fieldless coil' is a little misleading. Actually, a fieldless coil is one in which the magnetic field is confined to the coil itself and the immediate vicinity, so that as far as any external effect is concerned the coil behaves as though it had no field. Actually, however, it has its own internal field, so that it still has inductance."

"Then," queried the other, "is that type of coil a solution to the difficulties you have just mentioned?"

"Partially," answered Megohm. "It certainly reduces the stray effects, but it does not overcome the capacity effects, which, although quite small, are very important in modern circuits owing to the high efficiency of present-day arrangements."

"How can you overcome this, then?"

"By putting a metal shield, which is connected to earth or some point at fixed potential in between the various portions which are interacting. This allows them both to have a small capacity to earth but prevents any transfer of energy between the circuits."

"Is that what you meant by screening, then?" said the boy.

"That is capacity screening," replied the Professor, "and a simple shield of this nature would only affect the capacity coupling between the various circuits. It would have little effect upon the magnetic field produced by the coils themselves, and unless fieldless coils are employed, these stray magnetic fields will soon be a source of trouble.

Magnetic Shielding

"Magnetic shielding can only be accomplished by more or less completely enclosing the coils in metal boxes, in which case the effect produced is the same as if the magnetic field were totally enclosed within the box."

"I know," cried the Amp. "I have seen some receivers which use tin boxes like that, but when I tried putting one of my coils inside a cocoa tin, I couldn't get any results."

"Ah!" said the other, "that was because you overdid it. First of all, it is necessary for the screens to be some considerable distance away from the coil. If it is too near the coil, then the eddy currents set up in the screen itself are so heavy that very serious loss is introduced into the circuit. This will materially affect the decrement of the coil and often gives rise to a serious increase in the ratio of R over L."

"Whereby the fuse of the oojah-kapiv becomes unwound and recoils into the bazuka!" broke in the Amp cheerfully. "The next lecture will take place at 4.30 p.m. Now, Profes-

Half Hours with the Professor *(Continued)*

sor, would you mind going over all that very slowly and telling me first of all what eddy currents are, and then all the other things you said?"

"I'm sorry, my boy," smiled the Professor. "I was perhaps going a little too rapidly. Now look at those pieces of paper over there," he broke off, pointing out of the window where a gust of wind was chasing the bits of paper round and round. "See," he pointed out to the boy, "how the wind is whirling those bits of paper round and round like a whirlpool. That is what we call a wind eddy. In a somewhat similar fashion we often obtain circulating currents of electricity which are set up in masses of metal and these are known as eddy currents. Is that clear?" he inquired. The boy nodded, and the Professor resumed.

Eddy Currents

"Now, magnetic fields produced by coils will set up eddy currents in any metallic object in the vicinity. If, for example, a condenser is placed in too close proximity to a coil, it will introduce a certain loss into the coil."

"I don't quite get that," said the Amp. "What have eddy currents to do with loss?"

"Once again," smiled Megohm, "I see I am going too fast. If the magnetic field sets up eddy currents in the metal of nearby objects, the energy for these currents must come from somewhere. Now, the only energy we have is that in the coil, so that some of the energy from the coil is absorbed in setting up these eddy currents. This is not the purpose for which the energy was originally intended, so that the effect is clearly a loss, and actually it causes the coil to behave as if it had a slightly higher resistance."

The Amp nodded once again to show that he had understood. "But," he interrupted, "if these eddy currents cause loss in the coil, why do we use metal for screening? Can we not use some material which does not introduce loss?"

"Unfortunately, no," was the reply, "because the actual eddy currents themselves, although they produce loss in the coil, are responsible for the screening effect, so that they are a necessary evil. If we enclose the coil completely in a metal shield, then eddy currents will be produced in the screen throughout the whole of the surface. Obviously, the eddy currents will be stronger in certain positions than in others, but practically the whole of the box will be carrying these small eddy currents.

"Now, these circulating currents in turn set up magnetic fields of their own just as if they were very small single-turn coils, and the resultant effects of all these hundreds of circulating currents is that an appreciable magnetic field is set up outside the screen."

Here the Amp showed signs of getting restive, but the Professor silenced him with a gesture. "Wait a minute, my boy, I can see what is troubling you. You must remember that we have, all the time, the field produced by the coil itself. The copper box does not really stop this field, but permits it to come through without any difficulty. We have, however, the magnetic field produced by the combined effect of the various eddy currents, and the interesting fact is that these two effects cancel each other out, *outside the screen*.

"In other words, the magnetic field produced outside the screen by the eddy currents is equal and opposite to that produced by the coil itself, and the effect therefore is just the same as if there were no field. That is why I said just now that the effect was the same as if the field were confined within the screen."

"But," said the Amp, "how do eddy currents know when to stop, so to speak? I mean, how do they know what strength to make themselves in order to produce the washing out?"

"That," was the reply, "is wrapped up in the laws which govern the production of these eddy currents. As a matter of fact eddy currents automatically adjust themselves until they do produce this counteracting effect, and that is one of the fundamental laws of electrical circuits."

"Then, if I have got it right," said the boy, "it is only possible to screen by producing a heavy loss in the circuit."

"Not exactly," answered the other. "Indeed, if that were the case, screening would not be a very practicable proposition. Fortunately it is possible to arrange for effective screening without very heavy loss. If you consider the matter you would see that it is only necessary to cancel out the magnetic effect outside.

"Now, the magnetic field from a coil falls off quite rapidly as you increase the distance away, and if we increase the size of our screen then the amount of magnetic field that we have to cancel out is considerably smaller and the eddy currents which are set up are also smaller.

"In practice, if we keep our screen well away from the coil, the loss introduced is almost negligible, while the screening is none the less effective. In practice a clearance of two to three inches on all sides is necessary if the loss is to be really small, although the size may be reduced slightly with only a comparatively small increase in the loss."

The Amp thought this over very carefully for some time while the Professor fished in his pocket for his pouch. Presently the boy said, "What about the capacity screening, then, Professor? Has that got to be done separately?"

Complete Shielding

"Fortunately, no. An effective magnetic shield is also a perfectly good capacity shield, although the reverse is not the case. To obtain complete screening, as it is termed, it is only necessary to enclose the whole of any one circuit in a complete metal box, the only holes being those allowing for the connecting leads to be brought through."

"I know," broke in the Amp. "I've seen advertisements of boxes like that. They even put the valves inside."

"Yes," said the other, "that is quite right, the whole of the circuit, valves, condenser and coil, and all other accessories are all lumped inside the one box and the box is connected to earth to make it an effective capacity screen as well as a magnetic one."

"And that is what you are going to do with this set?"

"That is what I am going to do with this circuit," agreed the Professor, "and that's quite enough for one day, young man."

[*Another of Professor Megohm's chats will appear next month.*]

Broadcast Music of the Month

This photograph shows the Kneller Hall Band.

TO the average observer of the broadcasting programmes of the past month variety seems to be the key-note, but close examination proves that each week more and more popular music is being eliminated, and religious, educational and sports commentaries taking its place.

Short Melanges of Startling Contrasts

The breaking up of an evening into short melanges of startling contrasts benefits no one except those who take part in it at 2LO. One cannot conceive the National Sunday League, for instance, breaking off one of their fine concerts to tell Bible stories, or the manager of a classical concert interrupt by the interpolation of jazz sounds. Why not devote an evening, or use an alternative aerial, for both classes?

The names of many well-known artists have figured in the programmes, though not always those of interest to the general public. Lovers of "futurist" sounds will have doubtless welcomed the appearance of Stravinsky, whose "Fire Bird" and other scores have amused classical audiences.

One welcomes the news that Sir Henry Wood, one of the bitterest opponents of wireless while his own Promenades were in full swing, has at last yielded to the blandishments of the B.B.C., and one hopes that the concerts will be kept on popular lines and not become a melange of Irish folk-tunes mingled with jazz or futurist music only. His first appearance before the microphone on June 30 should be interesting, and one is glad to note that the programme is a Wagnerian one. It will no doubt be appreciated by listeners generally.

Miss Doris Lemon and Mr. Raymond Ellis—

—in "The Magic Flute."

Mr. Ben Davies is another familiar name, and his songs for June 27 include the ever-popular "My Dreams" and "I'll Sing Thee Songs of Araby."

Mr. Arnold Bennett's programme was also of interest, and amongst others stars are Mlle. Delysia, who broadcasts on July 1, Nelson Jackson, Dora Labbette, another recent convert to wireless, Cedric Sharpe, and John Henry, the inimitable. Amongst the stars, too, is Miss Marie Dainton, who continues to give extracts from her long list of theatrical experiences to the wide listening audience who are possibly also not aware that Miss Dainton was one of the most graceful dancers on the stage, as well as a clever actress of character parts.

Mozart Operas

The Mozart operas, *The Magic Flute* and *The Marriage of Figaro*, have become almost hackneyed by now, so many times have they been broadcast, but when these

Miss Alice Warnock.

Mr. Foden Williams.

Miss Myra Pugh.

Miss Gladys Colbonine.

Miss Kate Winter.

Mr. Jack Rickards.

Miss Gertrude Gilpin.

Broadcast Music of the Month *(Continued)*

Miss Jessie Rew.

Mr. Godfrey Brown.

include the artists of the B.N.O.C. there is no cause for complaint. Mr. Norman Allin has been seen in many poses, and he now takes the part of Dr. Bartolo. So quaint a dress, too, is worn by Miss Doris Lemon with her partner Raymond Ellis in *The Magic Flute* that the opera is almost inane unless seen as well as heard. William Michael is Marcel in *La Bohème*. All have been heard over the ether recently and always to advantage.

Newcomers

Amongst the newcomers to the microphone may be mentioned several noted artists. Mr. Percy Kahn, who has been heard at Sheffield, Aberdeen, and other stations again recently, may be said to have had a remarkable career. Born in London, he made a reputation as a boy soprano from the age of seven to twenty, singing throughout the British Isles.

At the age of 15 he gained an organ scholarship at the Royal College of Music, studying under the late Sir Walter Parratt. Later he turned to accompanying, carrying out this most difficult task for the greatest artists in the world—Caruso, McCormack, Melba, Tetrazzini, D'Alvarez, Ysaye, Elman, Kreisler and Kubelik, to name but a few. His concerts have taken him literally to the "four corners of the earth." His own personal triumphs include many fine songs and musical compositions, the conducting throughout a season of the Douglas Municipal Orchestra, where he performed the unique feat of singing and conducting at the same time. He is now one of our finest tenors, and both he and his charming wife, Miss Olive Kavann (heard recently from Eastbourne at an Albert Sandler concert), are big acquisitions to broadcast programmes.

M. Camille Couturier.

The name of Kate Winter needs no further introduction, and one is only glad to say that we have heard her again over the ether. Miss Crué Davidson, too, is one of our earliest and best known singers. Miss Doris Colston, who has been heard many times now, began this stage of her career in 1924, and made her first appearance as a vocalist at the mature age of six, when she sang "When All Was Young" from *Faust*, a feat in itself at that age.

Only 12 when war broke out Miss Colston, undaunted by her youth, got a concert party together and entertained the soldiers at the military hospitals. Later careful study brought its reward and Miss Colton has toured both this country and Canada with huge success. Her stage work has included musical comedy with George Edwardes, Daly's and big variety theatres, and it is possibly due to this and her art of tone production that enables her to broadcast so well.

Miss Marie Dainton.

Mr. Ben Jackson.

Miss Olive Kavann

Reviewed for the "Wireless Magazine" by STUDIUS

Mr. Leslie England.

Miss Doris Lemon.

Mr. Bertram Lewis.

Young Sopranos

Another young soprano is Marjorie Farnham, heard in opera and oratorio. A brilliant artist, also, is Miss Myra Pugh, who in addition to other honours won the first prize at the National Eisteddfod held at Mold in 1923 and again at Swansea last year.

Amongst a whole host of artists, too, one remembers Margaret Barrett, Olive Zalva, and the appearance of the Don Vocal Quartet whose concerts at Æolian Hall in May in their national dress aroused much interest. The quartet comprise Messrs. Keldich, Evglevsky, Alexandroff and Goloviee, and next to the Kedroff Quartet have been one of the most artistic in broadcasting work.

Miss Doris Colston

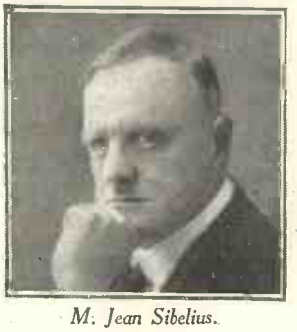
For the best instrumental work one must turn to the outside orchestras, and it will be a sorry day for many listeners if the B.B.C. "cut off" or substitute some dry-as-dust affair for the beautiful playing of Emilio Colombo's orchestra at the Hotel Victoria, or Camille Couturier's at Frascati's Restaurant.

Signor Colombo is a great artist whose classical recitals at Wigmore Hall many years ago are still remembered though he has found perhaps a wider medium now in broadcasting. A musical ensemble was given by him at the Palladium on May 27 for the last night of the season.

Saxophone Virtuoso

Camille Couturier is a saxophone virtuoso and unites several instruments, coming from a professorship of the Belgian Conservatoire. Mention, too, must be made of some of the provincial orchestras, such as those at Bournemouth conducted by Gilbert Stacey, a noted pianist, singer and composer, Jeffries and his orchestra at Glasgow, the Victor Oloff Sextet at 2LO and Alfredo's Band from Prince's Restaurant.

Miss Crué Davidson.



M. Jean Sibelius.

Pianists

Amongst the many pianists the name of Gordon Bryan stands out, for he has just completed his broadcasting centenary, a hundred performances within two years and four months, and has just been heard again at Birmingham, Cardiff, Edinburgh, Leeds and Bradford. Besides his own fine playing Mr. Bryan will be remembered for his inaugurating the Æolian Players, with Constance Izard, Rebecca Clarke and Joseph Slater, I think, as well as himself.

At Birmingham another popular artist, and singer too, Miss Ethel Williams, a pupil of Richard Wassall

Miss Margaret Barrett.

Mr. Percy Kahn

Miss Colleen Clifford.

Broadcast Music of the Month *(Continued)*

who is now the conductor of the City of Birmingham's police band, and also of Mr. James Howell, himself a noted broadcaster. Miss Williams has taken principal contralto parts in oratorio and is now a member of the Repertory Company of 5IT as well as Cousin Ethel in the Children's Hour, where she gives also occasional pianoforte recitals.

Too Many Syncopations

There have been far too many syncopated sounds inflicted on us, though to counteract it we have the appearance of Tommy Handley and John Henry this month. Banjo solos, too, have been given by the famous player Ben Jackson. He has become a virtuoso player all over the world, including British Columbia, America and Mexico. He tells how when in the U.S. he was known as a "honk-i-tonk" (the supposed sound of his instrument), and how in those times "all performers must room in the house," and, as Mr. Jackson says, pay three times as much as outside.

Another point was that when playing a sketch each and every artist had to take part in it. There were no fixed lines, and everything had to be gagged. "Luckily for me," says Mr. Jackson, "I had to be shot in the first act." He is a fine trick player of his instrument and is also able to make it artistic.

THE CATTERALL STRING QUARTET

Up in the North at Aberdeen some fine work is done by the clever writer and poet, a descendant of Scotland's national poet, Burns, whose *nom-de-plume* is Max Anton. A member of the Radio Players at the station, he has taken many parts, and as President of the Rutherston Dramatic Society has produced such plays as *Rob Roy*, and *A Tale of Two Cities* with much success.

Miss Jessie Rew's work is more on the literary side, her published works including "Swedish Fairy Tales" and translations of Swedish novels.

At Belfast

At Belfast are heard the sketches of Miss Alice Warnock. She herself is a holder of a Girton College scholarship, and after teaching in London returned to her own beloved Ireland, where she joined the Irish Literary Society and took up sketch writing round the Irish folk of the countryside, especially of Donegal. Miss Warnock has taken part in the broadcasting of her own sketches, and they have become a favourite item in many programmes.

Though difficult to conceive, an air-fight will be "relayed" by word of mouth from Hendon Aerodrome on July 2.

Other items of this month include the broadcast version of *The Belle of New York*, the broadcast by Chief Os-ke-non-Ton (Running Deer), the Red Indian baritone, and the welcome reappearance of Helena Millais.

Wireless Geography!

ARE you well enough up in geography—wireless geography I mean—to tell me straight off the reel where Micronesia is?

Greek Derivation

No, I am not trying to be funny. There *is* such a place, and it is *not* where the Micro-Farads, the Micro-Henries, the Micro-Ohms, the Micro-Phones, or any other members of the Micro family come from. Strange to say, though, the micro in Micronesia is the same Greek word "micro" which is made to do so much work for us in wireless.

The word Micronesia is made up from the two Greek words, *micro*, meaning small, and *nesos*, meaning an island; and it is, in fact, the name given to a group of small islands in the Pacific Ocean.

Made to do so much work.

My only knowledge of Micronesia is that the district, group of islands, or whatever it is, has been allotted the letters OI in the latest world scheme of identification of amateur wireless transmitters. The O signifies Oceania, and in the same group are OA Australia and OZ New Zealand. It is very doubtful, though, if in the strict geographical sense Australia and New Zealand form part of Oceania.

Other Letters

The other first identification letters in this new scheme are E Europe, A Asia, N North America, S South America, and F Africa. Thus EG are the letters allotted to Great Britain and Northern Ireland, EF to France, AI to India, NC to Canada, NU to the United States and SB to Brazil.

OF the various broadcasting systems in Europe, the one which, in a short space of time, has made considerable progress, is that of Poland. A start on an extensive scale was made when Warsaw opened its high-power station in December last. Since that date, encouraged by the great rush for licences, Polski Radio rapidly installed a three-kilowatt transmitter at Cracow, to be followed in last April by a more powerful plant at Posen.

Brilliant Send-off

The send-off given to the latter studio was a particularly brilliant one, inasmuch as on its inaugural night it opened with a relay from the Posen opera house of an original partiotic opera specially composed by a young Polish musician.

But Poland, with its newly acquired post-war territories, is an extensive country, and to effect an adequate service it requires further stations. To act as relay to the Warsaw programmes a transmitter is in course of erection at Cattowitz, near the old Russian frontier, and which before 1918 belonged to the Prussian province of Silesia. On the aerodrome at Lodz a station will also be installed. This city is an important one, as in 1914 it was counted as the fifth largest town in the Russian Empire.

Independent Studios

Each of the existing stations possesses an independent studio of its own for the presentation of local talent, but in the main they relay their most important programmes from the capital. In order to broadcast a distinctive identification signal Cracow, for instance, takes the chimes of the famous Zygmunt Bell from the historic Castle of Vavel; Posen, on the other hand, those from its equally illustrious Guildhall. As a rule, the Polish stations send out their calls not only in their own native language, but also in French, and the same is done with the official news bulletins.

Considerable impetus has been given to the use of wireless receivers owing to the fact that the licence fee is a very reduced one. The Polish listener pays but three zloty monthly, at the present rate of exchange a matter of 1s. 9d. This, in comparison to fees charged by some other continental countries, is very reasonable.

* * * * *

Although for some considerable time we have looked to Hilversum only for Dutch broadcasts, in the very near future we shall be given an opportunity of tuning-in to a new station of even greater power. As far back as February, an association in Holland was formed under the title of De Nederlandsche Draadlooze Omroep, an amalgamation of the Catholic Broadcasting Company and the Netherlands Christian Society. For something like eighteen months these associations had been hiring the Hilversum transmitter for their special evenings.

New Station

Huizen, the site of the new station, is a small fishing village lying on the banks of the Zuyder Zee, some seven and a half miles to the North-north-east of Hilversum, and roughly fourteen miles south-east by east of Amsterdam. For obvious reasons the transmitter only will be housed there, and it will be connected by land-line to two large studios now in course of construction at Amsterdam and Utrecht.

So far as can be foreseen, the power of the transmitter will attain 5 kilowatts in the aerial, and it will operate on a wavelength of 1,870 metres. At the time of writing, it is not quite clear to me whether, when the new station is in operation, broadcasts will still be effected by Hilversum, but as the latter station is supported by independent voluntary contributions, I feel convinced it will carry on its good work.

It is possible that as the NSF is extending its factory, the broadcasting plant may be transferred to Harderwyk, facing Amsterdam, on the eastern side of the Zuyder Zee.

* * * * *

Boon to Listeners

The advent of any high-power broadcasting station, without doubt, must prove a boon to distant listeners, as failing the possession of an elaborate wireless receiver, in other circumstances, we should miss very interesting broadcasts. Here is a case in point. Austria, at least once a year, indulges in a notable festival at Salzburg, a city in the Tyrol situated some ninety-five miles by rail East-south-east of Munich.

It is an old-world town with narrow winding streets such as are so often met with in the Northern districts of Austria. The surrounding hills, the famous Kapuzinerberg and the Monchsberg, form an ideal natural stage background for dramatic displays, and many are the thousands of German and Austrian tourists who visit this historical city.

Professor Max Reinhardt, who may be remembered as the producer of that wonderful spectacle *The Miracle* at Olympia, a year or so before the War, is organising further *alfresco* performances on a big scale at Salzburg between July 30 and August 28, when the *Festspiel* takes place.

Shakespeare.

It is his intention to produce Shakespeare's *Midsummer Night's Dream* in these glorious surroundings. The festival programme also includes operas, musical dramas, and orchestral concerts, and many of these will be relayed to the Vienna transmitters, and through them to other European cities, of which the Munich, Prague, and Warsaw stations are already mentioned. With a little luck as regards weather conditions, it should be possible to hear these notable broadcasts.

JAY COOTE.

Neat in appearance and efficient in operation this simple crystal set meets the need of many who want a receiver that is capable of tuning to both of the broadcasting wavelength bands without the need of changing coils. As is the case with all "Wireless Magazine" sets, a full-size blueprint layout, drilling guide and wiring diagram is available to facilitate construction.

The Hi-lo Crystal Set

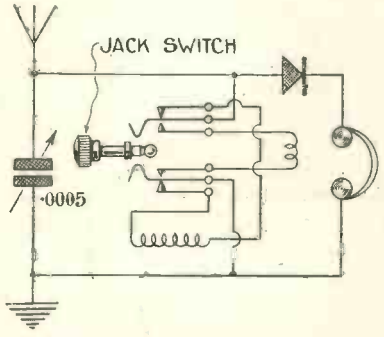
Designed, Built and Tested by the "Wireless Magazine" Technical Staff

High — or Low — wavelength Range without the Need of Changing Coils

View of the Completed Hi-lo Crystal Set.

NO listener is satisfied nowadays with a receiver that will not tune over both the lower and upper bands of broadcast wavelengths, and we need offer no further justification in introducing to WIRELESS MAGAZINE readers particulars of a simple crystal set that is capable of so doing.

There is a large number of people who are within range of the high-power and high-wavelength station at Daventry, and who are also able to pick up a local station. This set will meet their needs in more than one respect.



Circuit of the Hi-lo Crystal Set.

Simple Arrangement

In wireless it most frequently happens that the simplest arrangement works the best, and in designing this receiver it was the object of the WIRELESS MAGAZINE Technical Staff to produce a perfectly straightforward set following usual practice.

A glance at the circuit diagram will show that the receiver consists of either of two coils tuned by a .0005-microfarad variable square-law condenser in parallel, together with a crystal detector of the semi-permanent type and a pair of headphones.

One of the new jack-type switches is used for switching from one coil to another for reception on either the upper or lower broadcasting band of wavelengths. This is especially neat in appearance and is satisfactory in operation. When the switch is up (or down) the receiver is suitable for receiving on the Daventry band, and when it is down (or up) it is capable of receiving on the lower-wavelength band, depending upon which coils the constructor places in which holders.

"Local" Wavelength

In this connection it should be noted that the size of coil required for the latter band depends upon the wavelength of the local station, and if in any doubt the constructor is recommended to consult the lists of ranges published by various coil manufacturers, remembering that it is tuned by a .0005-microfarad condenser in *parallel* or *shunt*. With any ordinary aerial-earth system a No. 200 coil is suitable for the reception of Daventry.

The photograph of the completed set shows its neat appearance. It will be noticed that the mottled ebonite panel is particularly effective, and this finish can be strongly recommended to those who want a receiver that looks a little different from usual. On the left are seen the aerial and earth terminals, while on the right are those for connecting up the headphones.

Components Needed

For the construction of the Hi-lo Crystal Set the following components will be required:—

Ebonite panel, 9 in. by 6 in. (Trolite or Becol).

.0005-microfarad square-law variable condenser (Igranic-Pacent or Ormond).

Semi-permanent crystal detector (Trix or Jewel Pen, R.I.).

Double-pole change-over jack switch (Lotus or Edison Bell).

2 single-coil holders (Lotus or Magnum).

4 terminals marked:—Aerial, Earth, Phones, Phones (Belling-Lee).

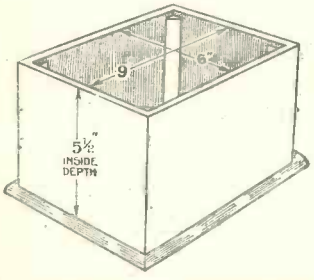
Dial indicator (Bulgin).

Glazite for connecting up (London Electric Wire).

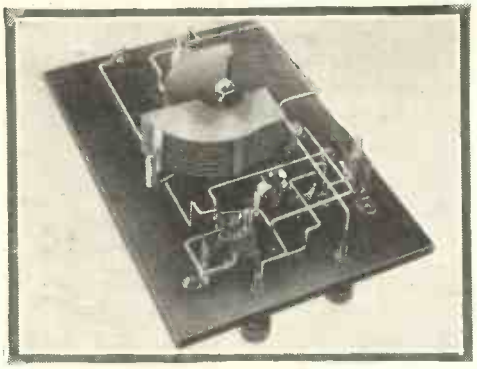
4 ¼-in. 4B.A. brass screws (Economic Electric).

Cabinet (Pickett's).

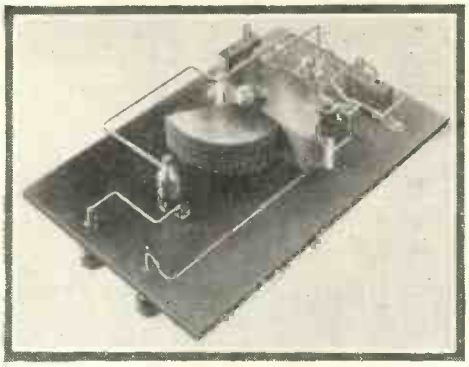
It should be noted that in each case the particular make of component used in the original set and allowed for in the layout is in each case mentioned first.



Cabinet for the Hi-lo Crystal Set.

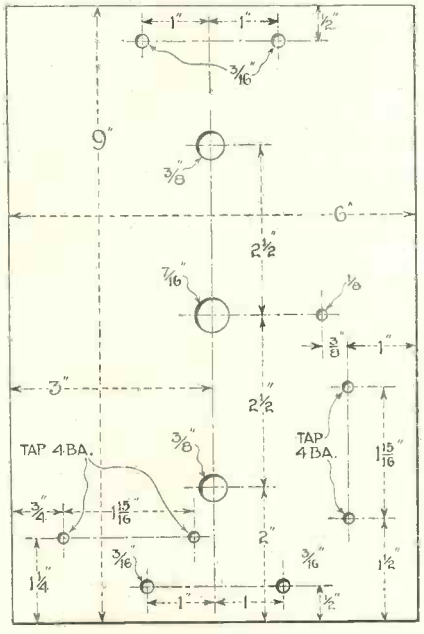


The layout of components of the Hi-lo Crystal Set is clearly shown by these photographs. It will be obvious that the high- and low-wavelength coils can be placed in either holder, but note should be made of the switch positions that bring them into circuit.



Full-size Blueprint

Construction of this receiver will be greatly facilitated for many amateurs by the use of the full-size blueprint layout, drilling guide, and wiring, that can be obtained from this office for 6d. post free. Address your request for a copy to Blueprint Dept., WIRELESS MAGAZINE, 58-61, Fetter Lane, E.C.4, and ask for No. WM18.



Panel Layout of the Hi-lo Crystal Set.

It is not, of course, essential to use a full-size blueprint, and all the necessary details are given in these pages.

Preparing the Panel

The first step in construction is the drilling of the panel, and before this is started careful note should be made that the mottled side is the right way up. There are eight holes to be drilled right through the panel, and four to be drilled half way and then tapped; these are for fixing the two single-coil holders in position.

When this has been done the components are to be fixed to the panel. The condenser, switch, and detector are all one-hole-fixed, and the mounting of them is a few minutes' work only.

Wiring can next be started, as indicated by the wiring diagram. It will be seen that each terminal point is marked with a letter of the alphabet; this indicates the order in which wiring should be carried out. All those points marked with the same letter should be connected together with one wire or as few wires as possible. Thus, first connect all those points marked *a*; then all those marked *b*; and so on until the wiring is completed.

Testing

To test the set, place a No. 200 coil in one holder and a No. 40 or 50 (in most cases) in the other, noting which position of the switch puts each in circuit. Now place the panel in the cabinet, and connect up the aerial, earth, and headphone leads.

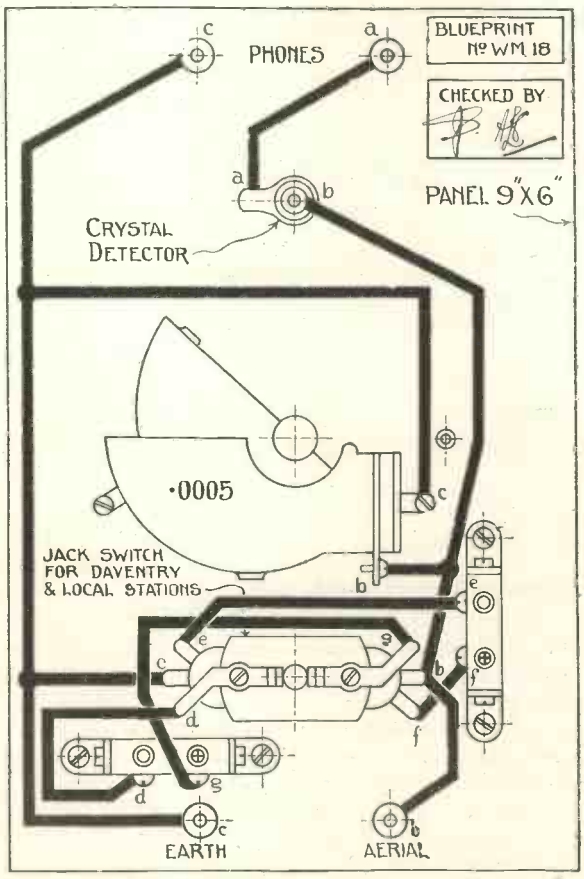
Pull up the detector plunger and allow it gently to return to its original position, at the same time turning the condenser dial until signals are heard.

To change over to the other band of wavelengths it is necessary only to move the switch and re-tune the condenser.

Once signals from a station have been received the condenser-dial setting should be noted for future reference, so that subsequent operations of tuning-in will be as simple as possible.

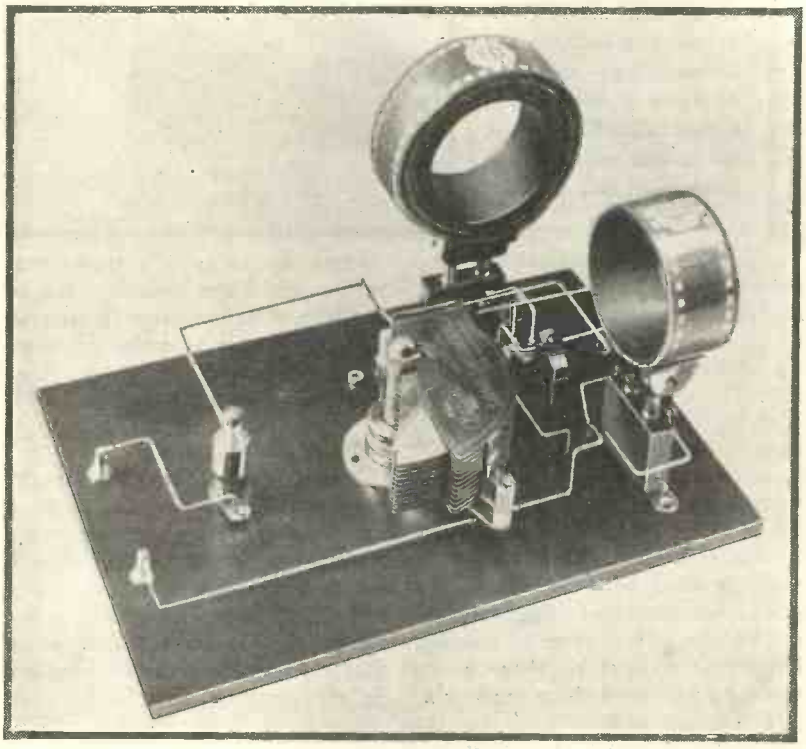
Aerial Efficiency

The results obtained from such a receiver as this depend very largely on the efficiency of the aerial-earth system and the operator's care in adjusting the detector (once the best sizes of coils have been determined). It is worth while taking trouble to see that the aerial and earth are as good as they can be under the circum-



Layout and Wiring Diagram of the Hi-lo Crystal Set. This can be obtained as a full-size blueprint (No. WM18), post free for 6d.

The Hi-lo Crystal Set *(Continued)*



This photograph shows the Hi-lo Crystal Set completely assembled and wired up ready for placing in its cabinet.

stances, while a light touch should be cultivated for adjusting the detector to its most sensitive point.

If the instructions contained in this article are carefully followed we are sure that constructors will find themselves in possession of a crystal set that will give satisfying results in use.

An interesting legal conflict is at present pending in America between a company formed to supply " wired wireless " programmes to its own private subscribers, and the local radio broadcast company, the latter holding that its own privileges are being unfairly usurped by the new method.

The B.B.C. and Dramatic Authors

THE B.B.C. has said a good deal at different times about the difficulty of securing suitable plays for broadcasting, and about the specialised needs of the microphone. It is perhaps legitimate to ask, and, in fact, it has already been asked, what recompense the author of a play may expect if he is fortunate enough to get it accepted for broadcasting.

General Attitude

The general attitude of the B.B.C. in relation to plays is in accord with its attitude to other programme material; that is, the B.B.C. tries to get the best available material at the minimum expenditure, trying always to be fair to both author and composer on the one hand, and actor and musician on the other hand.

The B.B.C. has far from adequate funds to fill to its satisfaction the 60,000 hours of programme time which comprises a year's work. It follows therefore that the strictest economy must be exercised in safeguarding the interests of the licence holder.

Nevertheless, it is an obligation which the B.B.C. recognises to assist in stimulating new talent from whatever quarter it may appear. In the case of authors already established, plays are commissioned and the terms of commissioning are a matter of arrangement in the ordinary way; but there are many new authors who look to the B.B.C. as the only means whereby they can reach the public. Naturally, the rate of payment to these is a matter for separate consideration at the outset.

Public Acclamation

The real test of success in dramatic art is public acclamation; but the B.B.C. can, and does, give to new authors a wider public introduction than they could otherwise expect. That is, in a measure, however slight, a recompense for work done, but is not, of course, the sole recompense. That comes also in the shape of hard cash. The B.B.C., however, does pay due regard to the business side of a transaction, a motive that is not due to stinginess but to commonsense.

B.B.C.

Radio Homes

IF you buy a new house on the Richings Park Estate at Iver, Bucks, you need not trouble to move your existing receiver, for each home is provided with a two-valve Gecophone receiver complete with loudspeaker and Osram valves.

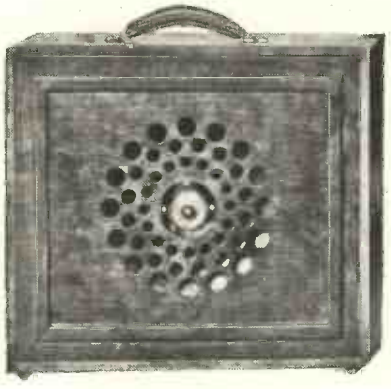
An interesting point is that in each case the aerial is actually built into the roof.

More Portables for 1927

There is only one aerial-tuning knob on the Pye portable (see below), either four or five valves being used at will by means of a simple switch. An Amplion loud-speaker, five Mullard valves and an Exide accumulator are amongst the standard equipment. W. G. Pye & Co., of Cambridge, are the makers.

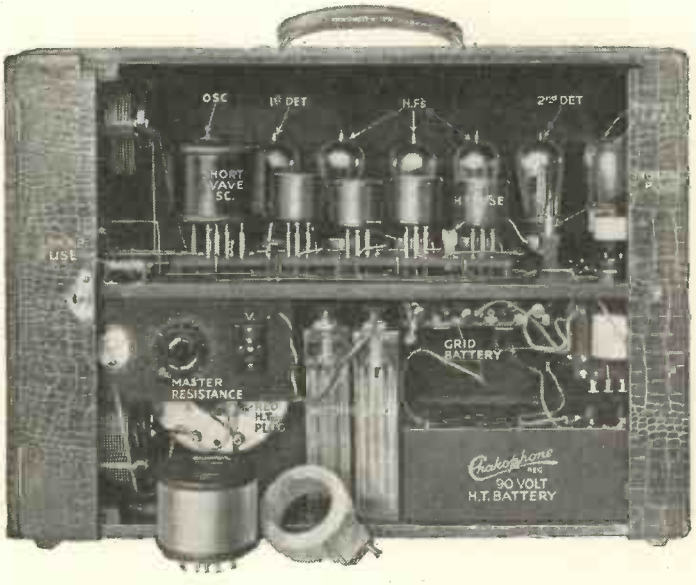
On the left is shown the new Burndept portable five-valver which, we know from personal experience, gives excellent results. It is intended primarily for the reception of Daventry. Burndept Wireless, Ltd., of Blackheath, S.E.3, are the makers.

Another fine portable of which we have had personal experience is the Marconiphone type 43, seen on the right and below. This incorporates a cone-type loud-speaker which gives excellent volume. Further particulars can be obtained from the Marconiphone Co., Ltd., of 210-212, Tottenham Court Road, W.1.



Shown below is the eight-valve Chakophone portable super-het, the general arrangement of which is clear from the photograph. Complete with all accessories this receiver weighs 40 lb., and (closed) it measures 22in. long by 8¾in. wide and 16in. high. Two tuning dials (with verniers) and a volume regulator comprise the controls, which are calibrated for many stations. The plug-in oscillator and loading coil for long wave-lengths are accommodated in a separate compartment. This set is made by the Eagle Engineering Co., Ltd., of Warwick.

Placed on the market only during the past fortnight, this McMichael five-valver (below) is completely self-contained. L. McMichael, Ltd., of Wexham Road, Slough, are the makers.



More About the Countryside Four

A Further Article by J. H. REYNER, B.Sc., A.M.I.E.E.

LAST month full constructional details were given of the special four-valve portable receiver which was developed for WIRELESS MAGAZINE readers in connection with the competition for "Popularising the Portable." A very brief review was made in that article of the reasons for adopting the particular circuit incorporated.

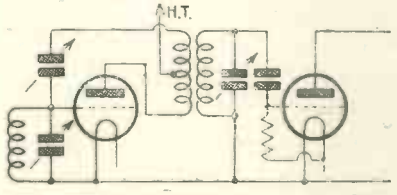


Fig. 1.—Experimental Split-primary Circuit which was Tried.

Circuits and Layout

It is proposed in this article to dwell upon certain other aspects of the subject, indicating some of the circuits which were tried and discarded, and also dealing with such questions as the choice of layout, which is most important in a portable receiver.

Some readers may have wondered why the tuned-anode circuit was chosen for this receiver in preference to one of the various transformer circuits popular at the present day. For example, the split-primary circuit as shown in Fig. 1 could be used, and was actually tried during the experimental stage.

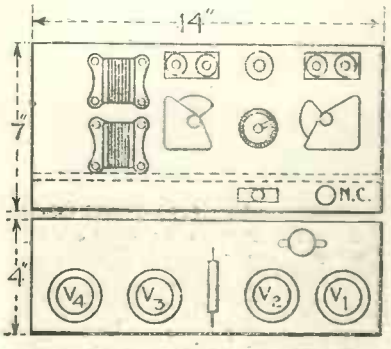


Fig. 4.—Actual layout of the Countryside Four.

It will be remembered, however, that one of the features of the Countryside Four is that the wavelength change from the local station to Daventry is accomplished by a simple switch. If it was desired to effect a change over by switching, utilising the circuit of Fig. 1, it will be seen that at least three points have to be changed over and possibly more. Even if the H.T.+ and L.T.− leads were left common to the two transformers then there would be three switching points, whereas with the tuned-anode arrangement there were only two, enabling a simpler switch to be adopted.

Tuned-anode Best

Secondly, of all the high-frequency amplifying systems, the tuned-anode, properly designed, is capable of giving the greatest amplification, and particularly as in this case where the selectivity was not of importance. So that attention should be concentrated on signal strength, the tuned-anode system was preferable from the point of view of efficiency as well as simplicity.

Various attempts were made to dispense with the neutralising adjustment and to adopt some form of phasal stabilisation. For example, one interesting circuit that was tried and which gave quite satisfactory results, but was finally discarded as not being as good as the simpler tuned-anode arrangement from the point of view of signal strength, was that shown in Fig. 2.

Stabilising Resistance

Here the H.T. is supplied to the H.F. valve through a high-frequency choke and the H.F. current is by-passed through a fixed condenser and a resistance to the L.T. The voltage developed across this resistance is introduced into the grid circuit of the next valve as can be seen from the diagram. By a simple choice of the resistance in conjunction with the other valves the circuit can be maintained perfectly stable, and is yet capable of giving a fair degree of amplification.

Some readers prefer to use portable receivers with a small aerial consisting of 10 or 20 ft. of insulated wire flung over a convenient tree, or other similar structure. This, of course, gives a considerable improvement in the signal strength obtainable, but there are occasions where such an arrangement is not practicable, so that the receiver was designed to give adequate strength without such an accessory.

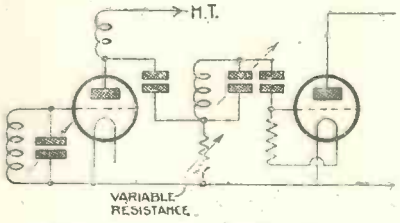


Fig. 2.—Another Interesting Experimental Circuit.

Making Connection

If it is desired, however, it is a simple matter to add a terminal connected to the grid of the first valve, and any aerial can then be connected to this terminal. Such a procedure would, of course, slightly upset the reading on the first tuning condenser owing to the small extra capacity introduced, but this is not of material importance.

In any wireless receiver the actual

£25 IN CASH PRIZES!

This amount (divided as £15 first prize, £3 second, £2 third and five others of £1 each), is offered by the Editor of the "Wireless Magazine" for the best and "happiest" snapshots of the Countryside Four in use.

For the protection of competitors in general, the Editor reserves the right to have the prize-winning set examined locally. Fuller particulars were given on page 391 of the previous issue.

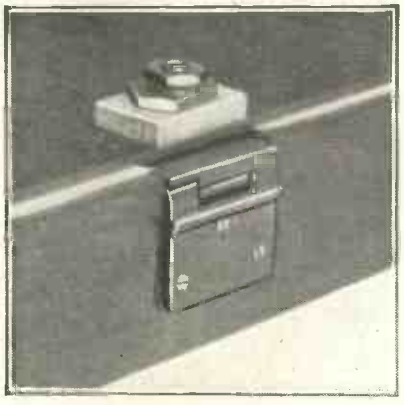
This competition closes on September 3, so readers still have plenty of time to buy a copy of blueprint No. WM17 (post free for 1s. 6d.), build the set and get some photographs of the enjoyable picnics that the Countryside Four will make possible.

layout of the components is a matter requiring considerable thought. The designer has to consider first and foremost the question of efficiency. This will give him one definite layout which is best suited to the circuit. He has also to consider, however, the question of appearance, for a pleasing panel layout is of no little importance, at any rate as far as the user is concerned.

Compromise Necessary

Unfortunately, the two requirements are seldom easily compatible. The requirements for maximum efficiency do not tally with the nice symmetrical layout on the panel which one would like. It is necessary to compromise to some extent, sacrificing a certain amount of the appearance and at the same time trying various rearrangements of the parts so that the final layout can come more into line with what is required, without altering the efficiency to any appreciable extent.

I myself always spend a considerable time on the examination of the layout. There are nearly always two or three ways in which the components can be placed, all of which are more or less equally good from the point of view of electrical efficiency. One of them, however, will give a much better appearance to the finished set than the others, and it is worth spending a good deal of time and patience in order to ascertain the most suitable arrangement of the parts.



Photograph of the Special Frame-aerial Hinge.

Alternative Components

The problem is somewhat complicated by the fact that, in many cases, readers will wish to use some components which they already possess, and therefore, where possible, it is desirable to allow ample clearance around the various components. This enables a reader to use components which he has by him, but it should not be taken as an encouragement to depart from the designer's specification more often than is absolutely necessary.

In a portable receiver the problem is still further aggravated by the fact that one has to fit the apparatus in a more limited space. In such circumstances some of the desirable features usually considered must be sacrificed. It is necessary to apply oneself to a more limited range of components and, in certain cases, to choose and allow for one particular make only. With a portable set the difficulty is not so much the arrangement of the parts in a symmetrical manner as fitting them into the available space without loss of efficiency.

This latter point is the only one which cannot be sacrificed to a greater extent than is absolutely necessary, namely, the actual efficiency of the arrangement, and it is no small problem to design a three- or four-valve receiver to go in a very compact space and still to maintain the layout such as to give efficiency.

Smallest Possible Space

The first point was the provision of suitable space for the L.F. stages, and a little thought will show that the position actually adopted occupies about the smallest space possible. The two transformers were placed on the panel, one above the other, and the two L.F. valves were placed at the back of the baseboard, one on each side of the transformers. This meant slightly longer leads than would be the case if the transformers were placed on the baseboard, but the amount of space occupied would be far too great if the usual baseboard layout had been adopted. The space on the left of the transformers, looking from the back of the baseboard, was utilised for the on-off switch which, being an earth potential, can be placed in any position.

This left about two-thirds of the panel for the high-frequency and detector stages, in which we have to include the two coils—one for Daventry and the other for the short waves—together with a change-over switch and some form of reaction control.

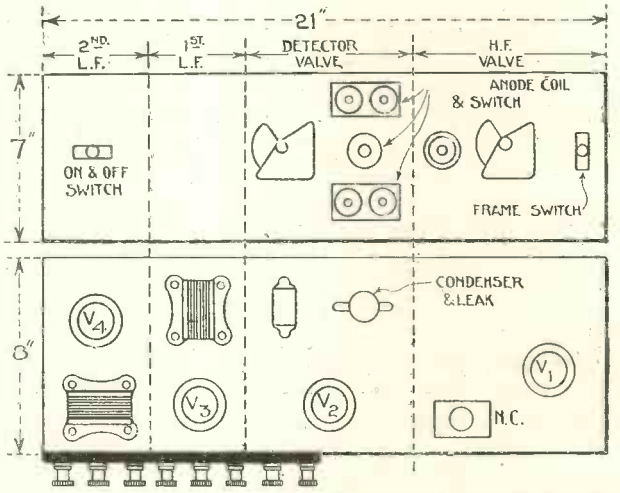
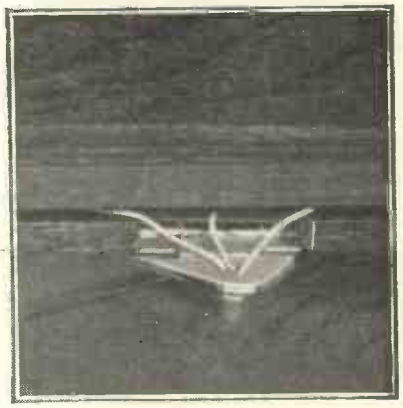


Fig. 3.—Layout of Countryside Four components as for a normal receiver. Note how each valve circuit makes a separate unit.

It will readily be realised that the layout adopted is about the only possible one. Even so, there is a small capacity effect between the coil on the right-hand side (again looking from the back) and the right-hand condenser, which is the one used to tune the frame. To minimise the effect of any interaction on this account the long-wave coil was placed in this position, since the capacity effect at the lower frequency is relatively smaller.

Many Hours Work

Considering the layout from the point of view of the finished set, it appears comparatively simple, but actually the final choice was the



Another View of the Special Frame-aerial Hinge.

More About the Countryside Four *(Continued)*

result of many hours of trial and error. Fig. 3 shows the layout of the various components used in the Countryside Four, as they would have been placed in a normal, non-portable receiver. It will be seen that both the panel and the baseboard are distinctly larger, that a good symmetrical layout is preserved, and that the leads are all short and direct, giving an efficient circuit. Yet actually the final layout adopted as shown in Fig. 4 occupies something like one-third of the cubical space of the former layout.

Special Frame-aerial Hinge

A little difficulty may have arisen over the question of the frame-aerial hinge which is used in this receiver. The photograph of my experimental model last month did not show this off to the best advantage, and some further photographs are accordingly given in this issue.

The device is in two portions, namely, the hinge proper and the pivoting portion, and the method of fitting requires a little care in order to make sure that a satisfactory result is obtained. First of all, cut away a slot $2\frac{1}{16}$ in. wide by $\frac{5}{8}$ in. deep in the edge of the lid itself (in the middle). The hinge should then be fixed to the lid by means of three screws, the hinged portion being on the outside of the cabinet. Next, drill a hole $\frac{1}{2}$ in. from the edge of the wooden cover which fits over the battery compartment. This hole should be $\frac{3}{4}$ in. in diameter. A second small piece of wood $1\frac{1}{2}$ in. by 1 in. by $\frac{3}{8}$ in. thick should then be obtained, and a $\frac{3}{4}$ in. hole drilled in the centre of this. This is used for a packing piece, since the cover over the battery compartment is only of three-ply wood.

Bearing Portion

Now unscrew the end nut from the pivot portion of the hinge and take off the fibre washer which follows it. The bearing portion may then be removed completely and should be inserted in the hole just drilled in the cover. The small packing piece is then inserted at the back, and finally the large nut is put on and screwed up tight. It may be found necessary to file away a portion of this large locking nut owing to the closeness of the hole to the edge of the cover piece. The hinge should then be fitted into the bearing and the fibre washer and nut replaced. The cover is then fitted in position over the battery compartment and screwed up with ordinary screws at the various points.

Constructional Checks

The actual construction will be quite clear from the photographs on the previous page, but it is desirable to keep making checks at various stages of the construction in order to make sure that, first, the lid will fit flush with the remainder of the cabinet in the closed position, and secondly, that in the open position the lid carrying the frame-aerial can swing quite freely. If these points are borne in mind during the fitting of the hinge no trouble is likely to arise.

Things Heard from American Stations

From Minneapolis, WCCO

Timber news.

Timber prices.

Wheat news for farmers.

Wheat news for agents.

Flour news.

A talk on "The Commercial Value of Sawdust."

That every fourth person in America has an automobile, and also that every four hundredth an aeroplane.

That England rules the waves, but America the barrels.

From Springfield, WBZ

College yells.

Poor imitation of English college choruses and songs.

The poverty of the jokes, and college jokes at that.

The very latest in American twang.

The most degraded English ever spoken.

The America of the Future.

What sounded like a patient's shout in a dentist's chair.

"Ush" about twelve times in as many minutes.

A frequent imitation of a dog's bow-wow. One wondered whether one lady in the studio belonged to a new dog species.

A bit of information for Englishmen: "Most of the people of Great Britain are on the starvation line."

WHO WAS THAT ?

The Editor of the "Wireless Magazine" has made arrangements to assist readers who are in difficulty over the identification of broadcasting stations they receive.

Each query should give as many particulars as possible (such as time, date, wavelength, language, and distinctive call or signal) and should be accompanied by the coupon on p. iii of the cover and a fee of one shilling (postal order or stamps).

From New York, WJZ

Stock Exchange prices.

The high quality of the voices that came through.

A whistling contest.

A question: "Do you believe in a personal God?"

The tremendous length of the news bulletin.

The high finance of the talks.

From New York, WEAF

"Romance! My dear, we are many years beyond it—ever so many."

"The Step on the Stairs." It was a real exposition of the Stars on the Steps.

Many emigrated tenors.

The inevitable Irish policeman.

From Portland, WCSH

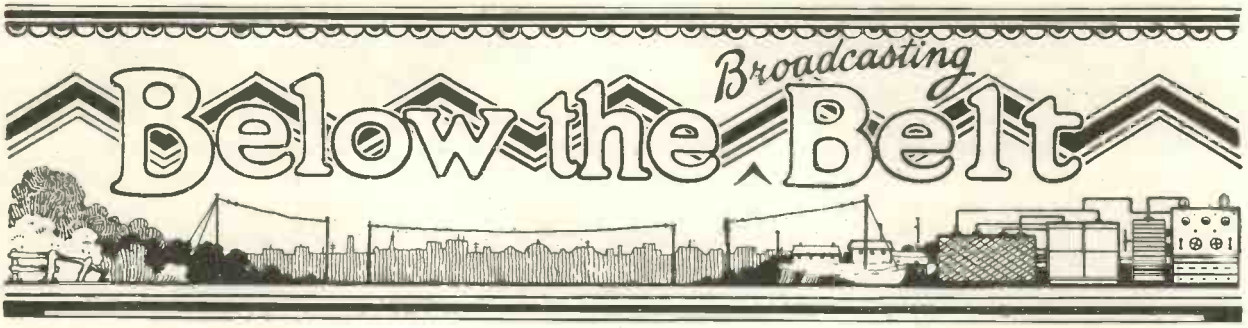
The First Radio Church.

The first radio parson who lives entirely by radio.

No coppers dropping into plates.

His announcement of the collection.

E. B. R.



SOME months ago I indulged in prophecy—usually an unwise proceeding. I said that I was sure that by the spring of 1927 we should have a very much increased interest in the 20-25-metre band. I also ventured to predict a considerable number of new professional telephony stations below 100 metres.

Triumphant

The first prophecy has been triumphantly fulfilled. During the last few months it has been possible to work either North or South America at some time or other almost any night of the week on the 20-metre band. There seem to be some hundreds of NU stations already at work, and the number is increasing almost every day.

With regard to stations on this side, the situation is not quite so satisfactory. After many enquiries I have come to the conclusion that British stations hesitate to go down to 23 metres because of the great difficulty in getting any local stations to test with—owing to great "skip." But that need not deter anyone. On many nights, at about 1½ hours after sunset, the United States east coast districts are just as easy to get in touch with on 23 metres as are French, Belgian, or German stations on the 45-metre band during the day.

North Americans

In my own case I quickly decided that there was nothing doing on 23 metres this side of the Atlantic, and went all out for the North American stations. I had worked some half a dozen, and a Brazilian, before ever I connected with a "local"—a Belgian with whom I had great difficulty in working, owing to the weakness of our signals.

There is no doubt that 23-metre work has come to stay, and I will venture on another prophecy. Next winter we shall find that it has really caught on with the British amateur.

With regard to short-wave broadcasting stations, there has not been quite the increase which I confidently expected. We have, however, two very good newcomers, 2XAD, which operates round about 22 metres and sends out the WGY programmes just as does 2XAF, and PCJJ, the Dutch station on 30.4 metres, which seems to be audible nearly all over the world. There will be more of these very interesting stations before long.

Meanwhile it is high time that the R.S.G.B. took some steps to regulate the use of telephony on the amateur bands. In my opinion, and in the opinion of a very great number of experimenters, the transmission of gramophone records should be absolutely prohibited on wavelengths below 150 metres. It is difficult to understand the use of them. If they are intended to test modulation on music, then the work can be done quite well on the longer and less crowded wavelength bands. If they are intended as entertainment, then they are illegal!

Awful Asses

I sometimes think that if the majority of amateur telephony transmitters knew what awful asses they sounded, they would keep well off the air. Most amateur telephony tests seem to consist of 90 per cent. "ers," "ums," and "ahs." The rest is divided into nine parts "Over to you" and one part vague references to "a slight change in the modulator," which seems to be thrown in unless someone should think the fellow was not really experimenting, but only amusing himself!

The great success of PCJJ has naturally brought up again the question of the provision of a short-wave broadcasting station to serve the Overseas Dominions of our Empire. I understand that the B.B.C. has permission from the P.M.G. to experiment, but has no money to spend. It has, tentatively, approached the Dominions' governments with the idea of ascertaining if any money would be forthcoming from that direction. I have not yet heard the result of these enquiries.

Technical Difficulties

But even if the money difficulty is overcome there are technical difficulties which will take a great deal of getting over. If the ordinary B.B.C. programmes are to be broadcast all the time they would only be available, in what might be called "normal listening hours," to a very small part of the Empire. In the most populated parts of Canada, for instance, the usual time at which the B.B.C. stations close down corresponds to that at which most workers will be arriving home after the day's toil.

The times in South, East and West Africa are not sufficiently far removed from home times to make them inconvenient, as the programmes would be heard about two hours later than they are given in this country; but India would hear the first news bulletin at 10.30 at night and would have to sit up very late indeed to hear anything like the whole of the programme. India is indeed in very much the same situation as regards British broadcasting as we, in Britain, are in regard to United States broadcasting.

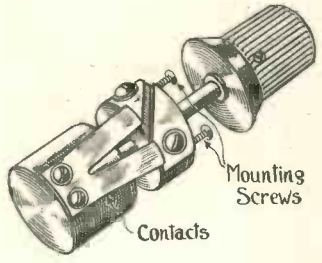
If It Does Come

If a British short-wave station is to come into being for the benefit of our Overseas Dominions, it might be used almost entirely for transmitting home and Empire news, and for talks by influential men at home. Then the time of transmission could be chosen to suit the country that was intended to benefit most from that particular talk. An alternative is to use the short-wave station purely as a radio link between this country and the broadcasting net of the various Overseas Dominions, who would rebroadcast.

5YM.

Novelties and New Apparatus

Marconiphone Switch



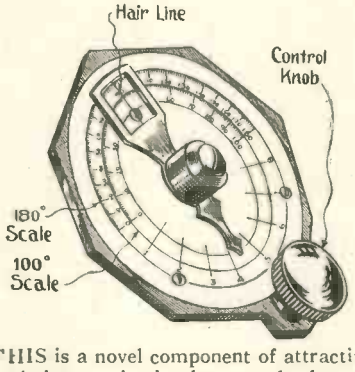
THIS component, which is particularly neat and robust in construction, consists of a rotating barrel, on which two sets of metal springs are mounted. These springs make contact with a number of metal segments attached to a fixed ebonite barrel. A substantial ebonite knob is fitted to the end of the moving spindle. When this is rotated in one direction one set of metal springs makes contact with and short-circuits two of these segments. When the knob is rotated in the reverse direction the other set of springs makes contact with two other segments.

Thus the switch is equivalent to a single-pole double-throw type. It is recommended by the makers for use in a valve circuit for the purpose of cutting out the last valve and, at the same time, disconnecting the filament connection to this valve. As such, it should prove very suitable, although there are a variety of uses to which it might also be applied.

On test the action proved to be very smooth, and perfect contact was obtained between the moving and fixed poles. It is necessary, when mounting the component, to drill three holes in the panel to take the spindle and two fixing screws. Soldering tags are provided for the purpose of making connections to the fixed segments.

This switch is made by the Marconiphone, Co., Ltd., of 210-212, Tottenham Court Road, W.1.

Ormond Dial



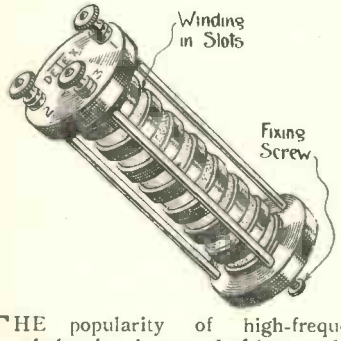
THIS is a novel component of attractive design. A circular metal plate is mounted on an ebonite frame: three different scales are marked on the plate, varying from a fine to a coarse graduation. Slow motion is obtained by the use of a special friction device: two intermediate small brass discs are constrained by means of a spring to make contact with a large diameter metal disc revolving with the indicating pointer, and also a smaller disc attached to the operating knob. Thus a two-point friction contact is obtained.

This arrangement proved to be highly satisfactory, and it was almost impossible to obtain the slightest sign of slip in the motion. A pointer covers the coarse graduation of the scale, whilst an indicator, which is made in the form of a cursor, having a glass window, moves over the two finer scales.

Both the appearance and finish of this component are particularly good. The action is very smooth and, owing to the efficiency of the friction gearing, the dial should function satisfactorily for an indefinite period of time.

The Ormond Engineering Co., Ltd., of 205, Pentonville Road, are the manufacturers.

Detex H.F. Choke



THE popularity of high-frequency chokes has increased of late, and it is now desirable to include one or more of these components in the majority of receivers. There are, however, difficulties which arise in the design of a choke, particularly as regards the range of wavelengths over which efficient choking can be obtained.

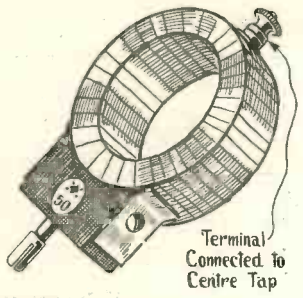
In the Detex choke eight slots are cut in an ebonite former. Each slot is well separated from the next and wound with a multi-turn fine gauge winding. A tapping is taken at the sixth slot, and is useful in cases where it is desired to receive on very low wavelengths.

Our test revealed that on the first tapping the component choked efficiently through the complete broadcast wavelength range and also on Daventry's wavelength, whilst with the second tapping the range extended to well above Daventry's wavelength. Thus the choke is suitable for all types of receiver.

The three terminals are mounted on the top of the component, and the winding in the slots is covered with green cloth, giving the finished article an attractive appearance.

It is manufactured by Detex Distributors, Ltd., of 125-9, Rosebery Av., E.C.1.

Star Tapped Coil



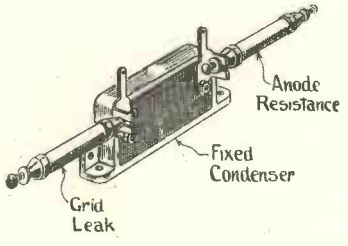
THIS is a two-pin plug-in coil having a centre tap brought out to a terminal placed at the top. The most striking feature about the particular coil is its relatively small size. The outside diameter is only $1\frac{3}{4}$ in.; thus it is very suitable for use in circuits where the available space is limited. In addition, with a small coil, the surrounding field is more concentrated and therefore less liable to cause interaction with other tuning circuits in the receiver.

These advantages are naturally obtained at the expense of efficiency, although the performance, as tested against one of normal design, was quite good.

The winding comprises three layers of enamelled-covered wire of suitable gauge. The space between each layer consists of one fold of brown paper. We think this is a point on which the design of the coil could be improved. Where a compact and reasonably efficient coil is required the component can be recommended.

The manufacturers are Star Wireless Supplies, of Biggleswade, Beds.

Graham-Farish R.C. Unit



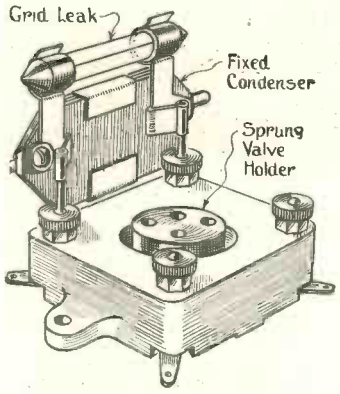
THIS comprises essentially a fixed condenser with two spade connectors. Two composition resistances are supplied, having spring-loaded washers at each end, and it is therefore possible to shunt the condenser by one of the leaks. The distance between the connectors is such that this may be accomplished by merely pushing the leak in place.

The assembly submitted for test consisted of a .006-microfarad condenser and a $\frac{1}{2}$-megohm grid leak, together with a 100,000-ohm anode resistance. On test it was found that the $\frac{1}{2}$-megohm leak actually had a resistance of 300,000 ohms, although this would not make any appreciable difference to the performance.

On account of the simple manner in which various values of resistance can be tried, this unit should prove very useful to constructors.

The Graham-Farish Manufacturing Co., of 17, Mason's Hill, Bromley, Kent, are the makers.

Benjamin Valve Holder

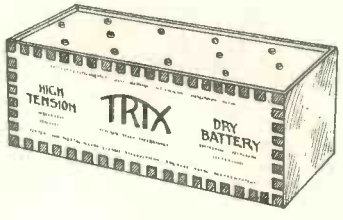


AN excellent type of anti-microphonic valve holder has recently been put on the market, combined with a special type of grid leak and condenser. Attached to the grid and one of the filament terminals of the holder are two projecting pins. A Dubilier grid leak and condenser unit clips on to the two projecting pins. This unit is thus connected up for use in the rectifying stage, or in an amplifier following a tuned-anode or resistance coupling.

On test it was found that the insulation resistance of both the valve holder and grid condenser was infinity. The grid leak proved to have the stated resistance value of 2 megohms, and the condenser was found to have a capacity of .0003 microfarad.

This unit should be very useful for the experimenter, as the grid leak and condenser may be easily removed. The manufacturers are Benjamin Electric, Ltd., of Tariff Road, N.17.

Trix H.T. Battery



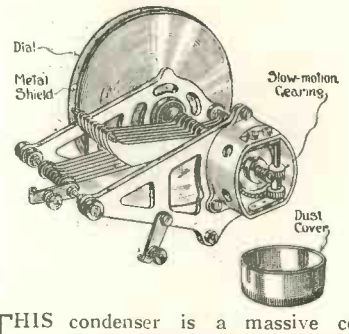
THE Trix high-tension battery has a maximum voltage of 60, and is tapped at every 3 volts. An excellent feature is the fact that for the first 9 volts on the negative side of the battery tappings are taken at every $1\frac{1}{2}$ volts. This allows satisfactory adjustment of grid bias to be obtained without going to the expense of a special grid-bias battery.

When it is desired to plug the H.T. battery as a means of a grid bias, the negative H.T. lead from the set is taken to the tapping on the battery marked 9 volts positive, then bias can be obtained from 0 to 9 volts as desired.

We subjected this high-tension battery to a fairly heavy test, which indicated that it was capable of standing up to the work required in a small receiver. It was found that a current of over 12 milliamperes could be supplied for long periods with scarcely any drop in the voltage. Considering the low cost of a Trix battery, this test was quite satisfactory.

E. J. Lever, of 33, Clerkenwell Green, E.C.1, is the manufacturer of Trix accessories.

Ediswan Condenser



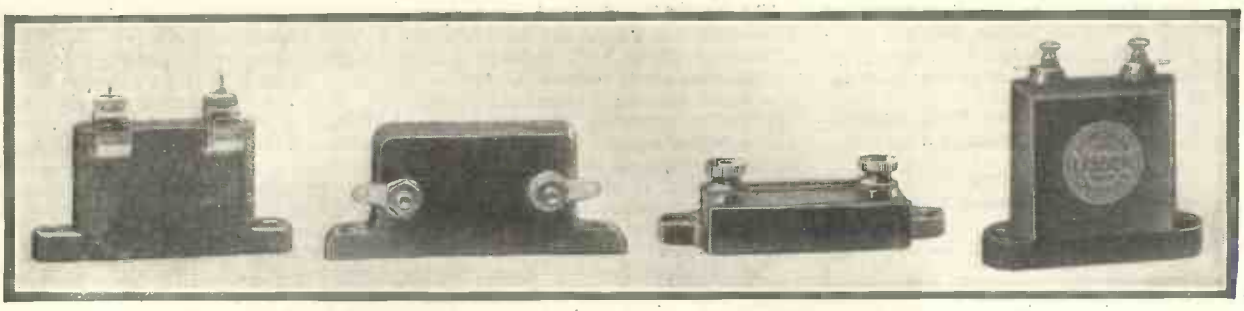
THIS condenser is a massive component designed on robust lines to withstand continual and prolonged use. The outer ebonite knob operates a small inner spindle on the end of which there is a worm wheel. This is connected to a pinion, which in turn operates a further reduction gear. In this manner a reduction gear of approximately 100 to 1 is obtained. Direct control of the moving vanes is obtained by operating the main dial.

In order to reduce the harmful effect of hand-capacity during the process of tuning, the end plates are electrically connected to the moving vanes, and in addition a circular aluminium disc is provided with a terminal for connecting to earth. The vernier fixing mechanism is enclosed in a metal case at the further end of the condenser, and this has a removable cover for inspection purposes.

Mention must be made of the particularly handsome dial supplied by the makers, which should greatly enhance the exterior appearance of a receiving set.

On test the minimum capacity proved to be .000026-microfarad and the maximum .000516-microfarad. The insulation resistance between the moving and fixed mains was infinity.

This component is made by the Edison Swan Electric Co., Ltd., of Ponders End, Middlesex.

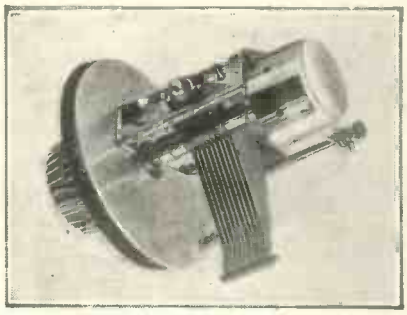


Some examples of fixed condensers: (Left to right) T.C.C., Paragon, Build-up (American) and Lissen.

Condenser Capacity: What It Is

By R. M. CLARK, M.C., B.Sc., A.M.I.E.E.

SPEAKING generally of the capacity of a vessel, we understand it to mean the volume of liquid which the vessel will contain, and measure it in so many pints or gallons, meaning that the vessel will hold that quantity of liquid.



A condenser of this type (Ormond S.L.F.) gives dial readings exactly in relation to the frequency of the signals tuned-in.

If, however, we are asked to state the capacity of a bicycle or motor-car tyre, or a balloon, or airship, then we are perhaps not so ready with the answer.

For such articles are commonly filled with air or other gas, and not with liquids, and in dealing with gases we have to allow for the fact that the quantity of gas which can be put into a given space depends on the pressure which is employed.

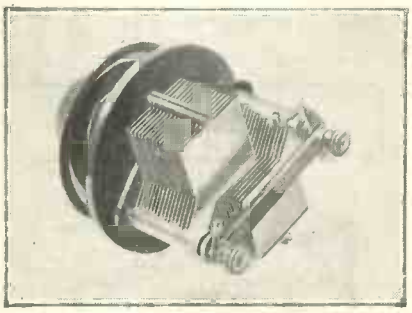
Capacity in Cubic Feet

Hence in the case of balloons and airships we refer to the capacity in cubic feet, which is a plain statement of the volume available. The volume of gas in cubic feet at atmospheric pressure which can be put into the space is then exactly equal to this capacity in cubic feet, but if means of applying unlimited pressure are available, then more and more air could be pumped in until the bursting strength of the vessel is reached.

If twice as much air is pumped in, the pressure is doubled, becoming equal to two atmospheres pressure; if three times as much air is put in, the pressure becomes three atmospheres. Therefore the quantity, or weight, of air which the vessel can contain varies considerably, yet the capacity in cubic feet is unchanged.

The electrical case is very similar. Every electrical conductor under given circumstances has a definite capacity for electricity; that is, in other words, a certain quantity of electricity will raise its electrical pressure by one unit.

Electrical pressure, or as it is often termed, electrical potential, is analogous to air pressure in our case.



The Newey four-point variable condenser has brass plates of an unusual shape, the control being geared.

When all parts of a conductor are at the same electrical pressure the electricity remains at rest; when there is a difference of pressure between parts the electricity tends to flow to equalise matters, just as, in the case of a bicycle tyre, the difference of air pressure between the inside and the outside produces a tendency to leak.

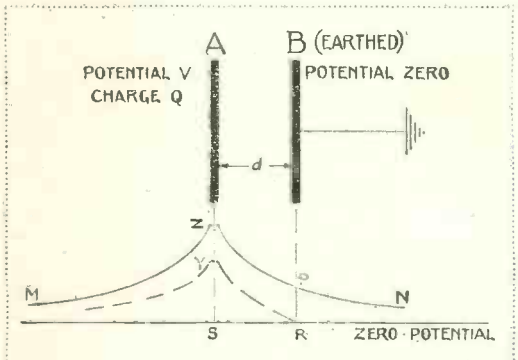


Fig. 1.—Potential Round a Charged Conductor.

Electrical Units

The practical unit of electrical pressure is the volt, and there are two other fundamental scientific units, based on the metric system, and hence called C.G.S. units (centimetre gramme second). All three units are definitely related.

If we have an insulated conductor of a certain capacity, then on giving it the proper amount of electricity its electrical pressure will rise by one volt. Twice as much electricity will raise the pressure to two volts, and three times as much will raise it to three volts, and so on.

Just as we have a limiting pressure with a balloon, when the strain becomes too much for the surrounding container, so we reach a limit in the electrical case, when the surrounding medium, which in the ordinary way will be air, can no longer support the electrical strain. The insulation gives way and a spark occurs.

There is another limiting effect to the voltage in the electrical case—the electricity begins to leak off when the pressure gets high, owing to the mutual repulsions of the electrons which constitute the charge. They try to push one another off, and at high pressures succeed in doing so to some extent, particularly from sharp points or edges.

This is the cause of the brush discharges and corona effects observed in the air round conductors at high voltages.

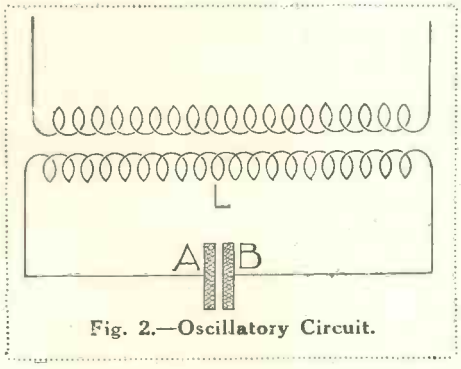


Fig. 2.—Oscillatory Circuit.

A conductor can be charged to any desired voltage within limits, therefore, by giving it the proper quantity of electricity. (It will of course be necessary to have a source of supply at a higher pressure, to effect this.)

But whatever the voltage, the capacity of the conductor remains constant throughout, so long as other conditions are unchanged. This is commonly put in the form of the relationship :

$$\text{Capacity} = \frac{\text{Quantity}}{\text{Voltage}}.$$

It is, however, easily possible to alter the capacity of any given conductor. The capacity can be shown to depend on three things :

(1) The external surface area.

(2) The distance from other charged or earthed bodies.

(3) The electrical properties of the insulating medium surrounding the conductor.

Another condenser with plates of unusual shape is the Wade (American), controlled through a system of eight gear wheels.

(1) The first of these items is fairly obvious ; the capacity depends on the size, and hence, if we want a condenser of high capacity we obtain a large area by using many plates, and, where possible, large ones.

(2) In the second item lies the fundamental basis of the action of a condenser. To illustrate the idea, consider two simple analogies. If a ship in warm sunny weather comes suddenly into the neighbourhood of an iceberg, everything on board the ship is naturally cooled, because of the proximity of the cold body. Also, the nearer the iceberg the greater the cooling effect.

On the contrary, a person standing near a fire finds his skin become hot, because, although the natural bodily heat tends to keep it at blood heat, the actual temperature is raised by the influence of the fire. This effect, again, is increased by going closer.

In the electrical case, suppose we have an insulated conductor A, charged up with a quantity of electricity Q to a potential V (see Fig. 1). Bring near to this conductor a second one B, connected to earth, and therefore at zero potential. This second conductor B is like the iceberg, it influences the space all around it, and its effect on A is to lower the electrical pressure.

Original Charge Remains

In spite of this lowering of the potential to something less than the original value, no charge has been removed from A, which still retains the original quantity Q.

In effect, then, the approach of B has produced an arrangement with more electrical capacity, because the same charge produces less electrical potential, or because, in order to raise the potential of A to its original value, more charge must be given it.

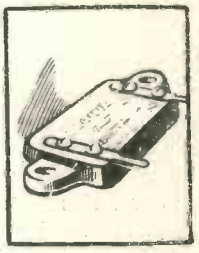
The conductors A and B, in fact, form a condenser ; that is, an arrangement for storing more electricity on the conductor A.

By bringing B closer, the lowering effect on the potential of A is augmented ; that is, the capacity of the arrangement is increased, and this may go on until the capacity is hundreds of times that of A by itself.

Earthed Conductor

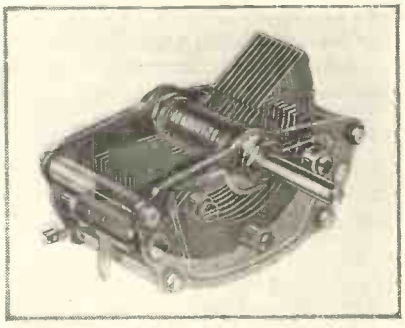
As we know, the hand is a very effective earthed conductor, and often causes considerable trouble when brought near wireless sets for tuning purposes.

The effect is illustrated in Fig. 1, where the potential of A alone due to its own charge is represented by ordinate SZ, and the potential in the space around by the curves ZM and ZN. At a distance "d" the potential is represented by RP.



When the earthed plate B is placed at this distance, the potential there is reduced to zero, with a corresponding reduction of the potential of A and all points in the neighbourhood. The new potential of A is now SY. If B were brought closer to A, the value of SY would be correspondingly reduced.

From this, to obtain a high capacity the plates of a condenser are always placed as near as possible without touching. The limit to this is fixed by the insulation strength of the medium between the plates, by leakage losses, and by mechanical considerations.



An American condenser—the Metralign S.L.T.—which combines the advantages of ordinary S.L.F., S.L.W. and S.L.C. types.

(3) The third item depends on a property of insulators called the

Although few condensers of this type are seen nowadays, they were in general use in the early days of broadcasting.

" dielectric constant " or " specific inductive capacity." Round every conductor there must be some insulating medium, commonly called the " dielectric," and the electrical effects produced by a charge on a conductor in the space around it vary with different dielectrics.

In the case of the variable condensers used in wireless, this dielectric is usually air ; in the fixed condensers of larger capacity thin layers of other materials are used. If an air condenser were immersed in oil, or if thin sheets of ebonite, or mica, or glass, or paraffined paper, were inserted between the plates, then the capacity of the condenser would be increased to an extent depending on the material used. This was first discovered by Michael Faraday.

If the use of a given material gives us, for instance, six times as much capacity as the use of air between the plates, then the dielectric constant of that material is six, and so on.

Formula

These three determining factors can be summed up in the formula for a parallel-plate condenser :

$$\text{Capacity} = \frac{KA}{12.56d},$$

where K = Dielectric constant of medium

A = Area of plates,

d = Distance between plates.

It must be clearly understood that no actual transference of electricity takes place between the opposite plates of a condenser, and for a steady or direct current the condenser is a complete obstruction.

Condenser Capacity *(Continued)*

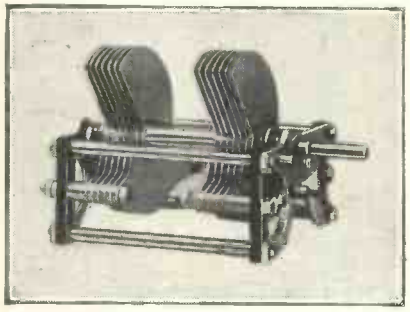
The dielectric is regarded as analogous to an elastic diaphragm in the path of the electricity ; this diaphragm can be imagined to yield to a sudden rush of electricity and then to rebound, so that the electricity tends to retrace its path. Also, the yielding of the diaphragm means that a sudden impulse on one side produces a sudden impulse on the other.

With an intermittent or pulsating current, therefore, the variations in the charges on the plates will exert correspondingly varying influences on the opposite plates.

H.F. Oscillations

When high-frequency oscillations are induced into a circuit (*see* Fig. 2) the electricity may be considered to oscillate backwards and forwards in it, first in the direction ALB and then in the direction BLA, so that the potentials of the plates A and B are alternately positive and negative.

First A is positive with regard to B, and then the reverse occurs in each oscillation, so that the influences of the charges on the plates on one another are continually varying. These influences extend across the dielectric from one plate to another, and the potential of each plate affects the flow of current into the other.



This special Cyldon S.L.F. condenser enables the operator to tune two circuits simultaneously with one control.

In this sense, therefore, an alternating current may be said to be able to flow through a condenser.

R. M. C.

Grid Bias for H.F. Valves

VERY few sets are now built in which provision is not made for the application of a suitable negative bias to the grids of the L.F. valves. The reasons why it is desirable to work these valves under such conditions are too well known to require repetition here.

But we may well ask why no one seems to think of applying grid bias to the grids of H.F. valves.

Apart from the frequency of the impulses, H.F. and L.F. valves are called upon to do exactly the same work. In fact, when general-purpose valves are used throughout a set identical valves may be used in the H.F. and the L.F. stages. If the valves are identical, so also will be their characteristic curves.

For a given mean grid potential the operating point will lie on exactly the same part of the curve whether the valve is engaged in amplifying oscillatory currents or L.F. impulses.

Stability with Losses

The reluctance to work H.F. valves with the mean potential of the grids at a negative value is probably a relic of the days when stability in H.F. amplifiers could only be obtained by introducing losses into the circuits. A common method of doing this was to work the valves with a sufficient positive bias to cause grid current to flow.

But now that the effect of the inter-electrode capacity (the cause of all the trouble) can be counteracted by one of the many neutralising systems there is no reason why H.F., as well as L.F., valves should not be worked under the most suitable conditions for distortionless amplification.

That is to say, there is no reason why a suitable negative bias should not be applied to the grids of H.F. amplifying valves.

G. N.

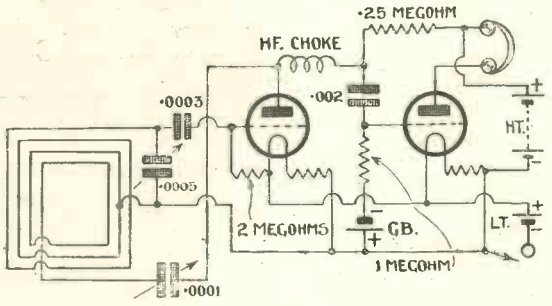
IN operating or constructing a set you may possibly meet with some difficulty that you cannot solve yourself.

Whatever it is don't worry yourself ; let the Technical Staff of the WIRELESS MAGAZINE *do all the worrying for you.*

Ask one question at a time ; write on one side of the paper only ; attach to your query the coupon on cover iii, and send it with a stamped addressed reply envelope and a fee of 1s. *to The Editor,* WIRELESS MAGAZINE, *58-61, Fetter Lane, E.C.4.*

Circuits for Your Portable Set

Specially developed by the "Wireless Magazine" Technical Staff, these circuits for portable receivers will appeal to many readers on account of their efficiency and simplicity. The use of R.C. couplings, employing the special "hi-mu" valves now on the market, results in sets that have a very low H.T. consumption

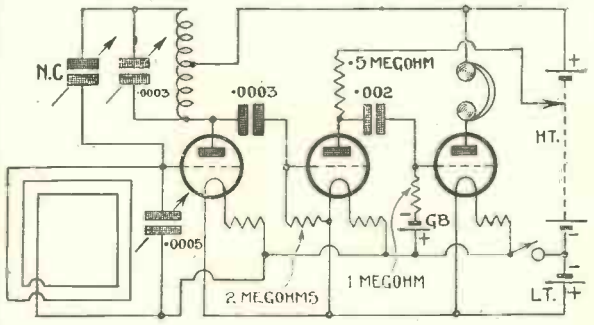


Resistance-capacity amplification, owing to its present day efficiency, combined with light weight of components required, is very suitable for use in portable sets. This circuit diagram shows a two-valve portable receiver employing a stage of R.C. L.F. amplification and using Reinartz reaction.

A tapped frame aerial is employed which may conveniently be wound in the lid of the case. It is important to note that for good results with this receiver the detector valve should be of the high-impedance type, having a high amplification factor.

For greater range a stage of neutralised H.F. as shown in the adjoining circuit diagram may be added. In this case a plain frame winding is used, while a centre-tapped coil is connected to the anode of the H.F. valve.

A neutralising condenser connected between—

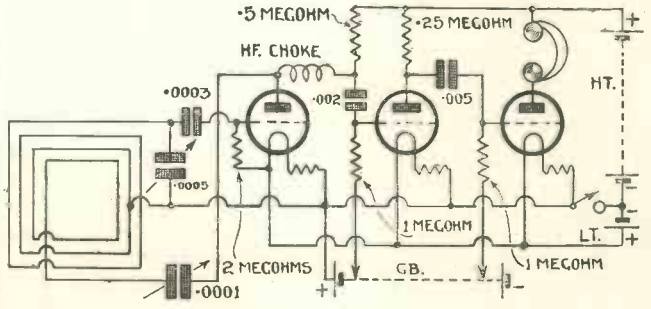


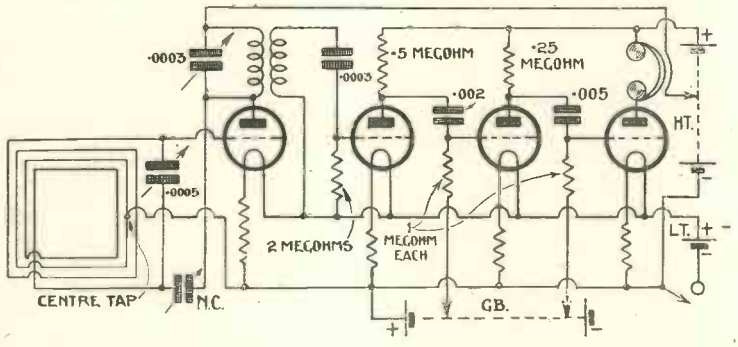
—the remaining end of the coil and the grid of the H.F. valve enables reaction to be obtained as required.

For best results with this circuit the first valve should be of the H.F. type, the second an R.C. valve, while the third may be a small power valve.

Where greater volume is required at short range the circuit adjoining may be used. This circuit is similar to the first one shown, except that an additional stage of resistance-capacity L.F. amplification is employed.

For best results the first two valves should be of the R.C. type, while the third may be a small power valve.





Volume with good range is obtainable by employing the last circuit shown. A tapped frame winding, as in the first circuit is used, while an H.F. transformer—which may be one of the plug-in types—is used for H.F. amplification.

The remainder of the circuit is quite straightforward and consists of a detector valve followed by two stages of R.C. L.F. amplification. A loud-speaker may be used quite successfully with this circuit.

Broadcast Boosts

By IRVINE FOSTER

THE B.B.C. announced the other day, in answer to a complaint that Brighton had been unfairly boosted, that it was open to any seaside resort to offer programmes for broadcasting—which would be considered strictly on their merits. I understand that from the dozens of programmes submitted that of Wumples-super-Mer has been selected as the most original and will be broadcast within the next few days.

The first item, "Sounds on the Prom.," will be a romantic portrayal of all that marvellous life and movement which goes to make Wumples-super-Mer what it is. The dulcet notes of the patriarchal mariners enquiring whether there are "any moer fer the Skylark," the voluptuous sucking noises of children sampling Wumples-super-Mer rock (lettered right through) and the health-giving lung exercises of babies left unattended save for an arrowroot biscuit outside the Pier Hotel will supply the *leif motif* against a general background of brass instruments, shuffling feet, and the far distant sound of waves squelching on banks of mud.

Business Side

The business side of the town will be convincingly represented by a sound picture in three parts entitled, "Our Industries." The principal feature of the first part, which will be broadcast from the Old Harbour, will be the despairing cries of the bloaters as they fling themselves on to the waiting hooks of fishermen, only too glad to escape from the bather-infested sea.

Overtime!

The famous Spinning Factory, which harmonises so well with its surroundings, will work overtime specially for the occasion, and subject to the works being well lubricated, will be heard manufacturing its famous sea serpent yarn.

Arduous Task

The second part will give an impression of the arduous task of the Municipal Chairman—the stealthy approach in rubber shoes, the telltale tintinnabulation of the ticket punch, the stampede of numberless feet and the pounce as one of the multitude escaping is seized and made to buy a ticket.

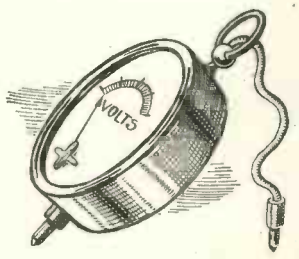
Cheerful Noises

The third part, which goes back to the town's ancient history for its inspiration, will consist of the cheerful noises of a particular piece of domestic work which is nowadays but seldom heard. It will be called "Lighting a fire for the lodgers on a chilly August evening."

Space does not permit me to deal with the other items in detail, but there is little doubt that the whole programme will be a wonderful advertisement for Wumples-super-Mer. The Committee responsible for the arrangements have only one regret, namely, that it is not yet possible to broadcast the enchanting smell of vinegar, seaweed and shell fish, which makes the High Street an olfactory paradise on summer evenings.

Things To Know About

Voltmeters



FOR the proper operation of a valve set it is essential that the correct H.T. and L.T. voltages should be used. An instrument for measuring voltage is called a voltmeter, and a handy type of voltmeter, which in size and shape resembles a watch, is shown above.

To measure the voltage applied to a valve filament the meter should read up to about eight volts and should be connected across the filament legs of the valve when this is in its socket and the filament is alight.

The voltmeter scale should extend to 100 or 120 volts for the purpose of measuring the H.T. voltage and the meter should be connected across the H.T. terminals of the set when the H.T. battery is connected up and is actually supplying current to the plates of the valves.

Seen in the Studios

At 5WA

The tallest announcer.

The studio windows opened (once).

The smoke in the downstairs studio.

A tumbler of water near the microphone.

The Welsh alphabet displayed prominently (for visiting announcers).

An Irish harp.

At 6BM

A broken big drum.

The fattest announcer.

The "Musical Interlude."

A notice, not quite clear, but which I made out as follows: "No talkers wanted; sketchers' entrance, side door."

E. B. R.

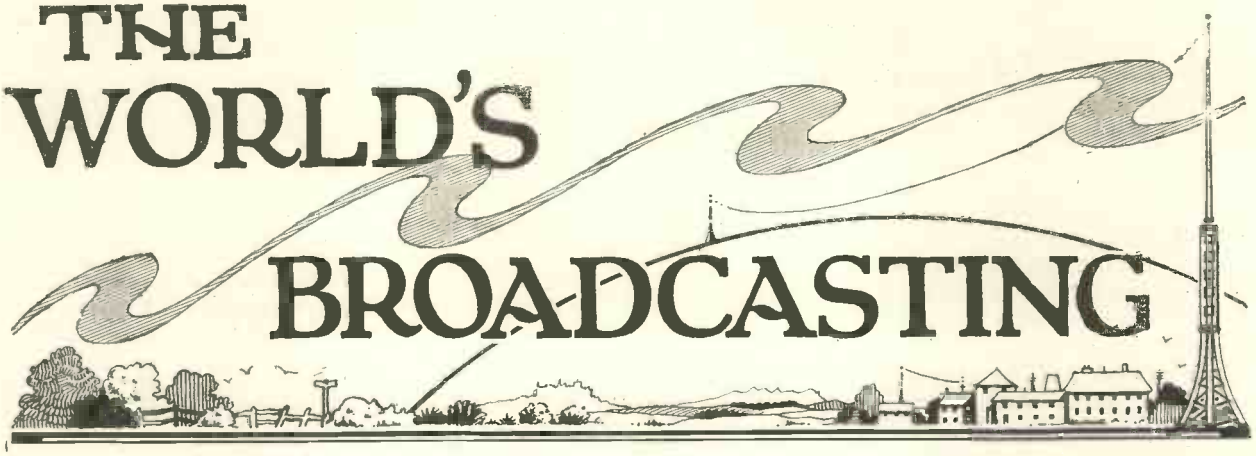
Foreign Terms

IT is a curious fact that in most European countries it is the custom to borrow words invented by a foreigner when talking of inventions of outside origin; Germany alone in this respect is an exception, and in nearly every case such appellations are either clumsily translated or alternately equally awkward polysyllabic substitutes are found for them. But pick up any French, Scandinavian, Spanish, Italian, Swiss, or even Czecho-Slovakian technical journal, and you will find that their articles on radio matters teem with English expressions.

At the same time, it should be added that if you were to hear them spoken with a native accent, you might take them to be an extra-European language!

J. G. A.

THE WORLD'S BROADCASTING



Wave-length in Metres.	Station.	Call Sign.	Wave-length in Metres.	Station.	Call Sign.	Wave-length in Metres.	Station.	Call Sign.
158	Beziers	—	310	Zagreb	—	438	Bilbao	EAJ9
196	Karlscrona	SMSM		Algiers	PTT	441.2	Brunn	—
200	Biarritz	—	312.5	Newcastle	5NO	443	Rjukan	—
201.3	Joenkoeping	SMZD	315.8	Breslau	—	450	Rome	1RO
202.7	Kristinehamm	SMTY	319.1	Dublin	2RN	454.5	Stockholm	SASA
217.4	Luxemburg	—	322.6	Milan	—	460	Barcelona	EAJ13
218	Orebro	—	325	Malaga	EAJ23	461.5	Oslo	—
220	Karlstadt	SMXG	326.1	Birmingham	5IT	464	Paris	L'Ecole Sup.
230	Juan-les-Pins	—	329.7	Konigsberg	—			
	St. Etienne	—	333.3	Naples	—	468.8	Langenberg	—
238	Bordeaux	—		Reykjavik	—	478	Lyon-la-Dona	—
241.9	Münster	—	335	Cartagena	EAJ15	483.9	Berlin	—
250	Casablanca	—	337	Copenhagen	Radio-raadet	491.8	Bournemouth	6BM
	Eskilstuna	—				496	Zurich	—
	Gleiwitz	—	340.9	Paris	Petit Parisien	497.5	Upsala	—
252.1	Bradford	2LS				500	Aberdeen	2BD
	Bremen	—	343.9	Seville	EAJ17		Linkoeping	—
	Montpellier	—	344.8	Barcelona	EAJ1		Tromso	—
	Saeffle	SMTS		Seville	EAJ17	504	Porsgrund	—
253	Toulouse	—	346	San Sebastian	EAJ8	508.5	Brussels	—
254.2	Kalmar	SMSN	348.9	Prague	—	517.2	Vienna	Radio Wien
	Kiel	—	350	Grenoble	—			
260.9	Malmo	SASC	353	Cardiff	5WA	526.3	Riga	—
268	Strassburg	8GF	357	Seville	EAJ5	535.7	Munich	—
270.3	Posen	—	358	Graz	—	545.9	Sundsvall	SASD
272.7	Sheffield	6FL	361.4	London	2LO	555.6	Budapest	Csepel
	Klagenfurt	—	365.8	Leipzig	—	566	Berlin	—
	Danzig	—	370	Paris	RadioLL		Hamar	—
	Nottingham	5NG	370.4	Bergen	—	577	Freiburg	—
277.8	Leeds	2LS	375	Helsingfors	—	720	Ostersund	—
278.2	Norrkoeping	SMVV		Madrid	EAJ7	760	Geneva	HB1
283	Dortmund	—	379.7	Stuttgart	—	850	Lausanne	HB2
287	Lille	—	384.6	Manchester	2ZY	1,000	Leningrad	—
288.5	Edinburgh	2EH	389	Madrid	Radio Espana	1,060	Hilversum	HDO
291	Radio Lyon	—				1,100	Basle	—
294	Stoke-on-Trent	6ST	390	Radio Toulouse	—	1,111	Warsaw	—
	Swansea	5SX	394.7	Hamburg	—	1,153.8	Soro	—
294.1	Dundee	2DE	400	Cork	6CK	1,200	Boden	SASE
	Hull	6KH		Falun	SMZK		Constantinople	—
	Innsbrück	—		Plymouth	5PY	1,250	Königswuster-hausen	LP
297	Liverpool	6LV	402	Salamanca	EAJ22			
	Hanover	—	405.4	Glasgow	5SC		Moscow	—
300	Bratislava	—	408	Reval	—		Motala	—
303	Lisbon	PLAA	411	Berne	—	1,450	Moscow	RDW
	Marseilles	—	416.7	Gothenburg	SASB	1,600	Daventry	5XX
	Nuremburg	—	419.5	Bordeaux	—	1,760	Paris	CFR
306	Madrid	EAJ12	420	Bilbao	EAJ11	1,800	Norddeich	KAV
306.1	Belfast	2BE	422	Cracow	—	1,850	Carthage	—
			428.6	Frankfort-on-Main	—	1,950	Scheveningen	—
308	Paris	Radio Vitus	434.8	Fredriksstad	—	2,000	Kovno	—
						2,650	Paris	FL

The Loftin-White Two (Continued from page 488)

tend to burst into oscillation there so that it falls off in efficiency at the two ends.

Bettering Adjustment

After the operation of the receiver has been mastered, however, the reader should try and better the adjustment, and after a little experience this will readily be achieved, and a setting will be obtained whereat the receiver is amazingly efficient and picks up stations by simply rotating the tuning dial.

I have picked up stations on this receiver and endeavoured, as a matter of interest, to strengthen them with the reaction condenser, only to find that it was already at its correct position and any further increase simply introduced the reaction distortion which is the precursor of oscillation.

Dial Setting

A brief list of several stations which have been received on this receiver is given more as a guide to the wavelength settings which may be expected, rather than a test report, because this will vary very largely with the local conditions, and will depend upon whether the reader is only interested in reception which can be obtained at the same time his local station is transmitting or whether he likes to listen to the numerous Spanish and other stations which broadcast quite attractive programmes after the B.B.C. stations have closed down.

One word of warning may be given, namely, that this receiver will cause interference to the neighbours if it is allowed to oscillate persistently. Care should be taken not to allow it to oscillate any longer than is necessary when adjusting the receiver. At any rate, it is advisable to carry out the adjustments on a wavelength different from that of the local station, whatever that happens to be, to minimise the risk of interference, and in any case, do not allow the set to oscillate more than is necessary in order to satisfy yourself that you are just off the point of reaction.

The sensitivity is such that stations will be received one or two degrees off the point of oscillation, so that it is not necessary to have a very critical adjustment.

One further remark may be made concerning the detector valve. In order to obtain smooth and efficient control of reaction, and also to improve the selectivity to a small extent, the grid leak on the detector valve has been connected to a separate grid-bias battery. By this means it is possible to put 1½ or 3 volts positive bias on the valve, according to the type in use, and it will be found to enable a very smooth reaction control to be obtained, without any loss of efficiency, whereas full positive voltage often results in plopping reaction.

Grid Bias

G.B.– should go to the negative terminal of an ordinary 9-volt grid-bias battery, G.B.+1 should go to 3, 4½, or 6 volts, according to the valve in use, and G.B.+2 should be 1½ to 3 volts more positive than G.B.1.

Finally, the use of the specified H.F. choke is important, since the constancy of reaction setting depends to a great extent on this factor. Disappointing results will be obtained unless a satisfactory product is used in this position.

VALVES—GREAT AND SMALL

There are valves and valves—as this photograph of a giant Cossor transmitting valve and a Stentor shows.

DIAL SETTINGS.
(No. 60 aerial coil: No. 40 reaction coil.)

Station.	Wavelength.	Condenser Setting.
Aberdeen	500	150°
Bournemouth	491	144°
Langenberg	468	136°
Frankfort	428.6	126°
Hamburg	398	116°
Leipzig	365.8	102°
London	361.4	98°
Birmingham	326.1	82°

ONE of the B.B.C. rules for SOS calls is: "In no case can an SOS be broadcast requesting the attendance of relatives *after* death has occurred." Mass telepathy, but no spiritualism yet.

AN American has just produced a remarkable invention which takes the form of a wireless set no bigger than a saucer. We have heard of a storm in a teacup.

WE are informed that the Johannesburg Broadcasting Station has had to close down through lack of financial support.

Real broadcosting!

PTT Transmissions

OF late both the Marseilles, Toulouse, and Lyons PTT transmissions have been developing their local programmes; in the course of the evening it will be found that on many occasions they merely turn to Paris for scientific or political talks and news bulletins. Generally speaking their entertainments are somewhat limited in scope, and in the main unpleasantly crowded with advertising puffs. PTT Lyons, alone, on certain evenings weekly, turns to a local cabaret for a fate transmission of typical French *café-concert* variety. J. S. A.

Specially Written by the Officials at Savoy Hill

What the B.B.C. is Doing

A GOOD deal of publicity has been given to a recent attempt on the part of the Dutch short-wave station at Eindhoven to relay B.B.C. programmes to various parts of the Dominions. The B.B.C. has taken no active part in this demonstration of wireless progress, as its attention has been concentrated entirely on the task for which it was constituted, namely, the provision of a broadcasting service for the population of the British Isles.

Limited Sentiment

This does not mean that the B.B.C. has no desire to co-operate in any progressive enterprise designed to interchange programmes between various parts of the Empire, or, alternatively, to assist in making the B.B.C. programmes available in other parts of the Empire. It is important, however, that sentimental considerations should not outstrip the practical aspect of the matter.

We had occasion, some little time ago, to draw up in these columns a definition of what might be regarded as a "stunt." Now, the B.B.C. cannot embark upon any proposals for Empire broadcasting as a "stunt," but it will, when the time is ripe, present proposals that are likely to result in that degree of efficiency which will justify the expenditure involved.

It must be remembered also that the B.B.C. has no money to spend on experiments in Empire broadcasting; consequently, the opinion of overseas representatives must first be tested with the view of ascertaining if any demand exists for such a service and the extent to which the Dominions will be prepared to co-operate financially and otherwise.

Over-charged !

The listener in Aberdeen who pays 10s. for his licence is probably not convinced that the programmes that he receives are of a sufficiently high quality to earn his gratitude. He is probably not sure that he is not over-charged when he has to pay 10s. for his licence. He might, therefore, be expected to hold very decided views about the deflection of licence money, paid for a broadcast service for himself, to other interests in the far corners of the earth.

As regards that other important factor, time, it must be borne in mind that practically a 24-hour service would be necessary if the scattered Dominions were to be served with B.B.C. programmes. There are also technical difficulties about the overcoming of which broadcasting experts are not at present satisfied. It might be very interesting as a novelty to provide a listener in the Himalayas with a programme with all the attendant "mush" and atmospherics. After a little while he would get tired of the "novelty."

It would plainly be detrimental to the ultimate success of an Empire service if the B.B.C. were to announce beforehand an important speech, and on the occasion of the broadcast the value of the speech was entirely negatived by "fading" or other form of interference. Until comparatively good reception is assured, broadcasting on short waves would, as everybody knows, meet with a fugitive success.

* * * * *

Rejected Proposal

There has been a tendency in some quarters to belittle both the imperial and national patriotism of the B.B.C., not only in connection with Empire broadcasting, but also as regards proposals for broadcasting propaganda with the object of attracting overseas visitors to this country. It has been alleged that proposals from a national organisation were rejected.

It is true that a proposal was made for broadcasting propaganda; but it had to be declined on account of lack of programme time and facilities, more particularly because it involved the broadcasting of matter of insufficient entertainment value. It would, therefore, have been unlikely to achieve the object in view.

If, as was the case in the particular instance quoted, the object is to attract visitors to this country, the B.B.C. is already doing what it believes to be effective propaganda of the kind by a series of holiday talks. The B.B.C. is constantly seeking effective ways to assist national interests in this manner, but is definitely of the opinion that stereotyped propaganda defeats its own purpose.

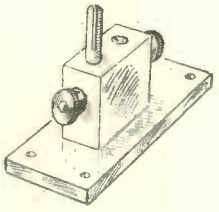
Doubtful Value

It is doubtful to what extent a series of broadcasts from English stations, intended to attract visitors to England, would answer the purpose, as there would be no evidence that the people whom it was desired to reach would be listening to B.B.C. stations at the time that the propagandist talk was given. The aim of inducing people to visit Great Britain might be more easily achieved if such talks were broadcast from Continental stations.

B.B.C.

Things To Know About

Coil Holders



A SINGLE coil holder consists of a plug and socket mounted in a block of insulating material and is provided with two terminals connected to the plug and socket respectively.

It is used for supporting an interchangeable coil of the honeycomb, duolateral, or similar type, the coil also being provided with a plug and socket.

When the coil is in position the plug of the coil fits into the socket of the coil holder and the plug of the coil holder into the socket of the coil

Read About the Revelation Four on page 497 !

Earth Connections
Rewinding Phones
Frame Reception
Aerial Types

Valve Overloading
Choke Coupling
Mains Polarity
H.T. Batteries

No Earth Connection

Q.—I find it possible to tune-in my local station, though at reduced strength and at a different setting of the tuning controls, when the earth lead is disconnected from the set. Can you explain this?—R. P. K. (Belfast).

A.—In the circumstances you mention the internal wiring of the set, the leads to the batteries and loud-speaker, etc., is acting as a counterpoise and allowing reception to be carried on. This "counterpoise," of course, will be far from efficient.—P. C.

Valve Overloading

Q.—What is meant when it is said that a valve is being overloaded?—B. M. S. (Whitby).

A.—This means that the signals being applied to the grid of the valve cause the potential of the grid to vary so much that the operating point cannot be kept on the straight portion of the characteristic curve lying on the negative side of the zero grid-volts line. When this happens it may be possible to avoid the overloading by increasing the H.T. voltage and suitably readjusting the grid bias. Otherwise it will be necessary to replace the valve by another capable of dealing with a larger grid-swing without distortion.—B.

Rewinding Phones

Q.—I have a pair of 120-ohm phones, one winding of which has become defective, and I wish to rewind the defective earpiece to the original resistance. What gauge and amount of wire should I use to accomplish this?—S. A. (Worthing).

A.—Use No. 44-gauge s.s.c. copper wire, and wind on 30 ft. of wire to each bobbin. This will mean 60 ft. of wire for the full single earpiece.—B. M.

Choke Coupling

Q.—Why is it that choke coupling gives purer results than transformer coupling?—V. N. (Darlington).

A.—Choke coupling does not necessarily always give purer results than transformer coupling, but it is, perhaps, true to say that pure reproduction can be more easily and cheaply obtained by using choke coupling than by employing transformers.

The principal difficulty in the way of making a transformer which will give really pure results is in winding a primary of sufficient impedance. A large primary winding means that there is not very much space left for the secondary, and hence those transformers which give best results usually have a low step-up ratio.

An L.F. choke, used in a choke coupling, may be regarded as an auto-coupled L.F. transformer having the very low step-up ratio of unity. As there is only one winding to be considered, this may be wound to a very high impedance.—P. C.

One Valve and Frame

Q.—Is it possible to receive good phone signals at seven miles from a main station with a single-valve set used in conjunction with a four-foot side frame aerial?—B. W. P. (Timperley).

A.—If the set is efficient and if advantage is taken of reaction we should expect you to get very good headphone reception under the conditions you mention, provided that the frame is not badly screened.—M.

Polarity of Mains

Q.—How can I ascertain the polarity of D.C. mains and how can I tell which, if either, main is earthed?—T. S. C. (Manchester).

A.—The polarity of the mains may be ascertained in various ways, but perhaps the simplest method is to immerse the ends of the leads in slightly acidulated water, keeping the two ends a few inches apart.

Bubbles will then be seen to rise from the negative lead.

In order to find out whether either of the mains is earthed connect a lamp, rated at the mains voltage, between each lead in turn and earth. If the lamp does not light when connected between either of the mains and a good earth neither of the mains is earthed. If the lamp lights when connected between one of the mains and earth the unconnected main is earthed.—H. B.

Earthing the Aerial

Q.—I wish to fit a switch so that I can connect my aerial directly to earth as a protection against lightning. As, however, I am using a counterpoise, I am not sure whether the switch should be arranged to connect the aerial to the counterpoise, when the set is not in use, or actually to earth. Can you enlighten me upon this point?—G. T. (Coventry).

A.—Your counterpoise is, or should be, carefully insulated from earth, and it would therefore be no protection to connect aerial and counterpoise together. The earthing switch should be so arranged that when the set is out of use the aerial can be connected directly to the ground.—P. M.

How Many Wires?

Q.—Which is the best type of aerial to use—a single-, twin-, or multi-wire aerial?—N. C. S. (Southport).

A.—Generally speaking, for ordinary broadcast reception, a single-wire aerial is the best, providing that the total length of the aerial wire is at least 70 feet. If space restricts the combined height and length of the aerial to less than 50 feet or so, two wires may be employed in parallel, while more wires in parallel may be an advantage in the case of very short aerials.

If two or more wires are used there should be a space of at least six feet between adjacent wires, and the wires should not be joined except at the lead-in tube.—M.

Exhausted H.T. Battery

Q.—How can I tell when my H.T. battery is exhausted and requires renewing, without buying an expensive high-resistance voltmeter?—D. P. L. (Clacton.).

A.—As the battery runs down signal strength will get weaker and weaker, and there will be an increasing difficulty in obtaining a proper reaction effect. Crackling noises, traceable to no other cause, may make their appearance, especially if a large-capacity fixed condenser is not used across the battery.

It will probably be noticed that when the set is first switched on it appears to work quite well, but that the above symptoms appear after the set has been in use for a time.—P. C.

When You Are In Difficulty—

It does not matter whether your knotty problem is a theoretical or a practical one—in either case the Technical Staff of the "Wireless Magazine" is ever ready to help you out of the difficulty. Just write your query out on one side of a sheet of paper (this small point saves us time and enables us to send an answer quicker) and send it with the coupon on page iii of the cover, a stamped addressed envelope and a fee of 1s. (postal order or stamps) to:—Information Bureau, "Wireless Magazine," 58-61, Fetter Lane, London, E.C.4.

IT'S not what you pay but what you get that determines whether a valve is cheap or expensive. When you buy a Cossor you get a Valve with a Kalenised filament giving such long service that you begin to wonder whether you'll ever have to buy another valve as long as you live! And at the same time you obtain a quality of reproduction which is the envy of your friends. What more can you expect from any valve?

Cossor

—the melody maker

Cossor gives you the sweet high notes of the Violin

Cossor gives you the majesty of the 'Cello

Cossor gives you the rich harmony of the Piano

Cossor gives you the throbbing of the Drums

More Questions Simply Answered

(Continued from p. 544)

Power Amplifier

Q.—What is the difference between a power amplifier and an ordinary L.F. amplifier?—S. C. A. (Scarborough).

A.—There is no essential difference between the two instruments you mention. A power amplifier is, however, designed to handle a larger volume, without distortion, than could be dealt with by an ordinary amplifier, and special power valves, with larger electrodes than usual, are used in conjunction with a suitably increased H.T. voltage.—B.

Smoothing Choke for L.T. Supply from Mains

Q.—I intend to make an L.T. supply system for my house mains (which are direct current), and would be pleased to receive information concerning a suitable low-resistance iron-core choke for smoothing purposes.—H. S. (Teddington).

A.—A suitable low-resistance choke can be constructed as follows:—1,500 turns of No. 18-gauge d.c.c. copper wire wound upon a 1-in. square iron core.

The bobbin should be 2¼ in. long and have an external diameter of at least 5 in. The total resistance of this choke will be about 8 ohms.—L. A. C.

Best Aerial

Q.—As I cannot have both ends of the horizontal portion of my aerial at the same height above the ground, is it better to have the lead-in end or the free end higher than the other end?—G. F. (Morden).

A.—It would be better to have the free end higher than the lead-in end, and the lead-in should be the end at the horizontal portion nearer the house. There is no advantage in having both ends of the horizontal portion at the same height above the ground, as it would, in fact, be ideal to have a perfectly vertical aerial, and you should approach this ideal as nearly as possible.—P. M.

Resistance Valves and Anode-bend Rectification

Q.—Why is it that a valve specially designed for the latest form of resistance-capacity coupling can be used for anode-bend rectification without grid bias or with the grid at zero potential with respect to the filament, yet when the same valve is employed as a resistance amplifier the grid requires a negative bias?

Surely if the valve rectifies on the lower bend of its characteristic curve with zero grid potential, then by adding negative grid bias the operating point of the valve is moved lower down the curve and the valve still rectifies?—I. B. (Bow).

A.—Such may appear to be the case at first sight, but if you will refer to a curve of a typical R.C. valve of the latest type you will observe that for anode-bend rectification only about 60 volts is advised for the anode potential, whilst for amplifying purposes about 120 volts is required.

The addition of H.T. to the plate of the valve moves the characteristic of the valve bodily to the left, so that grid bias is now really essential to ensure that the valve is worked on the straight part of its curve.—B. A.

Loud-speaker Coupling Transformer

Q.—I have obtained a Magnavox loud-speaker, and I understand that this make of speaker requires a special transformer for connecting it to a valve receiver.

Can you, please, supply me with the necessary details to enable me to construct a suitable instrument?—P. G. (Kent).

A.—The original transformer as supplied by the manufacturers was wound upon an iron core having a cross-sectional area of 1 square inch, and was composed of 4,000 turns of No. 40-gauge s.s.c. copper wire for each winding.

The turns were wound in piles or slabs, each complete winding possessing about ten slab-wound coils.—L. A. C.

Three-valve Circuit

Q.—Would a three-valve circuit, consisting of tuned-anode H.F., detector, and L.F. enable me to receive all British main stations at good loud-speaker strength?—D. L. H. (Nuneaton).

A.—The performance of any set depends upon a great many factors, such as the aerial system used, local screening, the efficiency of the set itself, the skill with which it is operated, etc.

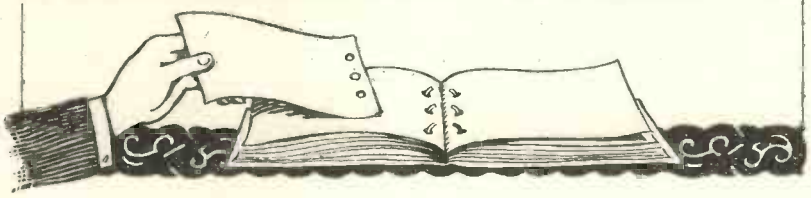
Frankly, we should not advise you to rely on the three-valve circuit for the results you mention as, although you may be able to pick up all the main British stations at different times, it is highly unlikely that you will be able to bring them all in on the loud-speaker, one after the other, on any desired occasion.—K. M.

Avoiding Hand-capacity Effects

Q.—What is the rule regarding the connecting up of the fixed and moving vanes of variable condensers in order to avoid hand-capacity effects?—T. P. W. (Barnet).

A.—Hand-capacity effects will be minimised if the moving plates are connected to points which are at earth potential as regards H.F. currents. That is to say, if a condenser is used in a grid circuit the moving vanes should be connected to the filament circuit and the fixed vanes to the grid of the valve, and in the case of a condenser in the anode circuit moving vanes should go to H.T. positive and the fixed vanes to the plate of the valve.—M.

"Wireless Magazine" REFERENCE SHEETS



Compiled by J. H. REYNER, B.Sc., A.M.I.E.E.

Month by month these sheets can be cut out and filed—either in a loose-leaf folder or on cards—for reference. The sequence of filing is a matter for personal choice. In a short time the amateur will be able to compile for himself a valuable reference book.

WIRELESS MAGAZINE Reference Sheet **No. 11**

Volume Factor

IN considering the suitability of any particular valve for the last stage of a low-frequency amplifier it is desirable to mention the volume with which the valve can safely cope. This can be done in terms of the volume factor of the valve, which is half the maximum grid swing of the negative side of the zero grid-volt line, corresponding to the straight portion of the characteristic curve for the particular anode voltage employed.

The diagram shows a representative characteristic and the maximum negative grid swing is 16 volts. The volume factor therefore would be half this quantity, which would be 8 volts.

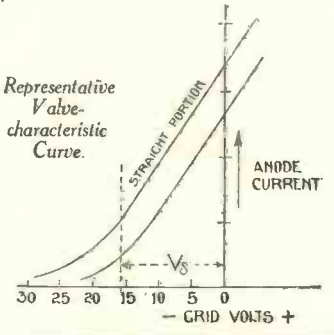
This is the static volume factor, which does not take account of the impedance in the anode circuit. For practical purposes, it is then necessary to convert this to the dynamic volume factor, which is obtained by multiplying the static volume factor by the quantity :—

$$\frac{2Z_o + 2Z_e}{2Z_o + Z_e}$$

where Z_o is the internal valve impedance, and Z_e is the external anode impedance.

Having obtained the actual dynamic volume factor of the valve under the particular conditions obtaining it is then necessary to compare this with the actual grid swing likely to be encountered in practice. It is found that the largest grid swing necessary with an ordinary loud-speaker in order to give adequate volume for a large-sized room is ± 17 volts.

If the valve is to be of any satisfactory use, therefore, it must have a volume factor in excess of this figure, and its static characteristic must, moreover, be capable of taking a grid bias of at least 17 volts with the particular anode voltage in use.



WIRELESS MAGAZINE Reference Sheet **No. 12**

Power Output

THE choice of a suitable power valve for the last stage of an amplifier does not depend only on its volume factor (see Sheet No. 11), but it is also affected by the power output the valve is capable of handling.

This is bound up to a large extent with the volume factor, which is a measure of the maximum grid swing capable of being handled by the valve in a satisfactory manner, and an expression can readily be obtained for the maximum distortionless power output in terms of the volume factor and other contents of the valve.

The maximum power output is given by the expression :—

$$P_{max} = \frac{2\mu^2\rho}{(2Z + \rho)^2} S$$

where μ and ρ are the amplification factor and impedance of the valve

Z is the external impedance.

S is the static volume factor.

It will be observed that this varies with the square of the volume factor. It is also proportional to the square of the amplification factor of the valve, so that if for a given impedance we can increase the amplification factor we obtain a considerable improvement in the volume which can be handled without distortion.

As in the case of the volume factor, it is necessary to know what is a satisfactory power output for normal purposes, and investigations show that a figure of .1 watt is a suitable power in the loud-speaker for a large room.

Having given a certain set of conditions, therefore, it is possible to work out the volume factor for the valve in question, and from this to determine the maximum power output without distortion. If this is above the figure of .1 watt just given, then the valve can be considered as capable of handling the necessary volume.

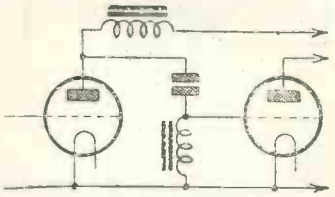
The majority of power valves in use to-day will not handle a sufficient volume unless the anode voltage is considerably increased, although there are certain super-power valves which can handle such a volume at normal voltages.

An increase in the anode voltage increases the maximum possible distortionless output quite considerably, but there is a limit to the output obtained by this means. In general a voltage of the order of at least 200 volts for the anode of the last valve is necessary if really distortionless output is to be obtained.

WIRELESS MAGAZINE Reference Sheet ***No. 13***

Dual-impedance Circuit

A FORM of circuit which has acquired a certain popularity for low-frequency amplification is that in which impedances are employed instead of resistances in the usual resistance-coupled circuit. The use of a low-frequency choke in place



Choke-coupled Circuit.

of the anode resistance is a well-known variant, but in the normal choke-coupled circuit the usual resistance grid leak is employed.

The use of an L.F. choke in this manner has certain advantages. It is possible to obtain a very high inductance, several times that possible on the primary winding of a good transformer, while at the same time the system avoids the drop in high-tension voltage which is inevitable with a resistance-coupled arrangement.

Such a system therefore partakes to a great extent of the advantages of both transformer and resistance coupling although it still possesses the disadvantage that the maximum amplification is that of the valve itself, there being no step-up effect.

It is claimed by the originator of the dual-impedance system (H. P. Donle) that the use of a resistance leak in order to maintain the grid of the preceding valve at a suitable potential is undesirable owing to the fact that on a heavy signal the charge on the coupling condenser cannot get away rapidly enough, and a choking effect results.

To avoid any such effect the dual-impedance system utilises a choke coil between the grid and filament in place of the usual lead. If there is any tendency to choke, therefore, an impedance having a low D.C. resistance such as this would overcome this effect.

The choke must, of course, be made of a high impedance to avoid shunting any of the low-frequency currents. Suitable values are 150 henries for the anode impedance, and 200 to 250 henries for the grid impedance.

WIRELESS MAGAZINE Reference Sheet ***No. 14***

Proportional Distortion

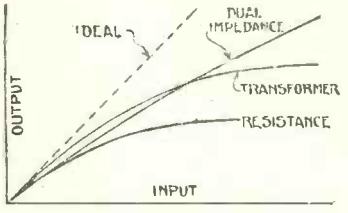
DISTORTION in a low-frequency amplifier may occur in a number of different ways. One form to which attention has been drawn a great deal in recent times is the frequency distortion whereby the very low or very high frequencies are not magnified to the true extent owing to the varying impedance of the coupling device employed in transferring the energy from one valve to the other.

There is also the distortion arising from non-linearity of the valve characteristic if unsuitable valves or incorrect bias is employed, whereby the anode-current variations in the valve circuit are not faithful reproductions of the grid-voltage variations on the input side. This defect can be overcome by the choice of suitable valves and adjustment of the grid-bias and high-tension voltages, to suit the volume to be handled.

There is a third form of distortion which is often not realised, which concerns the relative light and shade of transmission. This particularly applies to orchestral music where there are fairly rapid alternations between fortissimo and pianissimo passages.

In order to get the true effects and increase of the volume at the transmitting end to say three times the normal should produce an exactly similar increase at the receiving end. With the average systems of intervalve coupling, this is not the case and in consequence although no actual distortion is noted, there is a subtle difference between the reproduced music and the original.

The curve shows the effect of an ordinary transformer-coupled amplifier where the relative amplification falls off as the volume is increased. A similar effect is experienced for resistance-coupled amplifiers, the effect in this case being rather worse. A dual-impedance system, on the other hand (*See* Sheet 13), is distinctly better in this respect, and gives a more uniform response.

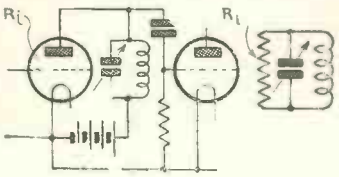


Proportional Distortion Curve.

WIRELESS MAGAZINE Reference Sheet ***No. 15***

Valve Damping

THE design of high-frequency amplifiers is dependent to a very large extent upon the valves with which the various circuits are to be associated. It is, indeed, practically impossible to design a satisfactory circuit without specifying that it shall be operated with a certain type of valve, so that due allowance may be made for the



Typical Tuned-anode Circuit.

effect of the valve impedance on the characteristics of the circuit generally.

The impedance of the valve is shunted across a portion of the circuit and materially increases the damping of the circuit itself. The simplest case is that of the tuned-anode arrangement which is shown in a skeleton form in the figure, and also in equivalent form. The effect of the valve is the same as a resistance shunted across the whole o the circuit.

Now the resistance of a coil and condenser in parallel is given by the expression L/CR, where L and C are the inductance and capacity respectively and R is the high-frequency resistance of the whole circuit. With an ordinary circuit this is of the order of 100,000 to 200,000 ohms, and since the average high-frequency valve has an impedance ranging from 20,000 to 50,000 ohms only, it will be seen to exercise a very considerable shunting effect, and will indeed cause an effect similar to an increase of the high-frequency resistance of the circuit of three or four times the normal value.

This effect may be minimised by tapping the valve across a portion of the circuit only, whereby the coupling effect is proportionally reduced. Tapping the valve across half the circuit reduces the damping by a quarter and so on, so that the condition can be varied accordingly. The optimum condition occurs when the damping introduced into the circuit by the valve is equal to that of the circuit by itself.

For any particular conditions, therefore, the appropriate tapping can be determined and converted, if desired, into an equivalent primary winding.

HAVE YOU TRIED R.C. COUPLINGS?

There are three common forms of coupling that can be used for low-frequency amplifiers. In this article E. BLAKE discusses the merits of each method, and explains why the resistance-capacity system gives the greatest purity of reproduction.

THOSE valves which follow a crystal detector or a rectifying valve are for low-frequency amplification, and on the method by which these valves are coupled, that is to say, by which the output of one is made the input to the next, the strength and quality—especially the quality—of the final result largely depend.

Hence, as the more an amateur learns about and hears radio reception, the more he seeks a good quality of tone rather than a large volume of noise, the following notes may be helpful to him.

Three Methods

The three commonest methods of coupling are :—

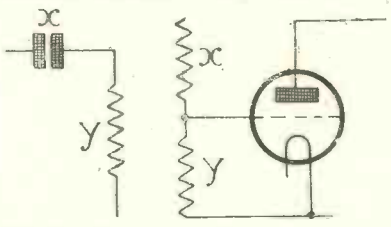
(1) **Transformer Coupling.**—Of the three this method gives the greatest step-up per valve, and this recommends it to popular use, as witness the large number of makes of inter-valve transformers on the market. Unless the transformer is well designed and well made its use will nullify the virtues of the rest of the set.

(2) **Choke Coupling.**—In regard to the quality of tone and quantity of volume obtainable by this method they work out on balance to about midway between transformer and resistance-coupling results. The volume is greater than with resistance coupling, but less than obtainable with transformers. The distortion caused by the iron core is less than in a transformer circuit, but more than is experienced with resistance coupling. The choke permits the use of a lower anode voltage than is required for an R.C. set, because its resistance is lower than the anode resistance in the last-mentioned.

(3) **Resistance-capacity Coupling.**—This is undoubtedly the best means of cascading L.F. valves when very good quality of tone is sought, because if the anode condenser has the proper capacity, the distortion on the lower notes is far less marked than when transformers are used.

There are several resistance-capacity units on the market, but, as it is likely that a given unit will not suit the type of valves used, I give a few notes on the relation between valve, resistance, coupling condenser and grid leak. In an experimental circuit clips should be provided for the last three items, to facilitate quick changes, so that different valves may be quickly tried and the best combination found.

The anode resistance should, for preference, be wire-wound, as this is less productive of noises than a carbon resistance. It should be of not



(Fig. 1.)—The coupling condenser and grid leak— **(Fig. 2.)—can be regarded as two resistances in series.**

less than five times the impedance of the valve in the anode circuit of which it is connected.

The coupling condenser should be of fixed capacity, with mica as dielectric. The capacity should be not less than .005 microfarad; .01 microfarad would be best. In testing, it is enlightening to substitute a variable .01 microfarad condenser; adjust first to a minimum and gradually increase the capacity. The results will leave you in no doubt as to "the importance of being earnest" in finding the correct capacity.

The grid leak should be of some eight to ten times the resistance of the anode resistance. As to the impedance of the valve, this is given by all reputable makers. The impedance of the condenser should be about 25 per cent. of the grid-leak resistance, the reason for this being as follows :—

Resistance in Series

This coupling condenser and the grid leak (Fig. 1) may be regarded as two resistances in series (Fig. 2). Now, the volume of sound is dependent upon the voltage applied across the valve, from filament to grid. Hence, if the voltage drop across the condenser x is too high, there will not be available sufficient voltage to operate the valve efficiently. Thus, the resistance of x should be a small portion of the resistance $x + y$; if it is not, the low notes will not have justice.

Just a few words about these low notes. The impedance of the coupling condenser can be calculated from the simple formula :—

$$\Omega = \frac{1}{2\pi n\ c\ (\text{farads})},$$

n being the frequency of the lowest note required, and c the capacity; the result is in ohms.

If we take the frequency of the lowest note required as 100, the formula becomes (approximately) :—

$$\Omega = \frac{10}{600 \times C\ (\text{microfarads})}\ (\text{ohms}).$$

An inspection of the formula in the first form given shows that the impedance of the condenser will be greater for 100 cycles frequency than for, say, 300 cycles frequency. And it may be repeated here that Ω should be about a quarter of the value of the grid leak in ohms. E. BLAKE.

The Revelation Four (Continued from page 501)

BRIEF TEST REPORT

Every station listed received at good loud-speaker strength.

Station.	Wavelength	Anode Condenser Setting.
Brussels	508	89.5
Aberdeen	500	86.5
Berlin	489	82
Lyons	478	79.5
Langenberg	468	76.5
Rome	450	74
Frankfort	428.6	70
Stuttgart	379	69
Madrid	375	67
Radio LL	370	66
Leipzig	365	64
London	361	60
Graz	358	54
Cardiff	353	52.5
Grenoble	350	51
Prague	348	48
Cartagena	337	47
Naples	333	41.5
Königsberg	329	38.5
Radio Vitus	328	37
Birmingham	326	36
Dortmund	283	34.5
Münster	241.9	21
Bordeaux	238	17.5

For the low-frequency stages two power valves of fairly low impedance, say 4,000 to 6,000 ohms, are desirable. There is no reason, though, why the first low-frequency valve should not have an impedance as high as 15,000 ohms.

It should be remembered in this connection, however, that the lower the impedance of the first low-frequency valve the higher can be the transformer ratio employed. With a valve of 10,000 ohms impedance, for instance, a step-up ratio of 1 to 6 can quite satisfactorily be employed.

As soon as the valves to be used have been decided upon the correct fixed resistors for use with a particular voltage battery can be obtained.

Battery Connections

To carry out a test connect up batteries in the following way:—Apply to H.T.+1 a voltage of about 60 to 80, and to H.T.+2 a voltage of about 120, while to G.B.— apply a negative potential of about 4½ to 6 volts. The ordinary low-tension accumulator should be connected to the L.T. terminals. The aerial and earth should also be connected. *Leave the H.T. lead disconnected for the present.*

Next place the valves in their correct positions, remembering that looking from the front of the receiver (that is, with the lid of the cabinet open), they are (1) second low-frequency stage; (2) first low-frequency stage; (3) high-frequency amplifier; and (4) detector stage. Now place the appropriate resistors in the holders.

Into the single-coil holder insert the appropriate coil, plug a split-primary transformer into the six-pin base, and place the screen in position. Now, and *not before*, the H.T.— lead can be connected up.

The reason for this precaution is that if the coil screen is moved while the set is switched on there is some chance of its providing a short path to earth for the high-tension battery. It should therefore be made a fixed rule *always* to remove the H.T.— wander plug from the battery before opening the lid of the cabinet to change coils.

Tuning-in

Plug a pair of phones into the right-hand jack and turn the reaction condenser until the plates are out of mesh. Now adjust the aerial-tuning condenser to the half-way position and rotate the right-hand condenser dial until a slight hiss is heard; this indicates that both circuits are in tune. To pick up a transmission move the reaction knob until the hiss is considerably intensified. Now rotate both tuning dials almost simultaneously so that the receiver always remains in the "hissing" condition.

As soon as a transmission is heard readjust the reaction condenser and re-tune to get the greatest volume. Now it is time to neutralise the high-frequency valve, and this should be done as follows:—

Remove the resistor for the H.F. valve and manipulate the neutrodyne condenser until signals are entirely cut out or reduced to their weakest volume. When this occurs the capacity of the valve has been balanced out. The resistor can then be put back into position.

Loud-speaker Reception

The receiver should now be perfectly adjusted, and the loud-speaker plug can be placed in the left-hand jack (removing the headphone plug from the right-hand jack), when whatever signals are being received should be heard from the loud-speaker. It will be found that a slight manipulation of the reaction condenser will provide an excellent volume control.

It is not essential, of course, though desirable, to use headphones for tuning-in as described. The loud-speaker can be plugged into the left-hand jack straight away if desired, and the adjustments made while using that instrument. It is always desirable, though, when trying to pick up distant stations, to use a pair of headphones for the preliminary adjustments.

In conclusion, it may be mentioned that the WIRELESS MAGAZINE Technical Staff will welcome reports of the performance of this receiver, and *should* any constructors have any difficulty over the set their combined experience will be willingly placed at their service. Don't be afraid to ask us for help—we want to make sure that the set pleases everybody who builds it.

VALVES TO USE IN THE REVELATION FOUR

	4-volt Valves.		6-volt Valves.	
	H.F. and Detector.	1st and 2nd L.F.	H.F. and Detector.	1st and 2nd L.F.
B.T.H.	—	—	B_4H	B_4
Cossor	Red Band	Green Band	Red Band	Green Band
Ediswan	GP_4	PV_4	—	—
Marconi	DEH_{410}	DEP_{410}	DEH612	DEL612
Mullard	PM_3	PM_{254}	PM_5X	PM_6
Osram	DEH_{410}	DEP_{410}	DEH612	DEL612
Shortpath	—	—	SP50B	SP55R

Equivalent 2-volt valves can also be used.

CATALOGUES AND PAMPHLETS

AN interesting 32-page booklet describing the short-wave beam system has been received from Marconi's Wireless Telegraph Co., Ltd., of Marconi House, Strand, W.C.2.

A gang-control condenser that also has individual control of each section is the subject of a leaflet issued by the Formo Co., of Cricklewood Lane, N.W.2.

Standard capacities and retail prices of the new Dubilier large-capacity mica condensers—especially suitable in R.C. amplifiers—are given in list Misc. L.1 issued by the Dubilier Condenser Co. (1925), Ltd., of Victoria Road, North Acton, W.3.

B.T.H. low-frequency transformers are the subject of a "letter-leaflet" sent us by the British Thomson-Houston Co., Ltd., of Crown House, Aldwych, W.C.2.

A new 68-page catalogue of wireless apparatus has been received from Electradix Radios, of 218, Upper Thames Street, E.C.4.

From Philips Lamps, Ltd., of 145, Charing Cross Road, W.C.2, we have received a leaflet describing a new D.C. high-tension supply unit.

Completely screened neutrodyne receivers are illustrated and described in an attractive booklet received from Freed-Eisemann Radio (Great Britain), Ltd., of 91, Regent Street, W.1.

American components are the subject of a 68-page catalogue issued by the Rothermel Radio Corporation of Great Britain, Ltd., of 24 & 26, Maddox Street, W.1. Copies can be obtained for 9d. to cover cost of postage.

Tangent battery eliminators and loud-speakers are the subject of folders issued by Gent & Co., Ltd., of Faraday Works, Leicester.

Particulars of new Igranic products—which include a loud-speaker filter unit, an L.T. charger and H.T. supply unit, and an H.F. choke—have been sent us by the Igranic Electric Co., Ltd., of 147, Queen Victoria Street, E.C.4.

Eelex standardised plugs, sockets, and switches are illustrated and described in a leaflet sent us by J. J. Eastick & Sons, of 118, Bunhill Row, E.C.1.

Reduced prices of Lisenin positive-grip terminals are announced in a leaflet sent us by the Lisenin Wireless Co., of 1A, Edgware Road, W.2.

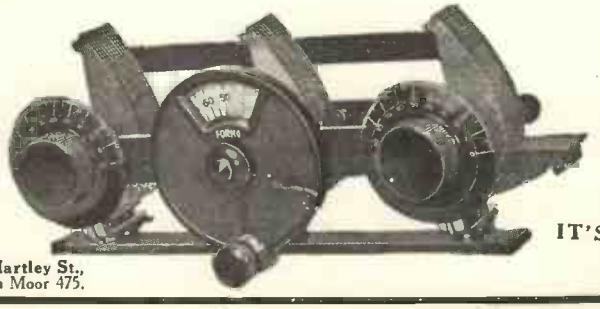
A special screw-driver for wireless use—called the Atlanta—is described in a leaflet issued by E.E. Company, of 6, Cambridge Road, Great Crosby, near Liverpool.

New Magnum products are the subject of folders and leaflets sent us by Burne-Jones & Co., Ltd., of 288, Borough High Street, S.E.1.

No More Sulphation!

UNLESS an accumulator is constantly kept charged sulphation of the plates occurs, with a consequent lowering of efficiency. The usual remedy for a sulphated accumulator is prolonged and repeated charging and discharging at a low rate, but even this method is only effectual when the trouble is slight.

From D.A.R., Ltd., Australia House, Strand, we have received a bottle of a preparation for removing the sulphate from accumulator plates. A very badly sulphated accumulator was treated with Dar, with the result that all signs of sulphation have disappeared, and the accumulator is now capable of taking its normal charge.

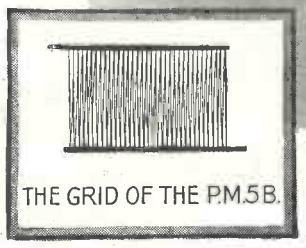


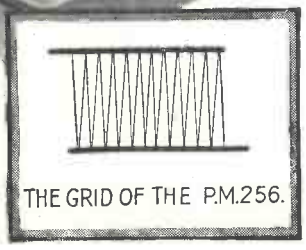
The "Wireless Magazine" Buyer's Guide

(Numbers in brackets indicate issue in which advertisement appeared.)

THE DIFFERENCE!

In this photograph the matched electrode construction of the P.M.6 is disclosed with the anode displaced. Note the great length of the wonderful P.M. Filament.





The grids illustrated give a striking example of the matched electrode system in the case of only two of the series of Mullard P.M. Valves.

MATCHED ELECTRODES
combined with the wonderful P.M. FILAMENT

MORE than a supreme filament in Mullard P.M. Valves . . . . more than a master filament that has set a new standard for long life, toughness, economy and power . . . . the wonderful P.M. Filament . . . .

A system of matched electrodes, designed by Mullard Engineers to produce unequalled performance in every type of valve operation by completely utilising the vast energy of this master P.M. Filament to the best advantage in each case.

The result of this special P.M. construction and design is that a series of P.M. Valves has been produced from which, no matter what type of circuit you employ, positively pure and powerful amplification is assured from the first to the last stage, culminating in a final reproduction that is a delight and a revelation.

Consult your radio dealer to-day about the correct Mullard P.M. Valves for your receiver.

For 2-volt accumulator

P.M.1 H.F. 0·1 amp. 14/-
P.M.1 L.F. 0·1 amp. 14/-
P.M.1A (Resist. Capacity) 0·1 amp. 14/-
P.M.2 (Power) 0·15 amp. 18/6

For 4-volt accumulator or 3 dry cells

P.M.3 (General Purpose) 0·1 amp. 14/-
P.M.3A (Resist. Capacity) 0·1 amp. 14/-
P.M.4 (Power) 0·1 amp. 18/6

For 6-volt accumulator or 4 dry cells

P.M.5X (General Purpose) 0·1 amp. 14/-
P.M.5B (Resist. Capacity) 0·1 amp. 14/-
P.M.6 (Power) 0·1 amp. 18/6

Super power valves for last L.F. Stage

P.M.254 (4 volts, 0·25 amp.) 22/6
P.M.256 (6 volts, 0·25 amp). 22/6

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Each musical instrument retains its characteristics, each voice its individuality. There is no unnatural accentuation of the treble, no deliberate emphasis of the bass, no artificial "sharpness" or "mellowness" in the new AMPLION CONE SPEAKER —just a natural rendering of notes and tones.

CONE AMPLION SPEAKER

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- An *adjustable* unit of improved type, remarkably sensitive and efficient, yet robust.
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Announcement of Graham Amplion Limited, 25, Savile Row, London, W.1.

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