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Vol. IV.] JUNE 12, 1926 [No. 3

THE IDEAL WEEKLY FOR THE HOME CONSTRUCTOR

IN THIS ISSUE:

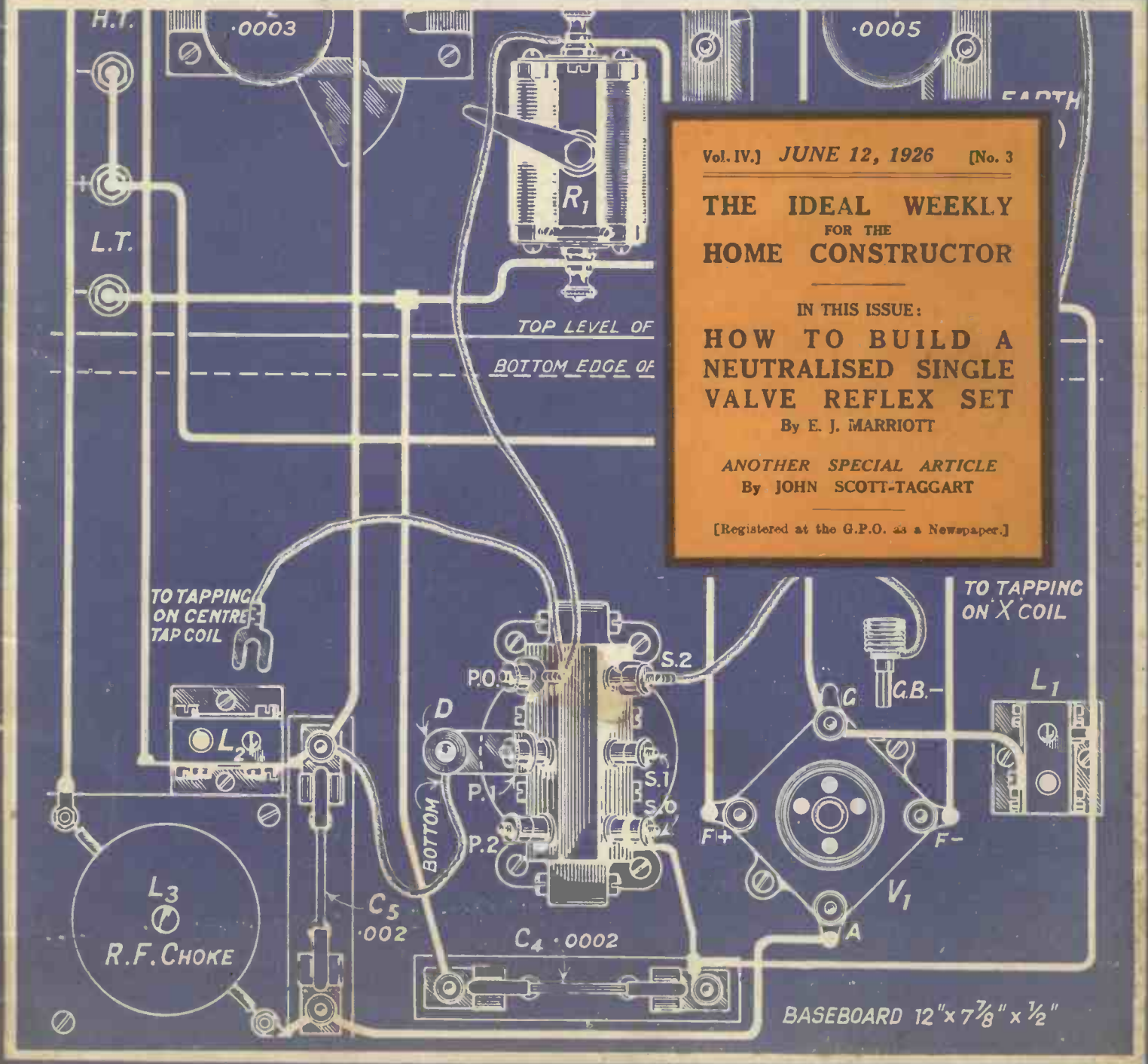
HOW TO BUILD A NEUTRALISED SINGLE VALVE REFLEX SET

By E. J. MARRIOTT

ANOTHER SPECIAL ARTICLE

By JOHN SCOTT-TAGGART

[Registered at the G.P.O. as a Newspaper.]



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£200

IF YOU ARE

"Let's see—five separate units give five capacities, taken singly. Then I can have the first two in series or parallel—total seven. Then the first three all in series or all in parallel—two more. The first and third and second and third in series, total 9. Ditto, in parallel, 11. First and second in series, and in parallel with the third—12 .... And the total number of different capacities with the five units is ———?" What is it?

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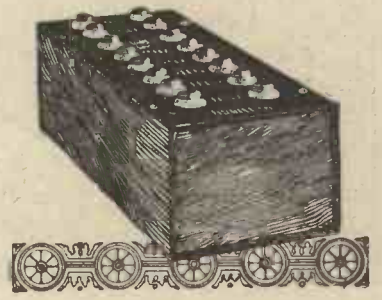
In addition, the purchase of a Dubilicon entitles you to enter for the £200 prize competition. All you have to do is to estimate the number of different capacities you can get by connecting up the first five units in various ways.

Ask your dealer about one to-day—and mind you enter for the £200 competition! He will tell you all about it!

The Dubilicon



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WIRELESS
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THIS WEEK'S NOTES AND NEWS

Those "Editorials"!

WHAT is *your* opinion about the B.B.C. "editorials" that have been causing such a controversy in the Press of late? Although many listeners have taken exception to this broadcasting of possibly controversial matters, an almost equally large number have expressed their appreciation of them. Incidentally, there is no truth in the rumour that these talks are to cease, although we are to have fewer talks in future. The 9.40 p.m. talks will be shorter and of topical interest and the 7.40 talks will be optional, and in many cases cut out completely.

Some Coming Events

ON June 18 the B.B.C. is giving us a relay by the National Union of School Orchestras, at the Crystal Palace. We shall have an interesting chance to see what the acoustics of that building are like, as heard via radio. Some of the numbers will be performed by the full orchestra of 4,000 performers.

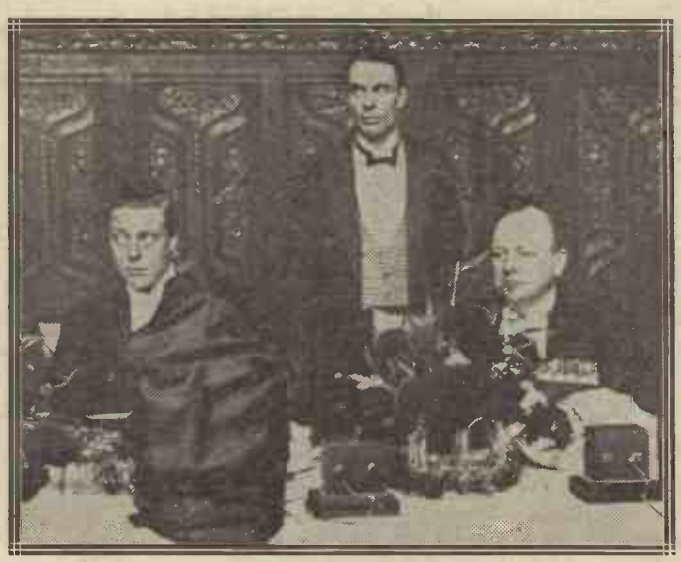
On June 20 the service at Lincoln Cathedral will be broadcast, with an address by Archdeacon Blackie, Canon and Precentor of the Cathedral and Chaplain to the King.

A New Instrument

I DON'T think it can be very often that the B.B.C. has a chance of broadcasting a new instrument, but we are promised one for June 16, when Mr. Jan Wien is giving a performance on the "zither banjo" in the Edinburgh studio.

The Nightingale

THE recent broadcasting of the nightingale has moved a listener in Prague to write and thank the B.B.C. for their excellent transmission of a song which would otherwise never be heard in Czecho-Slovakia. He says that this wonderful event will be a lasting impression for his whole life. The B.B.C. are indeed building up international relations!



On the occasion of the banquet to the Parliamentary Commercial Conference at the House of Lords the speeches were broadcast from the House for the first time. One microphone may be seen on the table between H.R.H. the Prince of Wales and Mr. Winston Churchill (right).

Mutiny Calling!

A "MUTINY SOS" was recently picked up off Rangoon, when the crew of the *Krishna* lightship mutinied and refused to "light up." A later outgoing vessel reported, however, that all was apparently in order again, as the lights were burning. Shall we have to devise a special signal to mean "mutiny on board"?

Good Amateur Work

AN excellent feat fell to the lot of two amateurs recently, when an Australian relayed a message from Mr. Bruce to Mr. Baldwin without an intermediate step between Australia and this country. The two stations concerned were A-3BD, operated by Mr. Earle Cox, of Melbourne, and G-2WY, worked at Tulse Hill, London, by Mr. H. J. Swift.

More New Features

AS an experiment, serial stories by popular authors are to be broadcast, each story running over several evenings. The French talks will in future take the form of dialogues suitable for tourists. I should think French listeners might derive considerable amusement from items like this!

Belgian Enterprise

"RADIO BELGIQUE" has always been notable for its excellent programmes, and I hear that still further improvements are under way. The literary section is to be extended, and comedies, farces and monologues, specially written for broadcasting, will be given on Mondays. The first of these entertainments, which will last for two hours, is dedicated to "Waterloo," and will be broadcast on June 18.

Those "Loud" Speakers

SEVERAL letters have recently appeared in the daily Press from people who are blessed with neighbours

This Week's Notes and News—*continued*

who keep their loud-speakers going till the end of the programme every night, the noise therefrom preventing them from getting any sleep until after midnight. I am blessed with a neighbour of this description, too. Nothing but a thunderstorm will stop the appalling row from his so-called loud-speaker. Sometimes I am sorely tempted to get out of bed and start up an oscillation campaign. Why must people fill the whole house (to say nothing of their neighbours' houses) with noise before they can enjoy the programme?

In the Future

"NOW, as you will see from the diagram you have just received . . ." This, according to a contemporary, is what we may expect in a typical wireless talk of the future. We shall derive considerably more fun when we listen to the amateurs on Sunday mornings before breakfast. I have heard several of them announce that they were still in the "pyjama" stage at 11 a.m.!

Sweden's 5XX

SWEDEN'S first big broadcasting station, I hear, is to be a replica of Daventry, and is being equipped by the Marconi Company.

A New One!

A DAILY paper has the headline "Measuring Waves in Kilocycles." Truly the advance of science is wonderful. When I was a boy they used to measure *frequencies* in kilocycles!

When Baby Came

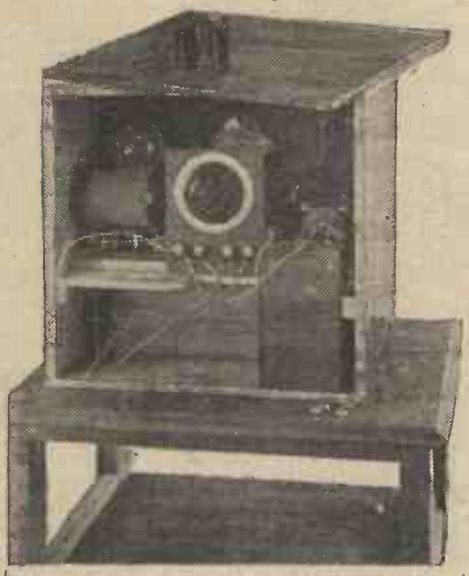
THE first wireless prosecution in Swansea took place recently, and the defendant explained that he was thinking of getting a licence when baby arrived, and he had never used the set since! Wireless hasn't learnt to hold its own yet.

". . . . Calling!"

I SEE that, as an outcome of a meeting and discussion, a plan is on foot to establish an "All-Welsh" broadcasting station. This may be a laudable object, but where is the Society for Prevention of Cruelty to Microphones?

Wireless and Clubs

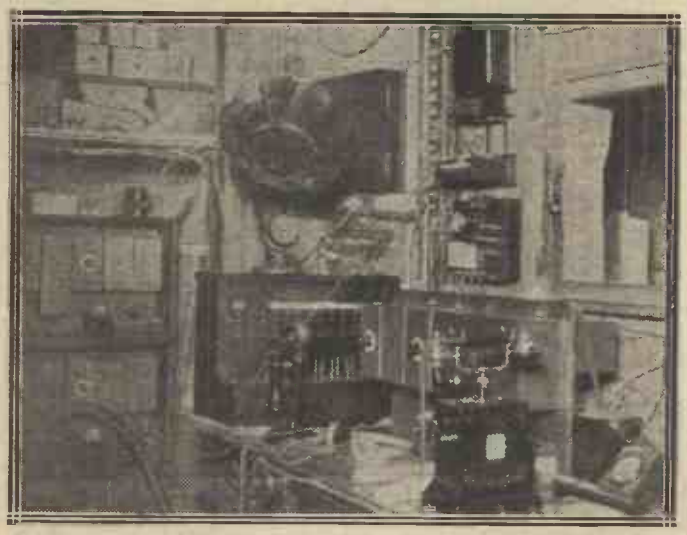
I WAS rather surprised to learn that wireless attracts very few members of West End clubs. The Athenæum installed a receiver and loud-speaker during the strike, but both have now been removed to a basement corridor and are hardly ever used. The R.A.C. also installed a set a short time ago, but members are very little interested, and most of the other West End clubs find the same. They surely want a few local oscillators to liven things up a little!



A completely screened oscillator used at the "Wireless" laboratories as a source of artificial signals for accurate testing work.

Where Listeners Score!

DURING the broadcasting of the speeches from the House of Lords on May 26 one of the "local" microphones went out of action, so that, though outside listeners heard the speeches perfectly, those actually present, but a long distance from the speakers, did not hear them properly! The acoustic properties of the Royal Gallery are notably poor, so that on this occasion listeners via ether certainly did come off best.



When the broadcasting service was opened in Britain, Newcastle was one of the first stations to achieve good long-distance results.

Removing Sets

I WONDER how many licence-holders realise that they are allowed to move their set to another address if they require to do so, provided that the period during which it is worked at this other address is reasonably short. "If the apparatus is to be used more or less regularly at the second address or a permanent aerial erected there, it will be necessary to obtain a separate licence for that address" is the actual wording of the clause.

Wireless Value

A MAGISTRATE, in imposing a fine of £7 on a "pirate," said that a wireless licence for 10s. a year was "the world's best value." Hear, hear!

Aeroplanes and Wireless

THE way in which wireless becomes a necessity instead of a luxury is shown by the fact that an aeroplane on the cross-channel route, reported missing recently, has not yet been traced on account of the fact that it was not equipped with wireless, otherwise the pilot would have been able to establish communication with one of the many coast stations.

Billy Bennett's Fee

I HEAR that Mr. Billy Bennett, who was heard via 2LO on the occasion of the Royal Variety Performance, has turned down an offer made by the B.B.C., although it works out at the rate of about £1 a minute. He said he considered the offer "quite inadequate" in the circumstances. He goes on a world tour next week.

Short-Wave Wireless

A RATHER amusing difficulty is said to have cropped up with high-power transmitters working on short waves. If signals are to be automatically recorded, say, in Australia, a power of about 50 kw. is usually employed at this end; with powers of this order, however, the emitted wave is so extremely strong that it is not content with travelling once round the world, but is alleged to keep on until it is "worn out." Thus when one of the big short-wave stations in Great Britain sends a single dot, in Australia they might receive one loud "dot," with about half a dozen weaker "echoes" produced by dots which had been lapping the globe.

CALL-SIGN.

NEUTRALISING THE SINGLE VALVE REFLEX CIRCUIT

By E. J. MARRIOTT

Have you ever constructed a single valve reflex receiver? The results obtainable with this set, as the official test report shows, are really creditable when it is recalled that only one valve is employed.

FOR some time past the writer has been experimenting with various types of reflex circuits in an endeavour to produce a single-valve receiver, capable of satisfying his own personal wishes for loud-speaking on the local station, and which would be very simple to control so far as self-oscillation is concerned.

The Circuit

Bearing the above points in mind, the circuit shown in Fig. 1 was finally decided on.

It will be seen that the aerial is auto-coupled to the grid coil L_1, which in this case is a Lissen X coil. In the anode circuit of the valve V_1, an H.F. choke is connected in order to prevent the amplified H.F. currents from passing through the H.T. battery, and these currents take the alternative path offered, *via* the fixed condenser C_5 to the tuned circuit L_2 C_2, and so back to the filament.

Across half the anode coil L_2 is connected a crystal detector and the primary (T_1) of an L.F. transformer (T_1 T_2), the secondary winding of which, connected in the grid circuit, passes back the rectified currents for amplification at low frequency.

The radio frequency choke L_3 will not, of course, prevent the amplified L.F. currents from passing, and these currents will therefore flow through the telephones or loud-speaker, as the case may be. The fixed condenser C_5 will prevent the batteries from being short-circuited, and also prevents the L.F. currents from passing through that part of the circuit.

Grid Bias

It will be observed that a grid-bias battery (G.B.) is incorporated in order that the valve shall function as an amplifier under the most effective conditions, and also that distortion shall be minimised.

Oscillation Control

Regarding stability and oscillation control, these have been obtained in the following manner:—Fig. 1 shows that the electrical centre of the coil L_2 is joined to the negative filament leg of the valve, while the anode is connected *via* the fixed condenser C_5 to one end of L_2, the other end of the same coil being connected through a very small variable condenser to the grid of the valve.

The Official Test Report by the "Wireless" Laboratories at Elstree.

The selectivity of this receiver is good, Bournemouth being received practically clear of London.

The valves which appeared to best suit the instrument were those of the D.E.5, B.4, D.F.A.4 types, general purpose valves of both bright and dull emitter types were also tried with fair success.

London was heard at good loud-speaker strength, the reproduction being very good.

Other stations heard on the phones were:—Dortmund (?), Hanover, Dublin, Glasgow, Daventry, Nottingham, Bournemouth, Breslau (?), Birmingham.

A useful feature regarding this scheme is that not only can self-oscillation be checked by adjustments of the condenser C_3, but when certain valves which may be in use exhibit no tendency towards self-oscillation, this condenser offers a means of obtaining reaction.

Both the transformer secondary (T_2) and the grid-bias battery G.B. are shunted by a fixed condenser of .0002 capacity in order to by-pass the H.F. currents passing through that part of the circuit.

The Detector

It will be appreciated from the theoretical circuit that the H.T. feed to the anode of the valve does not pass through the crystal detector. In this manner the detector, which in this case is one of the semi-permanent types, does not tend to become insensitive, and actually can be left for very long periods without readjustment.

A good idea of the general appearance of the completed receiver may be gathered from the photographs accompanying this article. It will be seen that it is reasonably compact, whilst the panel layout is symmetrical.

Components Required

In order to duplicate the receiver described you will require the following components, and it may be observed here that a number of the actual items mentioned may be substituted by others of good quality.

It must be remembered, however, that in reflex and other more or less unusual circuits an unsuitable change in one of the more important components may have quite an appreciable effect upon the results obtained:—

Ebonite panel, 12 in. by 8 in. by ¼ in. (Trelleborg).

Cabinet to take above panel with a baseboard 7½ in. deep.

One .0005 variable (slow-motion type) square law condenser (Ormond Engineering Co., Ltd.).

One .0003 variable (slow-motion type) square law condenser (Ormond Engineering Co., Ltd.).

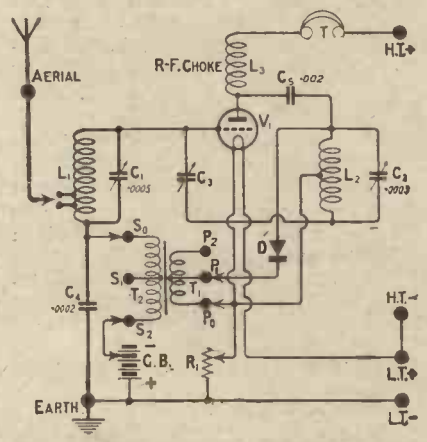


Fig. 1.—From this circuit diagram it will be seen that the transformer is of the tapped variety.

One .0002 clip-in condenser, with mount (L. McMichael, Ltd.).

One .002 clip-in condenser, with mount (L. McMichael, Ltd.).

(*Continued on page 78.*)

NEUTRALISING THE SINGLE-VALVE, Etc.—(*continued from p. 77*)

One "Midget" variable condenser (Peto-Scott Co., Ltd.).

One dual filament rheostat "Efesca" (Falk-Stadelmann & Co., Ltd.).

One P.M. detector (with clips) (Radio Instruments, Ltd.).

One "Multi-Ratio" L.F. transformer (Radio Instruments, Ltd.).

One anti-microphonic valve holder (Benjamin Electric, Ltd.).

Two board-mounting coil holders.

One "Success" H.F. choke (Beard & Fitch, Ltd.).

Eight brass terminals.

No. 16 "Glazite," for wiring up.

Short length of flex, with four spade terminals, two wander plugs, and wood screws, etc.

Radio Press Panel Transfers.

In addition to the above you will require a No. 60 centre-tapped coil for the normal broadcasting band and a No. 250 centre-tapped coil for 5XX, besides X coils to cover these bands.

Those used in the receiver described were obtained from Messrs. Lissen, Ltd.

Actual Construction

Having procured all the necessary components, you may proceed with the constructional work in accordance with the instructions given in the drawing of the panel layout.

Having completed the drilling, place the baseboard in the cabinet with the panel resting against it in the correct position, and fix the two together by means of the wood screws.

The whole can now be withdrawn from the cabinet, and the various components affixed in position on the panel. Those components to be carried by the baseboard should now be screwed down in the positions shown, omitting the L.F. transformer for the present.

Regarding the baseboard components, let me emphasise the fact that their positions should be as near as possible to those shown in the diagram, otherwise the final results may suffer.

Wiring Up

Before finally fixing the L.F. transformer to the baseboard, the wires which join to the filament rheostat should be fixed in position, as later on the lack of space would make this a difficult matter to accomplish.

It will be observed from the photograph that the detector is mounted directly on to one of the L.F. transformer terminals by means of the short piece of brass in which two holes have been drilled.

Checking

After completing the wiring, it should be checked over very carefully against the wiring diagram, and the L.T. circuits should be tested in the following manner:—Connect up your accumulator battery to the correct terminals, and make sure that the valve, when inserted in its holder, is correctly controlled by the rheostat.

Testing Out

Join up the batteries to their correct terminals, and plug in about 80 volts H.T., with about 3 volts grid bias. (It will be found that there is room in the cabinet, at the back of the baseboard, for a small 9-volt grid bias battery.)

Adjust the crystal detector, and with the aerial and earth connected, insert a No. 60 X coil in the holder for L_1, and a No. 60 centre-tapped coil in the socket for L_2, the flex lead from the aerial terminal being secured to one of the X coil tappings, whilst the flex lead from the P.O. terminal on the L.F. transformer must be affixed to the centre tapping on L_2.

Connect up the telephones, and, after lighting the valve to its correct brilliancy, and setting the "Midget" condenser to its zero position (that is, with the plates separated), adjust the grid tuning condenser to a low value—say, 30 deg. on the scale.

Now, if the anode condenser C_2 is turned slowly from minimum to maximum capacity, with some types of valve—the D.E.5 type, for instance—it will be found that self-oscillation takes place when the two circuits are in tune.

This will be indicated in the 'phones by a definite click on entering and emerging from the oscillatory state.

A slight adjustment of the "Midget" condenser C_3 will stop this self-oscillation, and when the correct position for C_3 has been found the set can be tested for actual reception.

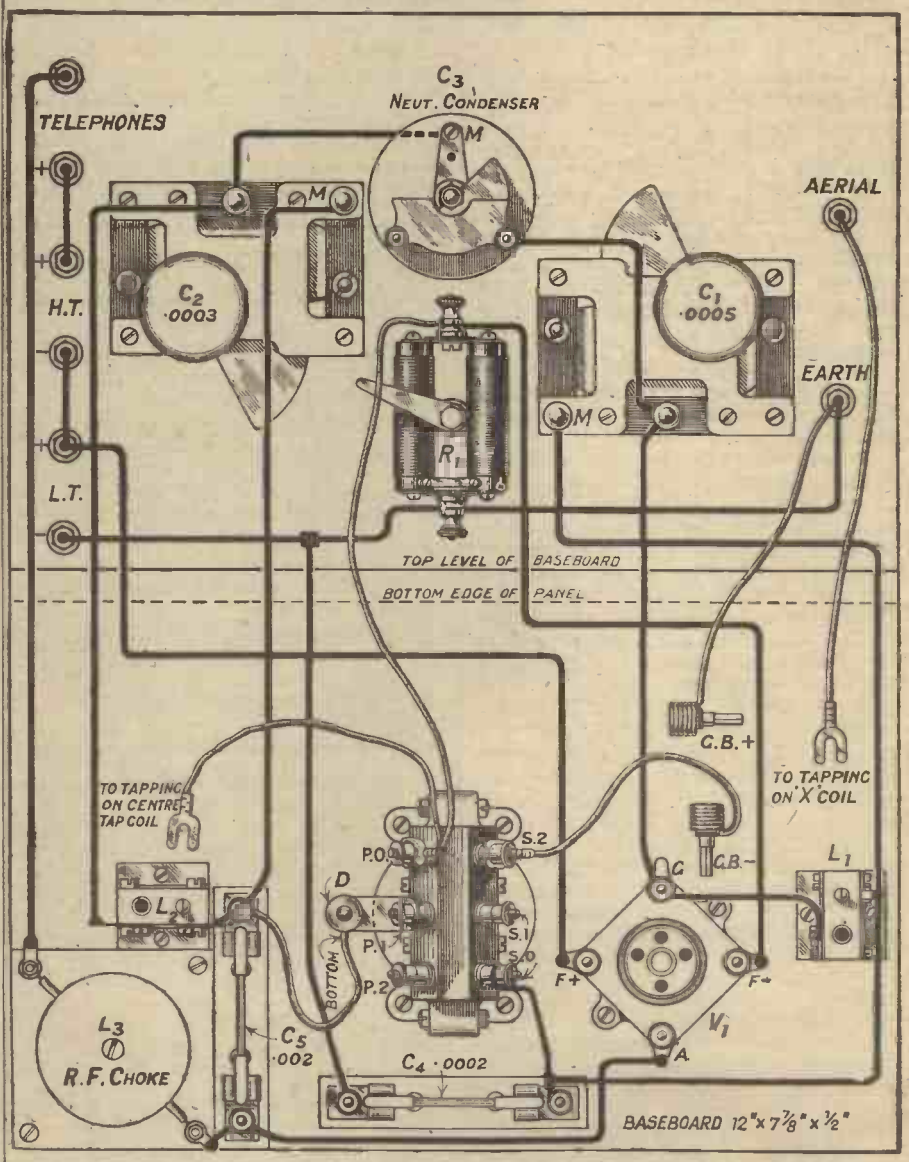


Fig. 2.—The semi-permanent crystal detector marked D is attached to the transformer primary terminal by means of a small angle bracket.

Actual Reception

To tune in the local station, it will be necessary to adjust both the condensers C_1 and C_2 quite slowly, keeping both these circuits in tune with each

(*Continued on page 79.*)

other as nearly as possible, and, if you are situated within, say, ten miles of a main station, signals will be heard very strongly in the telephones.

The detector can now be adjusted very carefully to its best contact, and then left alone, a slight final adjustment possibly being needed on the "Midget" condenser for best results.

Should the valve in use not oscillate when C_3 is at its minimum position, it will be found that increasing the value of this condenser will give a reaction effect, which operation should, however, be very carefully carried out in order that it is not carried to excess.

For the reception of Daventry, it is merely necessary to replace the coils in use by others of a suitable size. A No. 250 X coil for L_1, and a No. 250 centre-tapped coil for L_2, are usually quite O.K.

Valves

Although several different types of valve will give good results with this receiver, the loudest signals are obtained when use is made of a small power valve, such as the D.E.5, P.M.4, etc., with a high value of H.T. applied to its anode, together with a suitable grid bias.

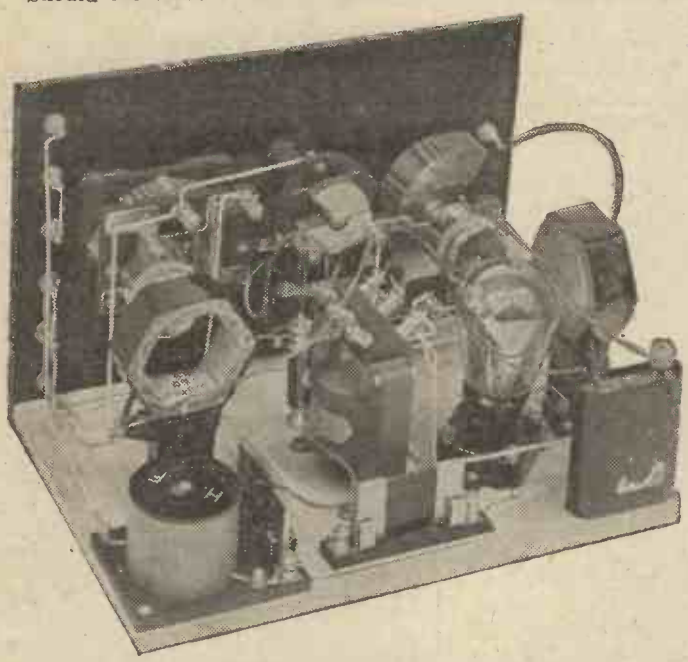
Useful Tips

Some of the main points to remember when operating this receiver are given below:

Do not continually alter the crystal contact in the hope of improving results. This may cause self-oscillation, with consequent interference to neighbouring listeners.

If the receiver oscillates, it can be easily and quickly stopped by a slight adjustment on the "Midget" condenser.

Should the valve in use exhibit no tendency to oscillate with C_3 at a minimum, then this condenser can be used to increase signal strength.



The grid-bias battery is housed within the cabinet, and may be seen on the extreme right in this photograph.

Neutralising the Single-Valve Reflex Circuit

(Continued from page 78)

Use as high an H.T. value as is permissible with the valve in use, together with a suitable value of grid bias.

Do not work so near the oscillation point that signals become distorted.

Test Report

Tested on a mediocre aerial situated about four miles west of 2LO, that station was received at good loud-speaker strength, sufficiently loud to be enjoyed in comfort in a normal-sized room.

Daventry came in at good 'phone strength, and although this set was primarily designed for loud-speaker reception of the local station alone, a number of other stations were heard on the ordinary broadcast band at weak telephone strength.

'PHONES AND CRYSTALS

Many amateurs have an idea that the higher the resistance of the telephones used in a crystal set the greater will be the signal strength obtainable. I have known 'phones with a resistance as high as 8,000 or even 12,000 ohms employed in crystal circuits. And the results? Nothing like so good as they should have been. For the average "ite" crystal of to-day, telephones, to give the best results, should not have a greater resistance than 2,000 ohms, and often 1,000 will be found quite sufficient. If you have a pair of very high-resistance 'phones, and are not satisfied with your reception or your signal strength, you may find it worth while to try wiring the earpieces in parallel instead of in series. If the total resistance of the two in series is 8,000 ohms, you may take it that the resistance of each of them is approximately 4,000. This means that, if you wire them in parallel, the total resistance will be only 2,000 ohms. Similarly, a pair of 4,000 ohm telephones has a resistance of only about 1,000 ohms with the receivers in parallel. To make a pair of parallel leads, proceed as follows:—Cut off 3 yds. of flex that really is flexible. Untwist the wires for about 18 in. at one end. Mark one of them with a red binding. Prevent them from untwisting any further by binding them together with silk or thread, so as to form a "Y." Quite close to the junction of the two arms scrape off the insulation of the wire tagged with red. Bare the ends of another piece of flex about 18 in. long, and twist its strands round those exposed near the junction of the "Y." Apply a little solder, seeing that it runs well into the strands. Cover the joint with insulating tape, bare the free end of the wire that you have soldered on, and tag with red. Treat the other arm of the "Y" in the same way, tagging in both cases with black. Now connect the two red-tagged leads to the positive terminals of the receivers, and the black ones to the others.

R. W. H.

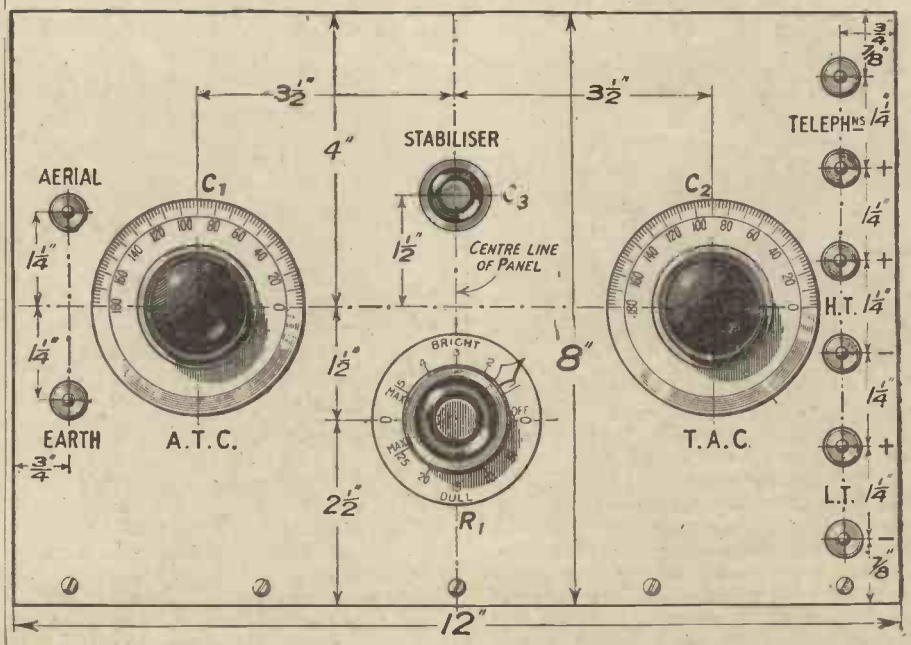


Fig. 3.—All necessary terminals are on the front of the panel.

THE TRUTH ABOUT REACTION

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

Do you understand the real purpose of reaction? This interesting article shows that the correct use of reaction deserves greater consideration than it often receives.

WHETHER we like it or not, reaction still remains one of the most potent weapons in the armoury of the radio amateur. It often makes just the difference between successful reception and the reverse, while there are occasions when the use of reaction control is indispensable to satisfactory reception.

Exceptions

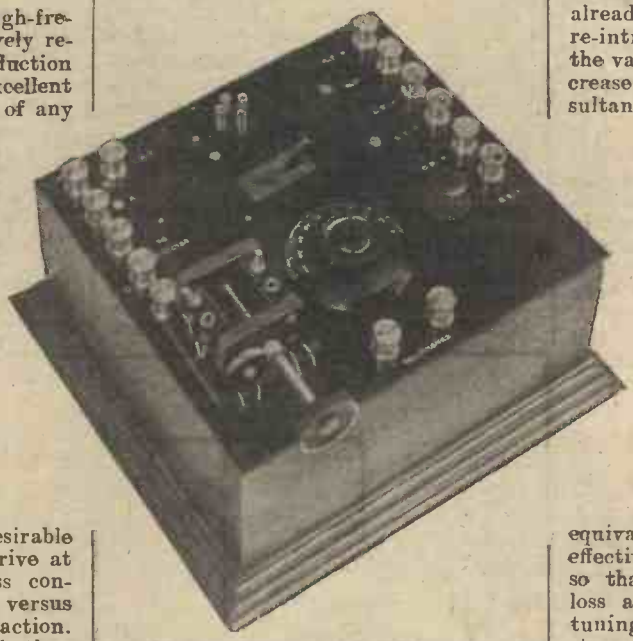
True, the development of high-frequency amplification comparatively recently has resulted in the production of receivers which will give excellent signal strength without the use of any reaction control, and from the point of view of convenience of operation, this is a point which has much to commend it. Such circuits, however, are rather exceptional, at any rate in the present state of development.

When it is Desirable

As far as simpler circuits are concerned, such as the single valve, or two-valve receiver, a receiver here without reaction is hardly ever encountered, and would be of little use for DX work. Granted, therefore, that a reaction control of some sort is, to say the least of it, very desirable in the majority of cases, we arrive at the old controversy of low-loss construction with no reaction, versus ordinary construction and reaction. If we are to use reaction at all, then why worry about specially low-loss coils?

Advantages of Low-loss

This problem has been discussed on many occasions, and has been the subject of considerable research. It is now generally agreed that there is a definite advantage in the use of low-loss coils in the first place, the final signal strength obtainable with full reaction being somewhat greater than with a coil initially having a higher resistance. Moreover, there is the effect which I described some time ago in *Wireless Weekly*, known as the Schrott effect, which shows that there is a critical limit below which an ordinary high-frequency valve will not amplify. If real DX is to be accomplished therefore, it is essential to employ a low-loss construction for the first tuned circuit of the receiver in order that the highest possible voltage may be applied across the grid and filament of the valve. Reaction has no appreciable influence on this critical limit, which is entirely due to the uneven emission of electrons from the filament.



"As far as simple circuits are concerned, such as a single valve, or a two-valve receiver, a set without reaction is hardly ever encountered."

Reaction Also Needed

These arguments, however, showing that it does pay to take trouble in making low-loss coils for the receiver, do not suggest that the use of reaction is unnecessary. The contrary is distinctly the case, and a marked improvement in the results can be obtained by the judicious use of reaction. Apart from the increase in the signal strength by the ordinary means there are other reasons for the use of a reaction adjustment.

Selectivity

It is well known that reaction increases both the signal strength and the selectivity of the circuit. This is generally explained by saying that the effective resistance of the circuit has been reduced. In a reaction circuit a small portion of the energy which has already been amplified by the valve is re-introduced into the grid circuit of the valve, where it causes a further increase in the amplification. The resultant effect of this is that the final current in the circuit (that is to say the signal strength) obtained from a given signal applied to the aerial is greater with reaction than without.

A Useful Relation

The current in a circuit is obtained by dividing the voltage applied by the resistance of the circuit so that the smaller the resistance the larger the current. If, therefore, the current is increased, then the resistance in the circuit must have been reduced. For this reason reaction is usually regarded as equivalent to a reduction in the effective resistance of the circuit, so that it behaves as a very low-loss arrangement, having very sharp tuning, and an increased signal strength. This conception of the action serves for the majority of instances, and explains many of the phenomena which are observed.

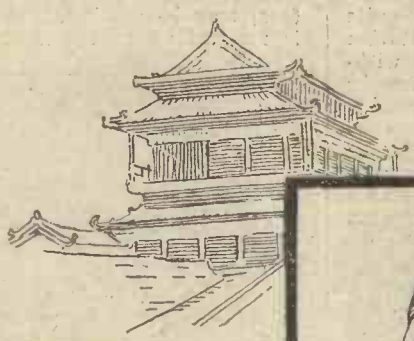
A Curious Phenomenon

There is another aspect of the question, however, which is often neglected and which throws considerable light upon the problem. Practical experience indicates that the results obtained by means of reaction are greater than one would imagine from the ordinary sharpening of the tuning. In particular the selectivity

(*Continued on page* 82.)

The Chinese have a proverb which says—

"One picture is worth more than ten thousand words"



TYPES AND PRICES:

RED TOP. For H.F. use 1·8 volts ·1 amp. 15/6

PLAIN TOP. For Detector 1·8 volts ·1 amp. 15/6

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EXAMINE closely this illustration of the new Cossor Point One. Observe particularly the seonite insulator at the top of the Anode—the key to the successful solution of the old problem of truly Co-axial Mounting. Week by week we shall unfold the story of this—one of the most remarkable contributions yet made to the Science of Radio.

The new Cossor Point One

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

Gilbert Ad. 5270

The Truth About Reaction—*continued*

can often be increased in quite remarkable fashion, and a station which is heavily interfered with without the reaction adjustment can be received quite clear when the reaction is correctly adjusted. This is sometimes so marked that one rather doubts whether it is due entirely to a reduction in the effective resistance of the circuit, and a consequent sharpening of the tune.

An Explanation

As a matter of fact there is a little more in it than this. Capt. Round has suggested that the tuning-in of any given station free of jamming from near-by stations is very largely dependent upon the relative strengths of the carrier waves of the two stations. By the ordinary process of tuning the signal strength of the interfering station is reduced, and that of the distant station is increased. If the current produced in the receiver by the carrier wave of the distant station is stronger than that of the local station, then Capt. Round's theory is that the local station will be swamped by the distant station, and perfectly clear and uninterrupted reception will result.

Practical results appear to confirm this theory very well indeed. As long as the carrier current produced by the local station (reduced though it may be by the process of tuning) remains greater in strength than that of the distant station, then interference will occur. As soon as we succeed by careful and accurate tuning in increasing the strength of the current produced by the distant carrier wave above that of the local station, then the interference suddenly vanishes, and clear reception results.

A Useful Effect

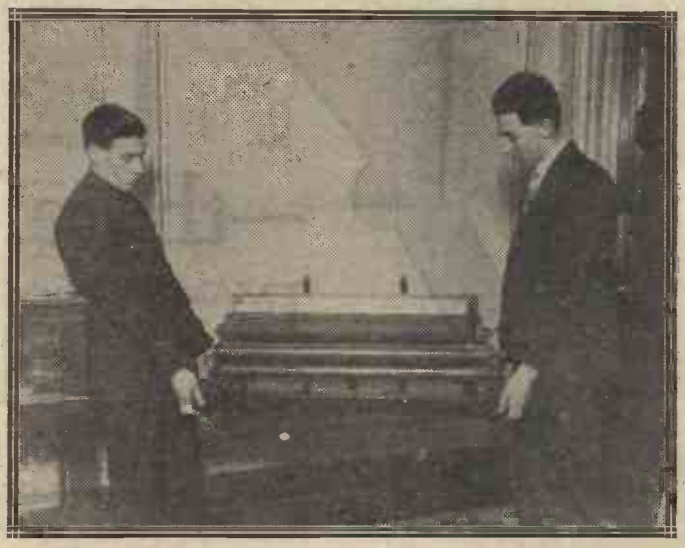
Now, the application of reaction to a tuned circuit assists us considerably in this attempt. The energy which is fed back from the anode to the grid circuit of the reaction valve is only obtained at the particular frequency to which the circuit is tuned. When the circuit is correctly adjusted, this frequency is that of the carrier wave of the incoming station, and subsequently the energy re-introduced into the circuit, which is at this frequency, will produce an effect equivalent to the strengthening of the carrier wave of the particular station required. This process, therefore, may be continued until a point is reached where the local station is swamped, as just described, and clear reception results.

"The development of high-frequency amplification comparatively recently has resulted in the production of receivers which will give excellent signal strength without the use of reaction."

Distortion

It may be that before this state of affairs is reached the carrier current of the distant station has to be increased so much by the application of reaction that considerable distortion results. In fact this is very often found to be the case, and in such circumstances the only remedy is to introduce some further tuned circuits into the receiver in order to increase the natural selectivity, as we term it, before this reaction effect is allowed to come into play. There is a great deal more than appears on the surface in the question of obtaining selective results consistent with good reproduction, but it will be clear from this aspect of reaction that, if judiciously handled, it is capable of giving considerably increased selectivity without necessarily causing serious distortion.

HISTORIC APPARATUS



The rapid strides that have been made in the science of wireless will be very apparent when it is realised that this early instrument for determining wavelengths weighs nearly ½-cwt.

CLEANLINESS IN SOLDERING

The beginner at constructional work is very often mystified when he first attempts soldering, to find that he simply cannot make his joints stick. His expert friends will tell him it is quite easy, and proceed to prove this by a demonstration.

The Secret

The secret lies in cleanliness. Unless both the soldering iron and the points to be soldered are absolutely clean, it is useless attempting to make a proper joint. Before commencing work, the iron must be tinned. First file the iron bright, removing all pits, and heat it until green flames just appear.

Now rub the point in some flux and pieces of solder contained in a tin lid. The iron will then take on a smooth coating of solder.

All shanks of terminals and other points to have wires attached should be filed bright, rubbed over with a little flux, and given a coating of solder.

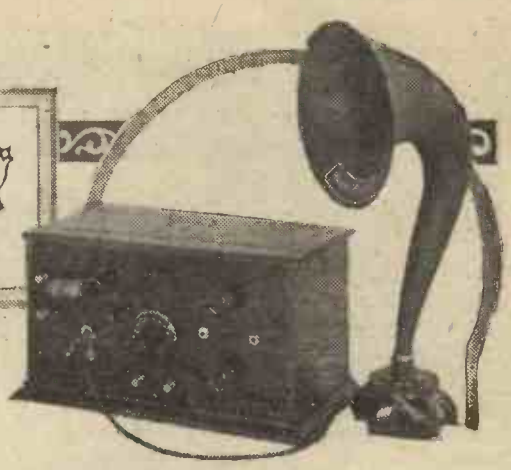
□ □ □

FOR SCOTS.

TO-MORROW, June 10, the buglers, pipers and drummers of the Scots Guards will take part in the programme of famous regimental marches of the British Army which is to be broadcast from all stations. Descriptive notes by Mr. Walter Wood will introduce the various marches.

"MY SET HAS DEVELOPED HAILSTORMS!"

BY A TEST-ROOM ASSISTANT



Are you troubled with "crackling" noises in your receiver? Do not put them all down to atmospherics, it may be your L.F. transformer at fault.

"UNTIL recently my receiver worked well, but during the last fortnight intermittent crashings and grindings have quite spoiled my reception. So violent is the noise at times that it is like atmospherics 'gone mad.' or a hailstorm outside." During one week's work in the test-room I once had to deal with two similar cases to that mentioned above, which leads me to think that such trouble is more prone to be met with than it should be. Usually the fault is due to an intermittent break in the primary winding of the L.F. transformer, and this is not confined to the cheaper types only, since even the more expensive makes are sometimes prone to such failures after a long period of continual use. It is not in my province to go into the reason for breakdowns, and in fact the experts are not altogether agreed as to the cause. I will devote attention, therefore, to the tracing and remedying of the trouble.

Systematic Searching

Following the procedure which is always to be advised, localise the fault to the associated circuits of one valve. This is done in the case of the Fig. 2 circuit by disconnecting the two leads to the primary winding T1 of the L.F. transformer and by joining these leads to a pair of telephones, it being assumed, of course, that the usual tests of replacing the H.T. battery and determining whether any given lead is loose by moving each lead in turn, when listening on telephones with the aerial and earth disconnected, have been tried. If the crackling ceases a breakdown in the primary wiring of the L.F. transformer is most likely responsible.

Testing the Transformer

Application of the well-known telephones and battery test, which is carried out by joining a pair of 'phones and a small battery in series to one primary terminal, whilst tapping the other with the free telephone tag, does not always give a definite indication of the fault. Where the failure is of

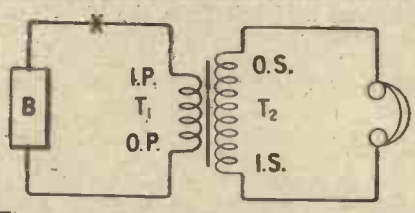


Fig. 1.—With the transformer connected like this, slight cracklings may be heard in the telephones if the primary is defective.

intermittent nature a "listening" test should be carried out, it being ascertained first that the battery and telephones are in themselves silent.

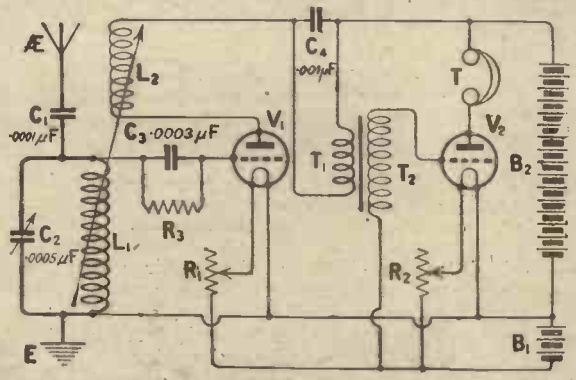


Fig. 2.—By disconnecting the leads to T1 and connecting in its place the telephones T, cracklings should not be heard if the fault is in the L.F. transformer.

For this test I would recommend that a four- or six-volt accumulator be employed and you should listen with the 'phones across the battery for a minute or so before proceeding further. If perfect silence is maintained obviously the battery and the telephones can be relied on and you should then connect up as shown in Fig. 1, where the battery is connected across the primary winding and the telephones across the secondary. Listen carefully in a quiet room, and if the slightest suspicion of crackling is heard it is likely that the primary winding is defective.

Insulation Testing

Another fault in an L.F. transformer which will give rise to noisiness is a breakdown of the insulation between windings, and in this case the telephones and battery in series should be connected between one terminal of the primary and one of the secondary winding respectively, and listening should be carried out, as before explained, in a quiet room. Crackling indicates that the insulation is poor and the transformer should be changed.

Results of Practical Tests

The results of the "listening" test on a good transformer and on one with an intermittent break in the primary winding may be of interest and are given below.

With the good component the ordinary telephones and battery test applied across IP and OP, with the telephones in the positions marked X in Fig. 1, gave strong clicks both on making and breaking the circuit. With the "dud" transformer, however, faint clicks were obtained only on making and not upon breaking. Listening with the 'phones in series with the battery (in position X) very faint crackles could be heard in a quiet room.

With the telephones connected across the secondary whilst making and breaking the battery connected across the primary, strong clicks were obtained both upon make and upon break with the good component, but with the defective instrument clicks were heard upon the make only.

PRACTICAL TOPICS

By G. P. KENDALL, B.Sc., Assistant Editor

H.T. Battery Economy—A Lamentable Happening—A Rheostat Tip.

H.T. Economy

When a multi-valve set is in use with several tappings to the high-tension battery to apply varying voltages to the different groups of valves there is a considerable risk of the high-tension battery being run down unequally in different portions, and this is a point to which due attention should be paid by those who are anxious to obtain the maximum useful life from their batteries.

Suppose that the set is one with two high-frequency valves, detector, and two low-frequency stages: the two high-frequency valves and the detector will probably be given something in the neighbourhood of 60 volts, while the full available voltage will be applied to the other two valves. If the popular small power valves are used for the H.F. stages it is quite possible that these two valves will take, together with the detector, practically as much current as the two low-frequency valves, and therefore that part of the H.T. battery below 60 volts will be carrying twice the load of the part above that voltage. As regard remedies, these are somewhat difficult to apply when the battery consists of a single large unit, and for this reason alone it is regarded as good practice to use a number of smaller separate units, say, of 36 or 45 volts each, because they can be re-arranged every now and then so as to equalise the work done by each.

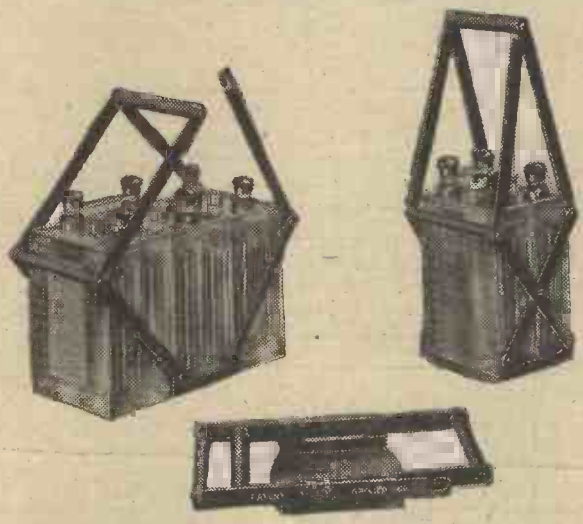
Separate Batteries

An alternative scheme which I personally favour strongly is to use an entirely separate battery for each group of valves, two batteries being used in the particular instance given, one for the H.F. and detector valves of, say, 60 volts, and the other of perhaps 108 or 120 volts to feed the two note magnifiers. This may seem a somewhat costly and even extravagant scheme, but in actual practice it works out quite otherwise. The increased life of the batteries which results from a more reasonable load upon each one amply justifies the additional first cost.

A Lamentable Happening

I once had a distressing experience with a neutralising condenser which seems to have a moral worthy of due emphasis. The condenser was of a type in which there was no provision definitely to prevent one plate from touching the other, and a sideway pressure upon the spindle was capable of producing this result. The circuit which I was testing was one of the kind in which one side of the neutralising condenser is connected to high-tension positive via certain windings, and the other to the grid circuit of the valve, and thus to the filament circuit. It will, therefore, be seen that if this condenser is shorted it completes a circuit from the high-tension battery with disastrous results.

This was actually what happened, and since I was using an accumulator high-tension battery the affair was somewhat spectacular. There was a small arc in the condenser, as the plates touched and separated, further fireworks denoting that the filament of the valve had gone, and a good deal of commotion in the high-tension battery.



Don't take risks when taking your battery for recharging; there are a number of excellent carrying crates on the market.

A Good Rule

Ever since that episode it has seemed to me wise to make it a definite rule that in all such circuits, when a neutralising condenser is used in which there is no definite provision to prevent a short circuit, a fixed condenser of suitable capacity should be inserted in series therewith. For example, if one puts in a fixed condenser of any size other than the very smallest, it will serve as an adequate safeguard, and have no effect upon the working of the set. Any convenient size, such as .0003, .0005, .001, or indeed almost any of the sizes likely to be in the hands of the experimenter, will serve.

A Rheostat Tip

Have you ever noticed that some filament rheostats appear to be capable of making a set noisy at all times, regardless of whether they are being manipulated or not? Some of them certainly do so, and are capable of being quite troublesome in a multi-valve set. Mere cleaning of the moving parts does not appear to remove the trouble, which appears to be the result of an unsatisfactory design which does not provide sufficient pressure upon the various parts in contact. A remedy which is sometimes adopted is to solder the ends of a short piece of flex directly to the moving finger and to the terminal of the component to which this should be connected by way of the various rubbing contacts. The contacts in question are thus short-circuited, but the remainder of the rheostat remains unaffected, so that it can continue to serve its usual purpose.

CORRESPONDENCE

Government Control

SIR,—I was very interested in Commander Kenworthy's article in WIRELESS dated May 22. I have also been interested in his talks from 2LO.

I am quite satisfied with the British Broadcasting Co. Personally, I do not think it would be advisable for "some Governments" to have control, if they should get in power.

I would suggest that a ballot should be taken of all licence-holders, and I am sure 75 per cent. at least would vote for the B.B.C. to carry on.—Yours faithfully,

S. V. LINDOP.

London, N.4.

SIR,—I have read Commander Kenworthy's article in WIRELESS dated May 22, and am in entire agreement with it. Personally, I can think of nothing more disastrous to the well-being of broadcasting than that it should become a government department, especially as we have had a sample of it in the "news" bulletins, or rather, propaganda, which have been issued during the recent strike, and I think I can safely predict an immediate slump in the number of licences taken out if such an event happens. Do the Government really think the British public will pay to hear such things as you point out in your article will assuredly occur?

Wishing him every success in his fight for the freedom, impartiality and neutrality of broadcasting.—Yours faithfully,

E. BARLOW.

Coventry.

Broadcast music, taken as a whole, calls for no special technique or adaptation apart from the placing of the instruments to secure the best tonal effects from the microphone.

THE TECHNIQUE OF WIRELESS AMUSEMENT

By C. CLAXTON TURNER

Humorous turns, whether presented in the form of monologues or songs, call very definitely for a special technique to render them suitable for broadcasting, and in this interesting article our contributor offers some valuable suggestions.

IT has been truly said that the average man finds it easier to criticise an omelette than to lay an egg, a truism that probably accounts for the major portion of the attempts at criticism of the entertainment offered by the wireless programmes of to-day. Although broadcasting is only three years of age, I believe that I am right in contending that it is the degree of development already achieved by it that has led the average listener to forget its youth and to resent bitterly the essential points at which there is still room for improvement.

Amusement

The most salient point in this regard is undeniably that which comprises general amusement. Broadcast music, whether of the classical or the popular type, calls for little or no special technique or adaptation beyond the normal requirements of music itself, with the possible reservation of slight adjustments in accordance with the tonal requirements of the microphone, and those are almost entirely a matter of mechanical rather than of artistic development.

Lectures need no special technique, for they rely entirely on the interesting nature of the matter broadcast; any item, however, that is broadcast purely for the purpose of amusing the generality of listeners must perforce be based upon a subtle technique of its own, and the only just criticism of that portion of the wireless programmes of to-day can be expressed in one sentence—"The technique of wireless amusement has not yet been discovered!" Let us regard, one by one, the various sections which comprise wireless amusement.

Monologues

We will first take dramatic monologues, because the fact that they demand no technique beyond that which is required for their successful delivery from an ordinary platform enables us to leave them at that.

To obtain a sympathetic response from his audience is difficult for the broadcast artist, who cannot even see the audience—sometimes a real deprivation!

Comedy monologues and humorous songs, on the other hand, call for a very definite kind of special technique to render them at all suitable for inclusion in a wireless programme.

Impelled in all probability by the necessarily hard task of providing a daily programme, there has hitherto been a tendency to broadcast comedy turns whose chief claims to inclusion in wireless programmes have lain in their success in some other sphere, plus the fact that their humour does not normally rely to any extent on the visual element, but that is far from being an adequate mode of selection.

Personality

The first requirement of any humorist on any stage is that he must contrive to rivet his audience's attention and interest from the start. It does not matter whether a comedian at a music hall is allowed five minutes or twenty in which to present his offering; his success really depends on his ability to make his watchers say within the first fifteen seconds: "Here's a funny fellow!" Even a funny make-up is not sufficient for this purpose, and a programme-description of him as a comedian or a bundle of fun is powerless to pull him through unless he himself can at once strike the right note of humour.

In wireless amusement, that necessity is a thousand degrees more essential. It is absolutely useless for an announcer to proclaim that Mr. So-and-So will now make us laugh unless the artiste is able to fulfil that promise without preamble.

Immediate Appeal

A comedian who can raise sundry smiles among his listeners during the course of his wireless turn is undeniably a clever fellow, but unless he can cause the majority of his listeners to recognise him as a sheer humorist as soon as he opens his mouth, he is

(*Continued on page 86.*)

THE TECHNIQUE OF WIRELESS AMUSEMENT

(Concluded from page 85)

lacking in the technique of wireless amusement. Until that technique is discovered and acquired, wireless amusement is doomed to disappoint the listening public.

A Wrong View

The injustice lies, however, in the proneness of the listening public to blame the B.B.C. because this technique is lacking, instead of recognising the fact that the fault lies at the door of the artistes whose duty it is to acquire the rudiments of this new branch of their profession.

The tendency of the average artiste is to regard a broadcasting engagement as being a sort of easily-earned addition to his yearly income, and for an artiste to attempt to adjust his offering to wireless requirements seems to be the exception rather than the rule.

A Recent Case

Only recently a comedienne permitted herself to conclude her broadcast item with a line to the effect that she hoped her audience was not bored, as in that case she could not hope to be encored! Such ineptitude could only arise from the assumption that her normal material was quite good enough, and that, anyway, she would not hear any complaints that might arise. It is just as essential to acquire special material for broadcasting as it is to discover and learn the special technique, and the comedian who hopes to gain lasting popularity in wireless by merely talking spasmodically without definite start or climax to his offering, and by casually carrying on until his allotted minutes have passed, is doomed to permanent relegation as soon as the right technique is discovered, even though he may be tolerated by better-natured listeners, *faute de mieux*, in the interim.

Twenty years ago, radio was looked upon as being solely for the scientific experimenter, and our photograph shows a very early type of transmitter which, although very simple when compared with a modern transmitter, was in those days looked upon as a really wonderful piece of apparatus.

Broadcast Plays

We now come to concerted amusement, in the form of playlets, sketches, and even plays, and I claim that what I have said about the individual artistes is even more true with regard to productions.

As long as would-be wireless playwrights continue their abortive attempts to adapt the technique of the theatre to the needs of broadcasting, so long will listeners await in vain the reception of enjoyable dramatic entertainment by wireless.

I am of opinion that the technique of wireless amusement, in all its branches, will prove to be as different from that of the stage as is water-polo different from the polo that is played at Ranelagh; and I contend that the first playwrights and artistes who succeed in developing a technique that is evolved for Radio instead of being a cheap distortion of the existing technique of some other form of entertainment will reap a rich reward that should satisfy the longings of even Mr. A. A. Milne.

In previous issues of "Wireless Weekly" some extremely popular features were those consisting of interviews with notable people. We are privileged this week in being able to give below an interview with "Wireless Wayfarer," who has very kindly answered his own questions!

I AM feeling at the moment just a teeny-weeny bit hipped. When you come to think it over it *is* a little bit rotten. All these other fellows are being interviewed, but so far nobody has come along to interview me. Under the persuasive influence of skilful questioning Mr. Bendall has shown us that he has quite a creditable knowledge of the doings of the aperiodic aerial; Mr. Brainer answered every one of the questions put to him about low-loss without the slightest hesitation; and others have been given an opportunity of letting them-

". . . He simply looked at me and shrugged his shoulders . . ."

selves go upon their pet subject in the same way. But what about me? You will hardly believe it when I tell you that on my suggesting (with an accompaniment of modest blushes) to Mr. Hercy Parris that I was quite ready to be interviewed, he simply looked at me, shrugged his shoulders, and murmured, "Oh, my giddy aunt." Jealous, I suppose. Things being as they are, and since it is obviously in the interests of wireless that I should be interviewed, I have decided to do the job myself.

Off We Go

Q.—Good morning, Mr. Wayfarer. I trust that I find you in the best of health.

A.—You do. Thanks to the little daily dose of manganese dioxide, extracted from a discarded high-tension battery, which I take, my inside is now completely depolarised, and I am simply full of volts and zip.

Q.—Are you continuing your splendid work in co-operation with Professor Goop?

A.—Yes, of course. As you know, the Professor and I have devoted our whole lives to the furtherance of wireless.

Q.—May I ask, Mr. Wayfarer, upon what the two giant brains are concentrated at the present moment?

A.—Why, certainly. And permit me to congratulate you upon coming so rapidly to the point. In recent weeks the Professor and I have been engaged in developing a new device for the complete and entire prevention of howling.

Q.—This is most interesting, Mr. Wayfarer. In the past, if I may say so, each of your numerous inventions has been a shining example of pure genius. Is this howl preventer to be the greatest of all?

A.—Our latest invention is always the greatest. Shall I tell you about the new device?

Q.—Here, this won't do. Your job is to supply the A.s and not to ask Q.s. But please let the world have your message.

A.—The device, though simple and inexpensive to instal, is most effective. It consists, briefly, of a half brick which is suspended by a cord immediately above the place at which the wireless enthusiast takes his stand for tuning purposes. The instant that the set is allowed to oscillate, energy is picked up by a small frame aerial and passed on to a relay which operates a release mechanism. The half brick descends upon the head of the offender. And that is that.

Q.—This sounds most promising. And have you tested the invention?

A.—We have. We installed it in Poddleby's den whilst he was out for a walk. On the following day he appeared at the wireless club with a bump as big as an orange on his pate, and he has not dared to oscillate since.

Q.—And are your experiments still continuing?

A.—No, unfortunately. There is at the moment an enforced lull in our activities. In a fit of absentmindedness Professor Goop forgot the presence of the half

". . . I decided to interview myself . . ."

brick above his own wireless set and tried to tune in Kastoff. He hopes to be about again in a week or so.

Q.—What a pity. It had occurred to me that it would be an excellent idea for you and Professor Goop to be interviewed jointly. Do you not agree?

A.—Most decidedly not. One celebrity at a time is surely sufficient.

A Problem Solved

Q.—Can you explain, Mr. Wayfarer, how it is that nothing has been heard of the American broadcasting stations by amateurs on this side of the Atlantic during the past winter?

(*Continued on page* 88).

Jottings by the Way—*continued*

A.—I have read or heard at least a score of explanations, each of which is, of course, the only correct one. The sun has been more spotty than usual, the moon has been fuller, whilst the Aurora Borealis has bored all of us with a roar o' atmospherics. It must be remembered, too, that 1924, one of the best years on record for long-distance work, was a Leap Year, which naturally helped oscillations to skip great distances. 1925 was only one year removed from a Leap Year, and the influence still remained during its first few months. Now, however, we find that we have reached the dead period. You will remember that no American broadcasting stations were received in 1921 in this country.

Q.—But were there any to receive?

A.—No; but does not that rather help to prove my point?

Q.—I can see, Mr. Wayfarer, that you have still not stated what you believe to be the real reason for the failure of the American stations to "get across" during the past winter. To what do you really attribute our inability to pick them up?

A.—To jazz.

Q.—But surely you are not serious? How could jazz be responsible?

A.—Very easily. In previous years the loud-speaker had not reached its present state of perfection, nor was dance music regularly broadcast from home and foreign stations until midnight or even later. Serious experimenters like myself regularly sat up until four in the morning. But during the last winter we have had no chance of doing so. Our families insisted upon dancing and upon making us dance until every available station had closed down, after which we were so fatigued that we went immediately to bed. My theory is that American stations have not been heard during this last winter simply because no wireless man was able to keep awake long enough to tune them in.

Q.—How convincingly you put things. I should never have thought of that. Is there, do you think, any other reason? I have known wireless men who received American stations regularly in the past, though they were always in bed before ten o'clock.

A.—So have I. Owing to the influence of the strain of uplift which runs through the broadcast programmes, wireless men are now much less proficient in the use of the long bow than they used to be.

One Better

Q.—Have you devoted much attention, Mr. Wayfarer, to the construction of low-loss components?

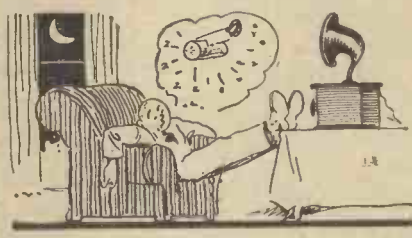
". . . Which operates a release mechanism . . ."

A.—A very great deal, with no little success, if I may say so. Only a month ago I wound a coil which was borrowed by Snaggsby, who has since forgotten to return it.

Q.—Hard lines. And was it low-loss?

A.—It was no loss.

Q.—Do you not find that there is a considerable amount of interference at the present time upon the broadcast waveband?



". . . Unable to keep awake long enough . . ."

A.—Most certainly I do. On occasions I find London almost blotting out Northolt, whilst Aldershot's signals are frequently barely readable owing to the babel of speech and music that is coming through from other stations. I find, too, that several of the French coastal spark stations are badly interfered with by both Belfast and Birmingham. This is obviously a crying scandal, but though I have made several complaints to Geneva, my letters have not even been acknowledged.

Q.—What in your opinion is the best time for receiving foreign broadcasting stations?

A.—Sunday evening, without a doubt. One then obtains a real idea of the interest that is taken in wireless in this country.

Q.—What do you mean?

A.—If you tune in any station that comes through fairly strongly between 5.30 and 8 o'clock on Sunday you will be delighted to find that there are dozens of other fellows just as keen as you are. They are clustered round that signal like desert vultures round their prey, and each of them is oscillating just to show that he has eliminated all damping from his receiving set. It does your heart good to hear these splendid fellows sparing never a squeak in their efforts to tune in distant stations.

Hypo-Selectivity

Q.—Your own set, I suppose, is ultra-selective?

A.—So selective that it will pick up a concert party's leading man's dropped h's or the note that a contralto really means to hit when she wobbles. I do not wish to boast, but I may say that I can easily separate an announcer at the London studio from his Oxford accent, or one at the Oxford studio from his London accent.

Q.—And how is this accomplished?

A.—Ah, that would be giving away secrets. Professor Goop and I have already shown the wonderful degree of selectivity that is obtainable in our hypo-iodine circuit, but in the one that I am using at present I have gone one better. I cannot give you full details, but I may just hint that the current of hot air which flows from the loud-speaker during topical talks is utilised somewhat ingeniously to dry up the damping that would otherwise be present. Occasionally the loud-speaker's output is excessive, in which case we make use of a special circuit

(*Concluded on page* 108.)

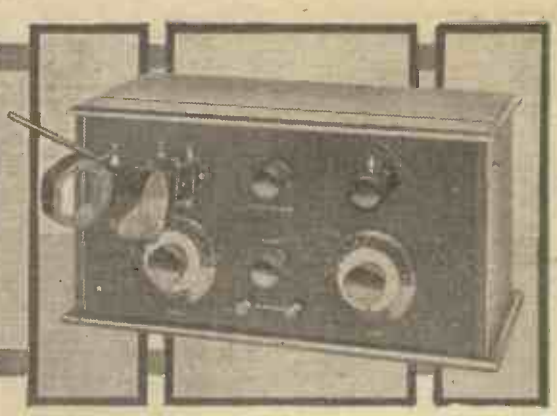
COUPON.

QUESTIONS AND ANSWERS.

This coupon must be accompanied by a P.O. for 2/6 for each question, and a stamped addressed envelope when sending queries to the Radio Press Information Dept. for a postal reply.

"WIRELESS." Vol. IV. No. 3.

IS IT DOING ITS BEST?



By L. H. THOMAS

One of the great joys of wireless is that there is always the chance of improving results by making apparently trivial alterations.

IT very often happens that an enthusiast who has spent some time in designing and constructing his own set, or in simply constructing a receiver to a published design, finds that he can obtain better results with his home-made set than can a friend who has bought a most expensive commercially-made receiver. This, while perhaps causing a certain amount of secret delight to the owner of the home-made set, is obviously extremely annoying to the possessor of the "ready-made" set; it is the purpose of this short article to help the latter person to obtain the results that he should.

An Observation

As a matter of fact, from the writer's experience, those who construct their own sets, though they may be quite satisfied with the results themselves, are very often not getting the best out of their receivers, so that they may also derive a certain amount of help from the few points mentioned.

The writer has been asked to play the part of "Doctor" to a large number of broadcast receivers, of all shapes, types and sizes, and an almost universal fault in the valve receivers was found to be the annoying phenomenon known as "overlap." All readers who have used a valve set at some time must have come in contact with this trouble, although they may not have recognised it at the time.

The "symptoms" are as follow:—When the coupling between the reaction coil and the secondary coil, A.T.I., or anode tuning inductance, is tightened, in order to make the set oscillate, it does not "slide" into the state of oscillation, as it should, but a loud "plop" is heard.

On loosening the coupling the same "plop" is again heard, generally at a different position of the coil this time.

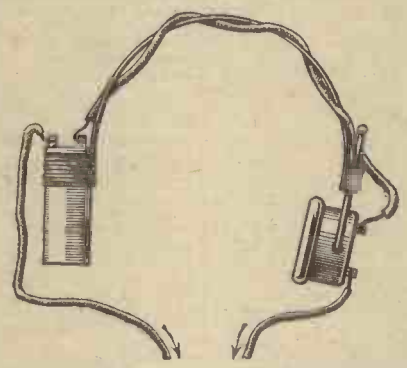
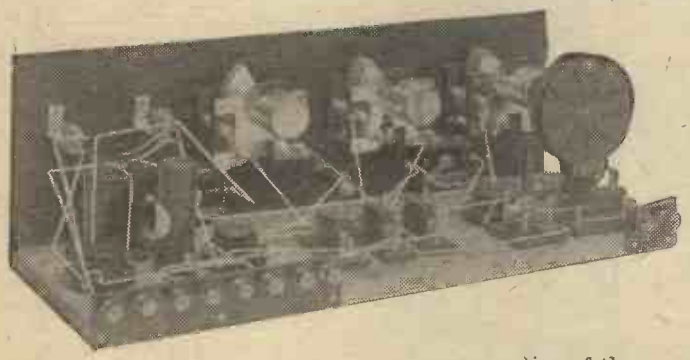


Fig. 1.—A very useful testing unit may be made by replacing one earpiece on your telephones with a dry cell in the manner shown.

This, of course, makes good tuning very difficult, as, when increasing the coupling so as to bring a distant station up to good strength, the set will suddenly burst into oscillation, generally with disastrous effects on the reception of the owners of other sets in the vicinity.



If hand-capacity effects are very noticeable in your receiver, try reversing the connections to the variable condensers.

Remedying the Trouble

This fault may be due to a number of causes, the chief of which are as follow:—

(1) The value of the grid-leak may be unsuitable. Try one of different resistance.

(2) The high-tension voltage on the detector valve may be too high. Try reducing it to about half, and if the trouble seems to be completely cured increase it by easy steps of, say, 3 volts at a time.

(3) The filament voltage of the detector may be too high, though do not decrease it too much.

(4) The reaction coil may be too large. For the normal broadcast band it should never be necessary to use a larger coil than a number 75, and a 50 or 35 should generally give satisfactory results.

(5) A defective earth often causes irregularity in the performance of a set, one of the symptoms very often being overlap.

The fault of "overlap" in a set should certainly be quite easily cured by one of the methods suggested above.

"Hand-Capacity"

Another fault frequently met with is that known as "hand-capacity effects." This is perhaps just as fatal to the tuning in of distant or weak stations as overlap.

This trouble shows itself by a total disappearance of a signal that has been carefully tuned in when the hand is removed from the knob of the condenser. As a rule, this may be cured simply by reversing the connections to the condenser. It should not, of course, be necessary to do this in a bought receiver, as all the condensers should certainly be wired correctly from the first.

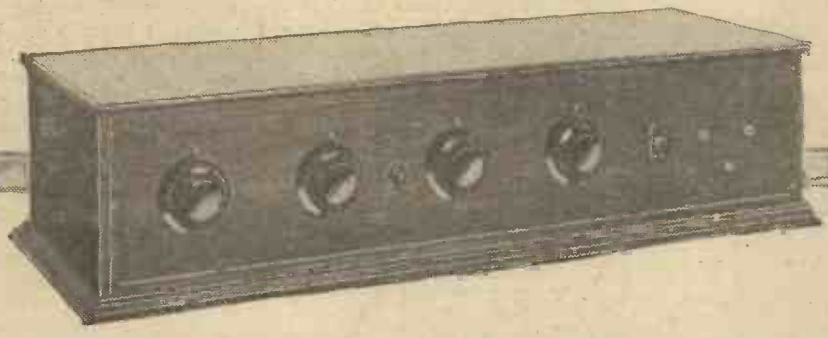
The home-constructor does not always, however, pay attention to this point. The series of plates connected to the actual spindle should always be connected to the point which is at the lowest H.F. potential. That is to say, where the condenser is across the A.T.I., the moving plates should be connected to the end of the coil which goes to earth. In the case of an anode-tuning condenser these plates should be connected to the side that goes to the positive H.T. terminal. This is connected to earth *via* the H.T. battery, and is therefore very unlikely to give rise to hand-capacity effects.

If the plates are connected in the correct manner and these effects are still noticeable, the earth may be faulty or even disconnected. If all the above points are attended to and the

(*Continued on page* 99.)

How the "Elstree Six" Circuit was Developed

By JOHN SCOTT-TAGGART



One of the most important results of the work of the "Wireless" Laboratories has been the production of the special circuit incorporated in the "Elstree Six" described in the current issue of "Modern Wireless." In this preliminary article Mr. Scott-Taggart commences a fascinating account of the work which led up to its production.

IN my last week's article I indicated the vast strides in high-frequency amplification which had been made by our Laboratories at Elstree in connection with high-frequency amplification. One of these developments is the "Elstree Six" circuit, but this is only one of the great improvements which will figure in the designs emanating from these Laboratories.

Another very good set which takes us great strides forward is the "Magic Five," described by Mr. J. H. Reyner in the issue of WIRELESS dated May 29. This latter receiver is some indication of the advances made in the direction of shielding.

An Important Development

The question of neutralising is one of the utmost importance in modern receiver design. There are several important factors. We have, first of all, the question of stopping multiple stages of high-frequency amplification from oscillating. The old method of using potentiometers as the main stabilising method is obsolete; what you were really doing was making up for bad design by introducing damping, which caused a great waste of energy.

Besides, the use of the potentiometer introduces positive potentials on the grids of the high-frequency amplifying valves. Have you ever by any chance connected the filament end of the secondary of a low-frequency transformer to the positive terminal of the accumulator, instead of to the negative side or to the negative side of the grid-bias battery? If you have, you will have found a very great reduction in signal strength, quite apart from the question of distortion.

An Inefficient Method

Why, then, should we connect the bottom ends of our high-frequency circuits to a potentiometer which will make the grids positive? The probable reason why we do it is that we do not actually hear the effect on signals, because if we tried to give negative bias to the grids of the high-frequency valves they would oscillate. The result is that we have never really been able to compare the two methods, whereas in the case of low-frequency transformers it is the simplest thing in the world to compare the two connections and to note the big difference in signal strength.

A Neutralising Advantage

By using modern neutralising methods we can connect our grid circuits to the negative terminal of the accumulator or, better still, to the negative side of a grid-bias battery, giving the grids of all the high-frequency amplifying valves a small negative potential. Such an idea would horrify the average constructor of twelve months ago, but nowadays we are beginning to do it as a matter of course.

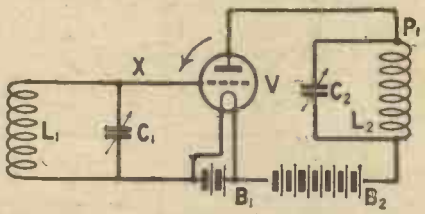


Fig. 1.—The arrow indicates how energy is fed back through the capacity of the valve and may cause self-oscillation.

Let me ask you to think of the matter from another viewpoint. Have you ever tried using in the high-frequency valve socket different kinds of valves? You will probably say that when using an ordinary general-purpose valve the results are quite good, but if you put in a power valve or any valve having a big grid and anode of the flat shape so prevalent to-day, the set immediately begins to oscillate and it is impossible to stop it. If your set happens to be a reflex circuit the trouble may be much worse.

Using Special Valves

Are we, then, to be robbed of all the advantages of these new valves which have been developed? The answer a year ago was yes. To-day, you can use such valves as the special power amplifiers of the high-impedance high-amplification ratio used for resistance-capacity work, with the knowledge that you are going to get a very much higher degree of amplification simply by using the right type of valve.

The best types of valves for high-frequency amplification would form the basis of a special article, and I will suggest the matter to the joint editors of this journal. You may, however, take it that both selectivity and amplification depend upon the type of valve used. The question of self-capacity of the valve has disappeared, at least in so far as ordinary broadcast wavelengths are concerned. You have probably seen V.24 valves in which the connections are taken as far apart from each other as possible. Such a valve has what is usually referred to as a low inter-electrode capacity. That is to say, the condenser formed by grid and anode, etc., is of small capacity.

A Debatable Point

The valves, however, which we are now preferring at Elstree are high-capacity valves. They have not a high capacity intentionally, although we are not at all sure that the increased capacity is not an advantage, because it is capable of being balanced out more easily. Obviously, if the valve capacity is very small it is very difficult to balance out. A very small capacity valve tends to make it very difficult for the home constructor to balance out the capacity accurately.

Over three years ago I suggested even deliberately adding to the low capacity high-frequency amplifying valve then used an additional condenser which would enable us to use a larger and less critical neutralising

How the "Elstree Six" Circuit was Developed—*continued*

condenser. To indicate some of the views in this country as recently as nine months ago, a prominent radio manufacturer publicly stated that the Neutrodyne type of receiver would be no use because of its critical character as regards the neutralising adjustment. The receivers which our Elstree Laboratories have designed, and will design in the future, are extremely simple to neutralise, and there is no fine adjustment required at all.

Possibilities of the New Valves

Let me give due credit to valve manufacturers. The special valves of the small power valve type, if not perhaps always intended for high-frequency amplification, have nevertheless given us a valve ideal for our purpose, although, of course, the circuits will work excellently with cheaper valves; but the full degree of amplification and selectivity is not obtainable unless an appropriate valve is used.

What Is It?

What is neutralising, neutrodyning, balancing, or whatever you prefer to call it? It is in reality producing a counter-effect which tends to stop that natural tendency to oscillate, which is possessed by all receivers having tuned circuits in the grid and anode, or in associated circuits where a natural reaction effect takes place. There are various capacities in a valve and between different parts of the circuit which tend to cause self-oscillation even when only one valve is used, as in Fig. 1, which shows a tuned grid circuit L1 C1 and a tuned anode circuit L2 C2. If this arrangement is connected up and a good valve and adequate high-tension voltage is used, the circuit will produce oscillations without any coupling between L1 and L2. This tendency to oscillate is largely due to the capacity between the grid and anode of the valve.

A Remedy

In Fig. 2 we have done two things which will tend to stop the circuit of Fig. 1 from oscillating. Instead of passing the anode current through the whole of the coil L2 we have taken a tapping Y half-way between the ends of the coil L2. We have also connected the bottom end of L2 to the grid of the valve through a neutralising condenser N, which has a value something like that of the condenser formed by the grid and anode of the valve. In the case of Fig. 1 self-oscillation will occur because high-frequency potentials at the end P1 of the inductance L2 are communicated through the capacity between grid and anode to the grid X.

The Neutralising Principle

If we could somehow get an equal opposing voltage introduced on to X at the same moment we could stop oscillation, and this is what Fig. 2 will do. It will be seen that from P1 arrowheads go along to the anode of the valve, then through the capacity of the anode and grid to the point X. While current, however, is flowing in the circuit L2 C2, the other end of L2, namely, P2, is at a voltage exactly opposite in sign to that of P1 and of the same magnitude. The voltage at P1 is communicated as shown by the upward travelling arrowheads to the point X, while the voltage at P2 travels round through the neutralising condenser N, also to X. The two voltages of opposite sign neutralise each other at the point X. This process could be explained in half a dozen different ways far more technically, but there does not seem to be any necessity for this.

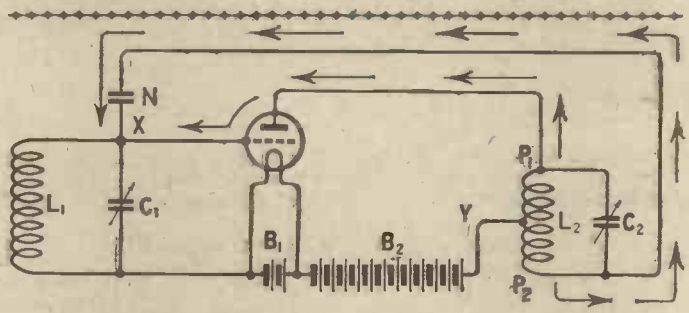


Fig. 2.—This is one of the standard "neutralising" schemes. The arrows show how energy is fed back through two channels.

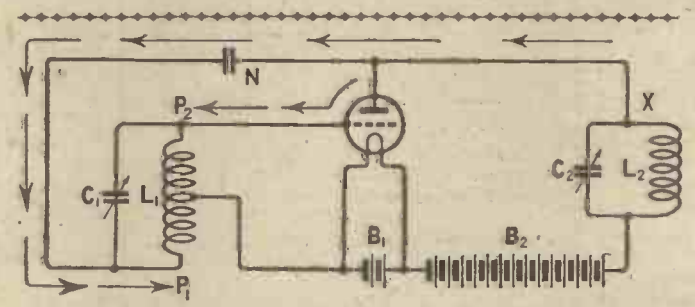


Fig. 3.—This circuit achieves the same end as that of Fig. 2 by means of a tapped grid coil.

A General Case

You will notice that I have not taken any particular receiving circuit, but am just trying to show how in a single-valve circuit having a tuned anode circuit it is quite possible to stop oscillation. If you wish to turn the Fig. 2 circuit into a receiver you can couple an aerial coil to L1 and the grid coil of the second valve (acting as a detector) to L2. Several of the Fig. 2 circuits might be connected together so as to get several stages of high-frequency amplification. I am keeping to a single valve, however, at present, for the sake of simplicity.

Another Method

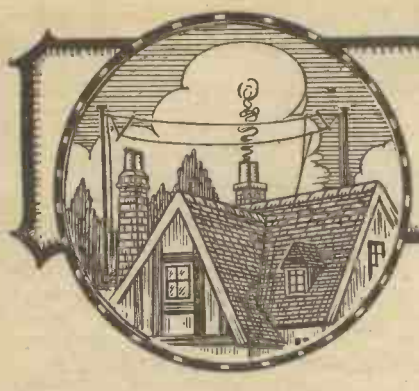
Fig. 3 is the equivalent of Fig. 2, except that this time we have taken the tapping from the middle of the grid circuit and passed the anode current through the whole of the inductance L2. This circuit is just as stable as Fig. 2. An easy way of explaining how it works is to consider the high-frequency potential at the point X in the anode circuit. The high-frequency potential may be positive or negative and may be of any size. Whatever it is, this potential can be communicated to the circuit L1 C1 in two different ways. It will take the path shown by the slanting arrowhead from anode to grid and then to the point P2, and will also go through the neutralising condenser N round the left of the circuit to the point P1.

As we are assuming that there are oscillations in the grid circuit L1 C1, it will be clear that the potential passed on to P2 may tend to cause self-oscillation, while the potential applied to P1, also from the anode circuit of the valve, will tend to stop self-oscillation. These two cancel and the circuit remains stable.

WIRELESS FOR THE BLIND

We all sympathise with the blind in their great loss, although we cannot realise to the full what that loss means to them; but I am sure that all of us who have the full use of our senses will be only too glad to help them in any way we can. A means of presenting unwanted wireless sets to blind persons has at last been found, and wireless will certainly be a great boon to the blind, so please forward any of your unwanted sets, whatever their size or age, to the Secretary-General, National Institute for the Blind, 224-8, Great Portland Street, W.1.

CALL-SIGN.



ADDING TO YOUR TOOL KIT

A new feature of special interest to the home constructor which will appear at frequent intervals.

EACH week, in this feature, a different tool will be considered and described with the intention of advising the reader as to the best and most economical method of equipping his tool-box. If he obtains them as they are described, he will soon have at his disposal practically every tool necessary for any constructional work of a light nature.

High Finance!

A method which can be recommended is one often practised by apprentices in engineering workshops, and consists of the laying aside each week of a small sum of money, say anything from one shilling to half-a-crown, according to one's ability, thus forming a small reserve from which one draws a sufficient amount to purchase a tool as regularly as possible. If one puts aside a small sum of money there may, of course, be a lapse of two or three weeks between some of the more expensive purchases, but if the system is persisted in, quite a respectable kit of tools can be obtained in a comparatively short time.

With this idea in mind, the various tools will be described with regard not only to the usefulness but also to the cost, and an attempt will be made always to keep a balance on the bank side.

Knives

The most important of all tools which the amateur must have is a knife, and although there may not seem much to be said about knives, a little advice on purchasing one will not be amiss.

An important point to remember is that although a knife has "Sheffield make" stamped on it, it should not be assumed that it is a good knife, although undoubtedly the very finest knives do come from there.

What to Pay

The price to be paid for a knife may vary from one shilling up to ten shillings, according to the finish, whether there are silver nameplates inserted in the hasp, etc. For workshop use, the latter class may be avoided as unsuitable for the very hard use experienced on the bench. Nor should a large amount of money be spent on combinations which contain three blades, a corkscrew, a tin opener, a screwdriver, a gimlet, a saw, a piercer, and an implement said to be used for getting stones out of horses' feet.

As a general rule, choose a knife with two strong blades with a hard-wearing hasp made of horn or fibre, and pay about half-a-crown for it, thus ensuring a useful hard-wearing tool.

Sharpening

The knife, when new, will, of course, be wonderfully keen, but this will soon disappear, and the correct way to sharpen a knife is on an oil stone, *not* on a fast revolving emery wheel, or even on smooth emery paper. This method needlessly cuts away the metal and produces a keenness due to a number of jagged points on the edge instead of the fine, smooth edge produced on an oil stone.

One of the great features of the General Strike was the unofficial distribution of news sheets containing the broadcast bulletins.

The load on the power supply panels at the broadcasting stations was heavy during the long hours of service imposed by the recent national emergency.

ELSTREE TEST REPORT ON THE "ALL-IN" PORTABLE

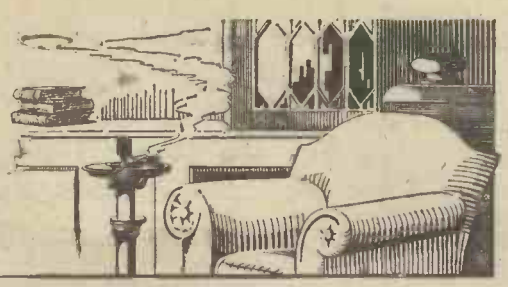
The set underwent the usual complete tests at the "Wireless" Laboratories, and it was found that when a 2-ft. frame was used good loud-speaker signals were obtained from London and Daventry. The set proved simple to operate and easy to handle, the potentiometer giving a satisfactory control of oscillation.

□ □ □

The special article by Commander Kenworthy, which was to have appeared in this issue, has unavoidably been held over. This special feature and many other attractive items will appear in our next issue, and readers should make sure of their copies by ordering early.

From my Armchair

BY EARL RUSSELL



In these columns Lord Russell expresses each week his own personal views on matters of interest to "Wireless" readers.

Care of Sets

That a stitch in time saves nine is never more true than in the necessity for devoting just a little care to the wireless set in the hands of the general public. When closing down for the night the aerial should be earthed, the H.T. battery should have the plugs removed and be covered up, and the set itself should be covered with a light dust sheet. The whole operation does not take a minute, and is much less trouble than cleaning out dirty condensers afterwards, and less expense than replacing H.T. batteries that have been ruined by a leaky layer of dust.

Look After the H.T.

H.T. batteries in particular may last three times as long in careful hands as in careless. Apart from such criminal carelessness as accidentally short-circuiting them, they should not be exposed to great heat, either of radiators or of the sun, nor to damp. The panel itself should not be exposed to the hot direct sun of summer; when it has turned that sickly, yellowish green, all hope of good results may generally be abandoned. It is indeed worth while remembering that, common as wireless is now and used as we all are to its regular operation, the whole thing none the less constitutes a very complicated and very delicate electrical instrument, and will well repay a little expenditure of care and thought in its protection.

Tiresome Reception

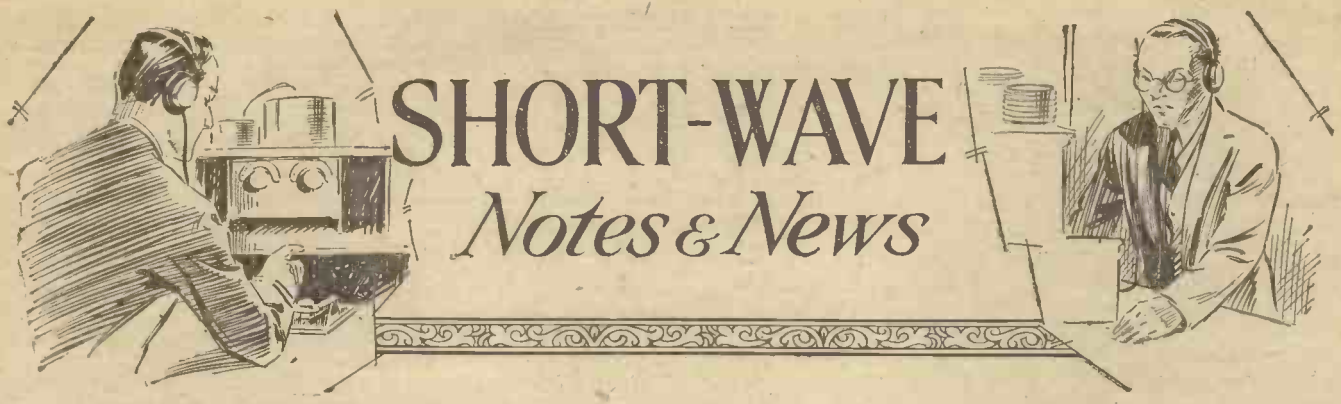
I don't know how other listeners have found it the last fortnight or so, but I have found reception on the broadcast band very tiresome. Not only have there been almost continual atmospherics, and sometimes violent ones, but there seems to me to have been much more Morse, and of a much more desolating character, than is usual. One of the interrupters makes about as much noise as a steam siren, and is almost impossible to disregard even when you have trained your ears to listen only to what you want to hear. Listening has been no pleasure, and searching has been almost impossible.

Selectivity

An arrangement of an aerial and reaction coil only in a two-valve crystal-reflex would not, one would *prima facie* think, be very selective even if a small fixed condenser is inserted in the aerial lead-in. And yet I have found that sometimes it is, and that half a degree on the aerial condenser will make all the difference. On the other hand, sometimes it is not, and one can hear two transmissions at the same time: it seems to depend chiefly on the tightness of coupling between the two coils, for I have been able to separate Manchester from London on this set, and to receive the Spanish station within a few metres of Bournemouth while Bournemouth has been working at full strength.

A Mystery

A correspondent is sending me a strange set to experiment with. It is not one full of gadgets, but quite the contrary; indeed, its strangeness lies in its simplicity, because it ought not to work well but I am told it does. We shall see, and when I know my readers shall hear also.



WITH the approach of summer weather a large number of stations who formerly worked on short waves with a fair amount of regularity have "gone off the ether." They may, however, be heard again any wet afternoon or evening! When the weather is at all hot, atmospherics seem to be very severe, and also conditions fall off badly. As a rule now, 8.30 p.m. or 9 p.m. seems to be the best time for European work; before this, signals are all abnormally weak, sounding as they generally do late at night in the winter. Apparently summer is going to reverse the reception conditions on the 45-metre band.

Very few American stations have been heard by the writer during the last fortnight, with the exception of the Brazilian and Argentine stations, who are generally audible at extremely good strength after 9.30 p.m. Not a single U.S.A. station has been heard, and WGY and KDKA have both been abnormally weak and difficult to follow.

A New "Big Noise"

Probably the strongest station ever heard (or ever likely to be heard!) on the 45-metre band is DCN, the station of M. Mesny, the well-known French scientist, at Fort-Issy, near Paris. DCN's signals are seldom less than R9 on one valve at the writer's station in South-East London, and they also seem somewhat guilty of straying about from time to time. The note, however, is *not* "Raw A.C.," in spite of the fact that it is a French station.

Enter Denmark

Most "hams" were doubtless glad to hear that the Danish Government had decided to grant transmission licences at last. Several Danish stations are now working regularly, and can generally be detected simply by the excellence of their transmissions. They all use very well rectified A.C., or pure D.C., and the most prominent of their stations at present are 7EW, 7BX, 7MT, and 7WA. 7BX has often been received by the writer when his input was under 1 watt, with 14-in. coupling to the aerial!

Irish News

Several Irish stations have also appeared recently. The Messrs. O'Dwyer, of Dublin, whose intensive reception was well known some time ago, have now been allotted the call-sign GW-18B. Others are 14B, 19B, and 11J, the latter presumably being still unlicensed! In Northern Ireland three new stations are GI-2BX, GI-5GH, and GI-6YM. Their full addresses will be found under the heading "Amateur Transmitting Notes."

GI-6YW, already famous for his ultra-low-power work, has now worked Canadian 1ED, who reported his signals R5, when his input was 4 watts to a receiving valve, supplied by a hand generator, turned by his left hand. He has also been reported R7 by P-3FZ at Madeira, and has worked to Tunis. His total is now 17 countries and three continents. He suggests that a silent period, say once a week, for low-power stations to see what they really can do without any of the "high-power QRM," would be extremely useful. He also desires the prohibition of all gramophones on 45 metres, and says that no licences should allow the use of powers higher than 100 watts. Vive le QRP!

What is said to be the first marine broadcasting station in American waters has been allotted the call-sign WRMU, and the boat, the MU1, will send out a daily programme on 236 metres. Our photograph shows the transmitter and receiver panels.

Cut it Down!

The writer certainly agrees with all these points. It would be much easier to work real DX with the minimum of power if the "canned-music" purveyors restricted their activities to the 150-200 or 440-metre bands. After all, were it not for the interference caused by the high-power stations, there would be no need for anyone to use more than about 10 watts to work any distance on the 45-metre band. As soon as one station increases power, the others have to follow suit to cut through the interference he causes! Why not use 10 watts?

A QRA Difficulty

A reader has written to the Editor suggesting the publication of a complete list of QRA's of *all* countries. The difficulty is, of course, that all countries have a fair share of pirates, who, though they can always be reached through one of the many "QSL bureaux," never publish their full address. A complete list of all licensed stations would, it is feared, contain only about 60 per cent. of the stations now to be heard on short waves.

Reports Wanted

A letter has reached the writer asking him to state that the call-sign Y-2JY has been allotted to Mr. Claude S. Crooks, of The Sugar House, Cossipore, Calcutta. He is carrying out experiments on 33 metres with an input of 5 watts, and will be very glad to receive reports.

Send your QRA Queries to Us

OBITUARY

MR. GUY C. BEDDINGTON

ALL readers of *Wireless Weekly* will be sorry to learn of the untimely death at the age of 24 of Mr. Guy Claude Beddington, whose all too few articles in *Wireless Weekly* and other contributions to wireless literature always bore the stamp of something out of the ordinary; but few perhaps realise how much has been lost to the world in this rich personality.

Born in 1902, he was educated at Ludgrove, and later at Eton, where he was at R. H. de Haviland's House. The general bent of his mind was towards the Classics—especially Greek, Divinity and Literature. It is said of him that from Eton days to the end he read a book a day.

Although his father, Lieut.-Col. Claude Beddington, had long been interested in wireless, and had been the inspirer of the earliest cavalry pack-stations of 1910, he had no particular bent towards science at all, until the spending of just one day in 1919, watching experiments in Major Prince's laboratory, acted like a match applied to a well-laid fire, and his enthusiasm flared up in favour of wireless. He at once applied himself to this with such energy and mental power that in an incredibly short time he attained a mastery of the subject.

He went up to Trinity College, Cambridge, in 1920, where he studied law, and passed his first examinations, but after only four terms he was struck down by severe influenza, which developed into a serious illness, and for the last 4½ years was practically all the time in bed.

His writings on wireless subjects called forth commendation from no less an authority than Sir J. J. Thompson. He made a special study of the "Trigger Circuit," which he first introduced to readers of *Wireless Weekly*, and held, among other technical patents, some very interesting modifications of this in its application to "calling-up," more particularly one using a double-grid valve, in which calling-up was effected only by the simultaneous action of two waves.

He also studied and experimented in such branches as loud-speaker design and valves with independently heated cathodes.

He was a brilliant linguist, speaking French, Italian and German, and his constant reading of the radio press in these languages gave him a wide and peculiar knowledge of contemporary work.

He was, however, not a mere bookworm. At Eton, shooting for the Ashburton Shield, he made top score for the school, and while at the University, before his health failed, he played polo and hunted.

As further instances of his amazing versatility, he studied music and had a thorough knowledge of harmony, used to play the saxophone and drum in jazz bands, and while in bed taught himself the ukulele. Moreover, while at his villa on the Italian Riviera, when he could still get out in a bath-chair, he interested himself in gardening, and, reading all the books he could obtain in the various languages he knew, he acquired a really deep and expert knowledge, for he never forgot anything he read. He specialised in sub-tropical plants.

He had a most wonderful charm and sense of humour, which endeared him to all, and in long drawn-out illness and suffering showed invincible and almost incredible pluck.

So exceptionally gifted, with such a mind, and such a character refined and softened in the fire of suffering, it is not to be wondered at that those who knew him in his latter days should call him "the most brilliant of God's creatures" and "la fleur magnifique que Dieu a cueillie pour ses jardins eternels."

The world holds proud record of many lives as glorious as they were brief, for it is eternally true that it is not the number of our years that count, but the quality of them.

This genius, however, had hardly had time to open upon the world, and his most fitting epitaph might be those simple words carved two thousand years ago on a Greek tomb: "His father's high hope."

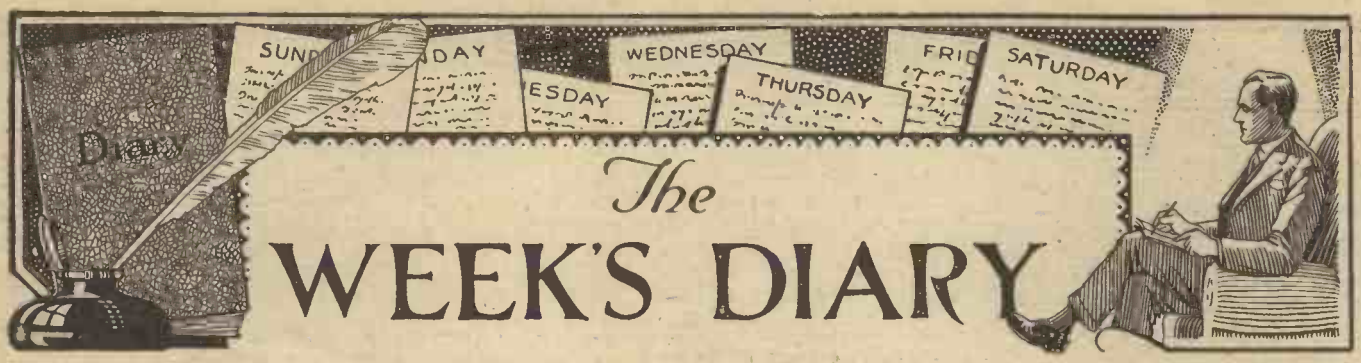
IN ADVANCE

Sunday, June 13.
- **2LO. Shakespeare's Heroines, No. 7**
- **6BM. Symphony Concert**

Monday, June 14.
- **5IT. Songs from Famous Comedies**
- **5SC. Memories**
- **5NO. "The Rest Cure"**

Tuesday, June 15.
- **2EH. A Variety Evening**
- **6ST. Musical Festival Winners**

Thursday, June 17.
- **2BE. Gounod Anniversary**
- **5WA. Merrymakers' Concert Party**



The WEEK'S DIARY

I HAVE been rather amused at all the alarums and excursions about the much-discussed B.B.C. "Editorials." Quite frankly, they have seemed to me harmless affairs with no political significance, and often little interest. Several of the newspapers have worked themselves up into what is sometimes called a "state," fearing apparently that the B.B.C. is likely to encroach upon their domain. My objection to them is that they form one more "talk" of which we have much more than enough at present. In any case, the B.B.C. have come to the very wise decision to restrict the numerous talks, and although nominally this change has been made to meet the "changing requirements of seasons," I very much doubt whether the autumn will see any increase in them again.

There is one kind of talk, however, to which I always make a point of listening—the speeches from a public dinner. Between ourselves it is not exactly the speeches that I am interested in, but there is always a chance of hearing somebody's stray remark that is not intended for the microphone. Rather mean, you think? Well, have not you enjoyed such remarks at times?

* * *

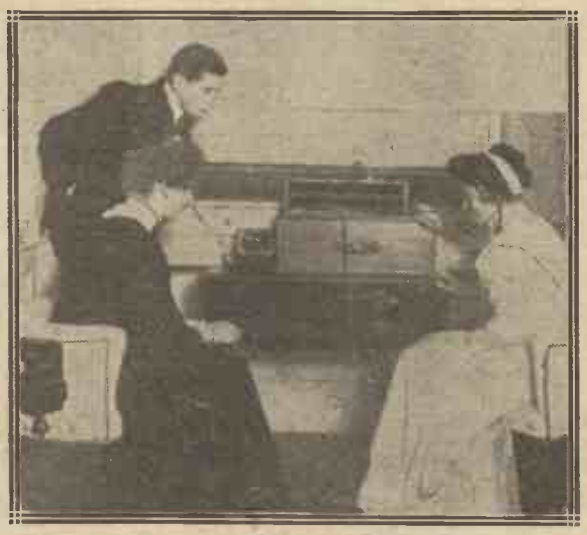
LISTENING the other night on a sensitive receiver, I picked up a long talk in English, which I at first thought came from an English relay station. At its conclusion I discovered the station sending out this talk was Rome. Several of the Continental stations have been broadcasting in English, and as a matter of fact English lessons—highly amusing in character to the English listener—are often given by some of the German stations. Recently the Spanish station, "Radio-Catalaña," broadcast a special concert dedicated to British listeners. The items were Spanish songs and dances and announcements were made both in Spanish and English, while listeners were asked to send their criticisms and results to the authorities operating the station.

"Radio-Belgique" also announces a series of English talks, so that listeners with good valve sets, and particularly those who have been fortunate enough to build the Elstree Six, should have an increasingly wide variety of programmes in their own language.

VALVES AND THE PORTABLE SET.

One of the problems of the successful use of a portable set concerns the safe carriage of the valves. To carry them in a separate and well padded box is one of the safest ways, but it involves the transport of an extra package. Many people prefer to trust to sprung valve sockets, but it must not be forgotten that valves sometimes jump out of such holders. It is wise to place a pad of felt or similar material over the tops of the valves so that they are held down securely when the lid of the case is shut.

A NEWSPAPER has been commenting on the fact that wireless receiving sets find little favour in West End clubs. It is true that a number of the clubs installed sets during the general strike, but these have mostly been removed or at least put away for the time being. The trouble is, of course, that the average wireless set operating a loud-speaker tends to make itself a nuisance in places where people wish to sit quietly and talk or read. I am sure that if one of the modern systems of distribution from a central point were adopted with a few headphones available in the public room for those who wish to listen, the innovation should prove very popular even in the most exclusive of the Clubs.



We have gone far from the days when slider crystal sets were employed to receive the time signals from the Eiffel Tower.

* * *

THE amateur transmitters are still very active, and the fact that spectacular feats are only achieved in the winter time, when the longer amateur wavelengths are used, has led many people to think that in the lighter months the amateur has little to do. Things have completely changed since the advent of the short wavelength, and the daylight work has been very remarkable. As an example of what is now being done, Mr. Earle Cox, a leading Melbourne amateur, recently conveyed a message by direct wireless to London, the message in question being addressed by Mr. Bruce, the Australian Premier, to Mr. Baldwin in this country. The reception of the message was undertaken by Mr. Swift, station 2WY, and the wavelength used was 35 metres.

The two amateurs were in communication with one another for an hour and no difficulty was experienced in getting the message through accurately. A remarkable feature of this transmission is that the power used to transmit the message all the way from Australia was but 300 watts, far less than the energy required to light quite satisfactorily a large room in a city office. Put in another way, the energy used was about a tenth of that consumed by the ordinary electric fire, and many electric irons use more!

* * *

I HAVE met several people recently who are under the impression that as wireless transmission of pictures across the Atlantic has been achieved satisfactorily, we shall soon have apparatus enabling us to see by wireless, and that broadcast receivers will be soon fitted with auxiliary apparatus for the purpose.

The Week's Diary—*continued*

I am afraid that many people do not understand the difference between transmitting pictures by wireless and *seeing* by wireless. The transmission of a picture by wireless may take a quarter of an hour, whereas seeing by wireless involves a scheme in which the picture seen on the screen changes about 16 times a second in order to obtain persistence of vision, much in the way that a cinematograph film consists of a series of pictures, one projected after the other to create the illusion of continuity. Transmission of pictures by wireless has reached a very high stage of perfection and, indeed, a commercial service is now on the way, but we have yet to see anything approaching a practical system of seeing by wireless, even in the laboratory. For this reason I do not anticipate that apparatus for seeing by wireless will be available for general public use for at least a year or two, so that people who have put off buying receivers with the idea that they will soon be able to buy "seeing and listening sets" are anticipating the event by a long period.

* * *

THE Wireless Exhibition this year will be a very fine affair I am told. Chatting with Mr. Moody, the Secretary of the Exhibition, the other day, he told me that plans were well ahead for an Exhibition surpassing in interest anything yet projected in this country. The B.B.C. are supporting the Exhibition in every possible way, and a replica of the 2LO studio is to be built at Olympia in order that broadcasting can be carried on in public view from that place—an idea, I believe, entered into with the more enthusiasm owing to the success achieved at the Ideal Home Exhibition. The Exhibition is no longer to be a "tied house" confined to members of any particular trade association, but will be thrown wide open to every reputable British wireless firm. Foreign exhibits will be barred in order that the Exhibition may be entirely British in its character.

* * *

READERS of *Wireless Weekly* will be very sorry to hear of the untimely death of Mr. Guy C. Beddington, regarding whom an obituary notice appears on another page of this issue. Mr. Beddington was a particularly keen radio worker, and it was interesting to note that his articles in this journal inspired a very large number of readers to follow in his footsteps. The attention thus directed to the Prince circuit has proved very helpful in popularising a particularly good form of low-frequency amplification among those who are more keen on quality than the raucous noise that emanates so frequently from mishandled loud-speakers and sets.

Many readers have asked how reaction can be applied to the Prince circuit. I was interested to hear the other day of a new circuit developed for WIRELESS in which the difficulties of applying reaction have been very successfully overcome. The circuit is now undergoing its final tests, which I am informed have been entirely satisfactory.

* * *

THE ghost stories broadcast from 2LO have quite frequently thrilled listeners, but to hear voices coming from one's loud-speaker when the local station has closed down (but not yet switched off), and when, furthermore, the voices are recognised as those belonging to members of one's household, the thrill is something more than ordinary. A reader in Edinburgh recently experienced just such a shock, and found it was due to a crystal set in the same house acting as a microphone and modulating the carrier waves picked up on a second indoor aerial. The modulated currents in this aerial were radiated to the aerial on which the reader was listening and amplified for the loud-speaker in the usual way. There have been several cases where a listener has overheard voices in an adjacent house, due to precisely the same reason, so that if you are carrying on any very private conversation in the vicinity of a crystal set, it is just as well to lift the cat-whisker!

* * *

THE huge success of the Alhambra transmission should induce the B.B.C. to pay more attention than they have done in the past to the broadcasting of variety as against theatrical entertainment. I had a party of friends in my own house listening to the Alhambra transmission, and rarely has any feature evoked so much general appreciation. The only criticism one could make related to the imperfect audibility of several of the artists, due largely, no doubt, to the echo effects produced in so large a theatre. Capt. Eckersley tells me that the whole subject of echo is one requiring the closest study, as quite unexpected effects are often found when the actual transmission takes place.

Discussing the matter recently with an acoustical expert who specialises in gramophone recording, I gathered that in general, echo effects, while enhancing the naturalness of such items as orchestral pieces (the splendid reproduction of the orchestra from Eastbourne is a case in point), with voices are very rarely successful, and tend to produce a state of strain on the part of the listener in endeavouring to follow the words as they are spoken. The great value of transmissions such as that from the Alhambra is that the artists working in full view of the audience are generally able to give a far more "human" turn than is generally the case in front of the unresponsive and awe-inspiring microphone.

* * *

HERE is a little wireless tragedy. A very keen enthusiast was about to be visited by an elderly maiden aunt from the country. She had never heard wireless before, and for family reasons it was advisable that she should be thoroughly impressed.

This story has a very sad ending! Unfortunately, the set was switched on in the middle of the imitation of a village band which took place during Vivian Foster's recent "Parish Concert," one of the cleverest pieces of fooling from London for some time.

WAVE-TRAP.

ARMY WIRELESS

The 54th Divisional (E.A.) Signals recently gave a wireless demonstration and riding display on Wanstead Flats to attract recruits. Our photograph shows a 30-watt field transmitter, which was used on a wavelength of 740 metres.

trouble still persists, as a last resort a metal plate may be fixed to the back of the panel in some way. This should surround the condenser without actually touching it, or any other component, and should be connected to earth. As a general rule, however, it should not be necessary to adopt this measure.

Size of Variable Condensers

One factor which applies chiefly to the home-constructor who deviates from the actual components specified in an article when constructing a set described in a technical paper, is that the actual capacities of the variable condensers should not be changed. It may not be essential to purchase the same make of condensers as specified by the designer of the original set, but he has generally chosen the condenser *values* with some care, and it is therefore unwise to depart from them. The writer has often seen sets using large condensers by means of which the whole broadcast band occupies only one-third or half the condenser scale. Remember that there is no object in "squashing the stations together" like this, and that tuning will be infinitely easier if a smaller condenser is used.

For the receiver that is only required to get the local station this may not be so important, but for those who wish

IS IT DOING ITS BEST?

(Continued from page 90)

to listen to other stations, the ideal size of condenser is one that *just* covers the range from the highest to the lowest broadcast station that may be tuned in.

Coil-Holders

Coil-holders are sometimes a fruitful source of trouble, even in the case of some ready-made sets. The most usual fault is a tendency on the part of the moving unit to drop when a fairly heavy coil is employed. If the coil-holder is tightened up too much it becomes too stiff for accurate tuning to be carried out. Here the only satisfactory remedy is, unfortunately, to scrap the offending component and buy one of a better make. Most of the coil-holders employing some form of gearing are quite reliable in this respect, but, of course, some of the older types are also perfectly satisfactory.

Noises Inside the Set

The scraping or scratching noises so often dismissed with the word "atmospherics!" are too often found to emanate from inside the set. The simplest possible way of making sure whether or not they are *bona-fide* atmospherics is to disconnect the aerial and earth and to note whether they continue. The noise caused by atmospherics or other external sources should only be very weakly received when the aerial and earth are removed.

To trace the noise, once it has been decided that the set is responsible, is, however, somewhat more difficult. The batteries should first be examined. Probably it is safe to say that nine times out of ten the high-tension battery is to blame.

In one of the type made up from flashlamp batteries the best method of testing is to run over each cell with a voltmeter or a pocket-lamp bulb.

One single "dud" cell is quite capable of causing the familiar noise. If the battery is of commercial manufacture the only thing to do is to note whether it is showing a voltage much lower than the rated value. If it is not, it is fairly safe to assume that the trouble is to be found elsewhere. The accumulator should be examined, and care should be taken that all the terminals are clean and well screwed down. Corroded terminals are best renovated by means of a file, and, afterwards, a little vaseline. If neither of the batteries is found to be responsible, the only thing to do is to make a systematic search over the aerial and earth.

COMPONENTS WE HAVE TRIED

Conducted by the "Wireless" Laboratories, Elstree.

Vernier Rheostat

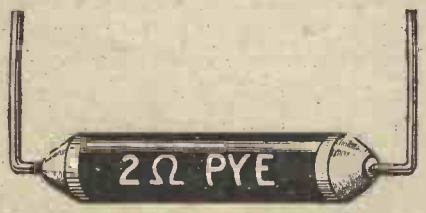
SUBMITTED by Messrs. King Quality Products, Ltd., a King Quality Vernier Rheostat has been tested at our laboratories. The ordinary 6.5 ohm resistance element is wound on a fibre strip, while the vernier winding is a single turn. The vernier spindle passes through the hollow main spindle and it was found that the total variation obtainable with the vernier was .15 ohm. The rheostat was found to be exceptionally noiseless in use and to carry .8 ampere without undue heating.

Ormond L.F. Transformer

ONE of the L.F. transformers made by Messrs. the Ormond Engineering Co., Ltd., has been tested at our laboratories with good results. It is of open type, and gave good quality reproduction. Considering the low price its performance may be considered very satisfactory indeed.

Pye Grid Leak

GRID leaks have been submitted for report by Messrs. W. G. Pye & Co. The sample tested was rated at 2 megohms, and on test was found to have an actual resistance very close to this. The leak is of familiar shape, but rather short, a

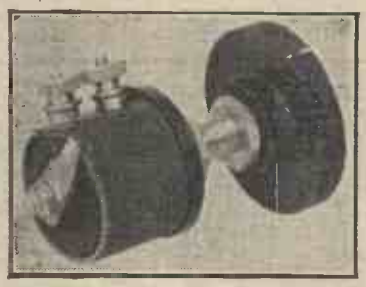


Pye grid leaks are fitted with stout wires which are very useful when soldering the leak in position.

stout wire being provided at each end for soldering purposes. This component is strongly constructed, remains constant in value, and can be recommended.

Junior "Ideal" L.F. Transformer

THE Junior model "Ideal" transformer manufactured by Messrs. the Marconiphone Co., Ltd., has been tested at our laboratories. This instrument was found to produce a high degree of amplification, whilst the quality of reproduction was in every way satisfactory. The transformer can be thoroughly recommended as a general-purpose instrument.



Having a resistance of 30 ohms, this Ediswan rheostat forms a very compact component.

Ediswan Rheostats

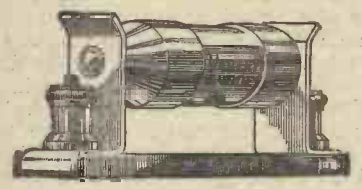
DUAL and dull emitter type filament rheostats have been sent for test by Messrs. the Edison Swan Electric Co., Ltd. Both rheostats are of circular form, with the usual type of rotating contact arm, and provided with terminals. In the dual rheostat the contact arm can be changed from one resistance element to the other by pressing the rheostat knob, thus allowing the arm to clear a stop. The dual rheostat elements had resistance of 37 and 7.5 ohms, while the dull-emitter pattern had a resistance of 33 ohms. The motion of both was smooth and noiseless, and the finish good.

Neutralising Condensers

NEUTRALISING condensers have been submitted for test by Messrs. A. F. Bulgin & Co. The sample tested consisted of a circular ebonite base carrying a small cylinder of insulating material, from the top of which projected a slotted rod. This rod could be adjusted by means of the key supplied to vary the capacity of the condenser. The component was found to have maximum and minimum capacities of 2.6 and 0.3 micro-microfarads respectively, and should prove useful in neutralised H.F. amplification circuits.

"Varley" Anode Resistance

FROM Messrs. the Varley Magnet Co. (proprietors, Oliver Pell Control, Ltd.) we have received a number of their Varley wire-wound resistances. They are of standard size, and may be had in



A drawing of a Varley wire-wound anode resistance.

various values, with or without clips and base.

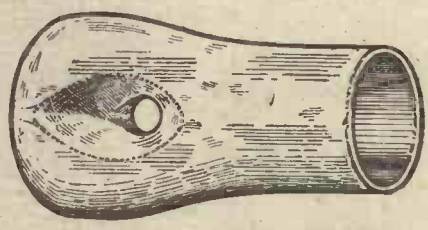
On test, each resistance was found to be exactly of the value specified and perfectly silent in use as an anode resistance in a resistance-capacity L.F. amplifier. These resistances are well made and finished, and can be thoroughly recommended.

"Tungstone" Accumulator

WE have tested a 12-volt, 50-ampere-hour (actual) accumulator manufactured by Messrs. the Tungstone Accumulator Co., Ltd. On discharging at 3 and 6 amps., it was found to have a capacity of 90 ampere hours, as against the makers 50 a.h. rating, while even after severe tests the plates were in excellent condition. This accumulator is so constructed that any single plate can be easily renewed. It can be thoroughly recommended for its robust construction and ability to withstand heavy discharges and rigorous treatment.

"Hobbs" Aerial Insulators

HOLLOW porcelain aerial insulators have been sent in by Mr. J. A. Brassington, Jun., for test. They are made so that the aerial wire is carried inside, while an eye for the halyard is formed at one end. By this means a large



The "Hobbs" aerial insulator is of unusual design.

insulating surface is provided, while the inside of the insulator will remain dry under the severest conditions.

On test, with the halyards and insulators made soaking wet, the insulation resistance was found to be infinity, while with the roughest usage only a small flake could be broken off the insulators. They can be thoroughly recommended.

"ANSWERS TO CORRESPONDENTS"

Some amusing extracts from the Russian Press

THE Russian radio journals are receiving from their correspondents a great number of "soft" questions which are intended in most cases as a gentle "leg-pull."

The technical experts treat them accordingly.

Here are a few examples:—

Q.—On what depends the strength and range of reception?

A.—On the experience of the amateur.

Q.—How can one ascertain if broadcasting has started without listening-in?

A.—Ring up the broadcasting station or send a telegram.

Q.—Should the catswhisker be placed vertically or horizontally?

A.—Place it horizontally and direct the contact towards the broadcasting station.

Q.—Is there any danger in turning on the water tap during a thunderstorm?

A.—There is, unless you earth the water pipes.

Q.—I receive on my single-valve set all the Russian stations; can I improve my results?

A.—Yes, wait till there are more stations built.

Q.—Are there many receiving stations in London?

A.—Yes; there are so many stations that aerials are being insulated from one another by means of Presspahn.

Q.—What is the best way of tuning a receiver?

A.—Put on your Sunday suit. Don't wear a hat, as it may interfere with the headphones. While tuning, bend your body to an angle of 60 deg. and see that your head is directional to the transmitting station.

Q.—What is a period?

A.—A period is the time of a pirate's oscillation, while he is deciding if he should take out a licence.

Q.—What is meant by wavelength?

A.—The length of the wave from end to end.

Q.—Why do so many constructors buy their receivers ready-made?

A.—Because they cannot get them for nothing.

Q.—How can I avoid interference from a telephone line?

A.—Place the telephone line at right-angles to your aerial.

NEXT WEEK

A SIMPLE TWO-VALVE SET FOR LONG RANGE WORK.

I HAVE BEEN ASKED....

In studying theoretical circuit diagrams I notice that the "stopping" condensers are shown as of low capacity on the high-frequency side and of considerably larger size in choke or resistance L.F. amplifiers. What is the exact function of these condensers and what determines the value required?

Your question involves a considerable amount of theoretical explanation if it is to be thoroughly detailed, but briefly put, some system of passing on the signal voltages from the plate circuit of one valve to the grid circuit of the next is required in order to secure the desired degree of amplification. A simple way of effecting this would appear to be to join the plate of one valve directly to the grid of the next, but a little consideration will show that if this were done the latter would receive considerable positive bias from the H.T. battery. To prevent this, "stopping" condensers are inserted between plates and grids respectively.

Now, to a direct current a condenser offers infinite resistance, assuming perfect insulation and no current can flow. To alternating or pulsating currents, however, the stopping effect is proportionately lessened as the frequency increases. It will be understood, therefore, that high or radio frequency impulses are more easily communicated through a given condenser than low or audio frequencies. From these considerations it will be apparent that to pass on radio frequency impulses a smaller condenser will serve than is required for low or audio frequencies, a negligible blocking or "cut off" effect being assumed for both cases. On the H.F. side a usual value is .0003, and for L.F. coupling .01 to .25 are general figures, the higher capacity being preferred, provided the insulation remains adequate, although no really noticeable distortion is present down to .006.

How can I tell which is the positive main of my house lighting electric supply?

Immerse the bared ends of two leads, from any lamp bracket, in a jar of water to which a little salt or vinegar has been added. Bubbles will collect round both wires, and that at which least are seen is the positive. Do not let the two wires touch, or you will short the mains and blow your fuses.

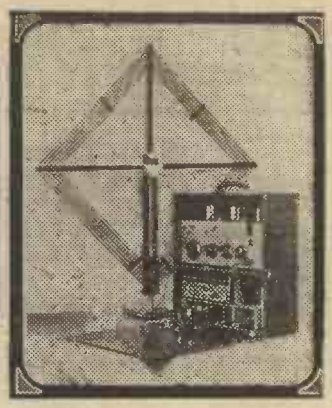
Is there any increased risk of the house being struck by lightning through the employment of a small indoor aerial?

Aerials do not *attract* lightning, which generally, although not invariably, strikes the highest neighbouring point. It is unlikely that increased risk results through the erection of an indoor aerial.

What is meant by a "dry" joint?

A "dry" joint is a soldered connection which is not electrically joined owing to the presence of a thin film of flux between the two metal surfaces. Such joints often appear perfect as far as can be seen, but generally a pull with a pair of pliers will expose the weakness. The difficulty is best overcome by well tinning all points to be soldered, with a really hot iron, before attempting the wiring proper.

OPERATING THE "ALL-IN" PORTABLE SET



By JOHN UNDERDOWN

Some helpful operating notes upon the constructional article which appeared in our last issue.

LAST week I gave full constructional details of the "All-In" four-valve portable set, and here it is proposed to deal more fully with the subject of getting the best from the receiver and to indicate the results which may be obtained. During the strike period the receiver was mostly used in south-east London at distances of ten to twelve miles from 2LO, and in most positions, working on the "Success" frame, it was found possible to receive that station at from fair to good loud-speaker strength. In my own house, at twelve miles south-east of 2LO, loud-speaker results were obtained in all rooms except one, in which, curiously enough, the whole four valves had to be used before signals in the telephones were good. The results from 5XX were, taken on the whole, somewhat better than those from the London station, the frame being used in conjunction with a 250 X coil, for loading purposes.

In the Open Country

In the open country I have been agreeably surprised by the way in which the set functions, and in a particularly good position on the hills above Tonbridge, Kent, both 2LO and 5XX gave sufficient volume on the loud-speaker to be comfortably audible. In Tonbridge itself, which lies in a valley, however, results were not so good, but excellent telephone strength was obtained, using four valves, from the two previously mentioned stations, and also from a number of others, both British and Continental. Before referring to results obtainable upon an open aerial I would like to mention that on a frame, twelve miles south-east of 2LO, I have heard, at good telephone strength, on four valves, the French station Ecole Supérieure, Radio-Toulouse, Hamburg, Newcastle, and a number of other stations unidentified.

On the Outside Aerial

On the outside aerial, at twelve miles south-east of 2LO, using 60 X and 250 X coils respectively, London and Daventry give strength which on the loud-speaker is uncomfortably loud for a room of average size. Radio-Toulouse, Belfast, Newcastle, and a number of other British and Continental stations unidentified, are also received at fair loud-speaker strength. The set, however, is not highly selective when used on an outside aerial, and to receive stations close in wavelength to that of the local station it is necessary to employ a wavetrap.

The handsome portable receiver which was described in our last issue. The set may be used in conjunction with an ordinary aerial and earth if it is desired.

Valves and H.T.

I have tried a number of types of valves in the receiver, but the best results are obtained by employing general-purpose .06 ampere valves in the first three valve sockets, followed by a four-volt power valve for the note magnifier. Sixty volts on the first three and 100 volts on the last valve, with $4\frac{1}{2}$ volts grid bias, are suitable working H.T. voltages. A good idea of the disposition of the batteries will be obtained from the heading photograph.

Operating

Once adjusted on the local station, as described in last week's issue, it is a very simple matter to search for other stations. For those operating on a higher wavelength than the local station the condenser reading will have to be increased, while some slight readjustment of the potentiometer setting may be required to bring the transmission up to maximum strength. For stations lower in wavelength a lesser reading will be required upon the aerial tuning condenser. By suitably adjusting the H.T. on the H.F. and detector valves, and the setting of the rheostat R1, it will be found that smooth reaction control will be given by the potentiometer. This latter should be worked as far over towards the negative side as is consistent with stable working, that is, the potentiometer dials should be rotated in a clockwise direction to bring up signal strength.

Conclusion

Reviewing the results generally obtainable, the set can be thoroughly recommended for use on either a frame or an open aerial, loud-speaker results being obtainable up to distances of ten miles from a main station, or at considerably greater distances from 5XX. With telephones, on the frame it should be possible to obtain 5XX at good strength in almost any part of the United Kingdom, whilst on an open aerial loud-speaker strength should be given. In general, some type of temporary aerial, consisting of rubber-covered wire slung over a near-by tree, is preferable to a frame, but this latter has its advantages in the open country. The set should prove useful to flat dwellers, fairly close to a station, who have difficulty in erecting a good aerial.

AMATEUR TRANSMITTING NOTES

QRA's Wanted

A-7HL, Y-1BR, Y-1FA, Y-1CD, BE-1AX, G-6OM, D-PK7, G-2ZA, A-5KN, G-6XI, GBM, G-5CQ, G-2BAJ, G-2BFI, LAXX, GW-3XX, GW-3ZZ, G-6OU, G-2SN.

QRA's Found

GI-2BX: Municipal College of Technology, Belfast.

GI-5GH: Mr. Gillespie, 16, Knockdene Park South, Belfast.

GI-6YM: Belfast Y.M.C.A. Radio Club, Belfast.

DCN: Militaire Francaise, Fort-d'Issy, near Paris.

A-3HL: A. Hutchings, "Bryn Avon," Callawadda, Victoria, Australia.

G-5SO: A. M. C. Christian, 270, New Chester Road, Port Sunlight (new address).

G-6NR: R. S. Roberts, 92, Arlington Road, Camden Town, N.W.1.

LA-IE: Lorentz Johnsen, Kalfarvel 59, Bergen, Norway.

A-3QH: J. H. Feldman, Forrest Street, South Geelong, Victoria, Australia.

R-GA2: G. Sarbach, Venado Tuerto, Argentina.

CH-2AR: Carlos Reiher, Casilla 3,062, Valparaiso, Chili.

TUK: Tomsk University, Tomsk, Siberia.

G-6HT: A. E. Marlow, Penn Road, Penn, Wolverhampton.

G-6CL: J. Clarricoats, 107, Friern Barnet Road, London, N.11.

QSL Cards Held

We now have cards addressed to the following, and will be glad to forward them on application:—

POLL, N-0RP, GBM, N-2PZ, G-5UQ, 2LF, 2IA, 6EP, 5SO, 6XI, 2ZA, 2OO, 5JX, 2UD, 5FQ, 5RB, 6BD, 5TD, L-1AG, L-1JW, RRP, U-1AI, SMUV, I-1AF, BE-1AX, TPAI, Y-1CD, A-5KN, SS-8LBT, D-PK7.

FROM OUR READERS

Charged Rain

SIR,—I have read, from time to time, letters from readers on the subject of electrically charged rain. I had a rather striking example of this, yesterday night.

I was experimenting with a 2-valve set (1-V-O), when a sudden shower came making listening impossible, as it created a loud roar in the 'phones.

At first I did not suspect the rain, but thought it might be the H.T. Battery. I therefore took off the A and E terminals while wondering where the money for the new H.T.B. was coming from.

To my surprise the noise stopped at once, but accidentally touching the aerial wire I noticed a small spark jump from my finger to the wire (or rather from the wire to my finger)!

On touching the AE and E leads I drew a spark about 1 mm. in length.

With best wishes to R.P.

Yours faithfully,

E. PHILIPS ALLEN.

Radcliffe-on-Trent.

Hints and Tips

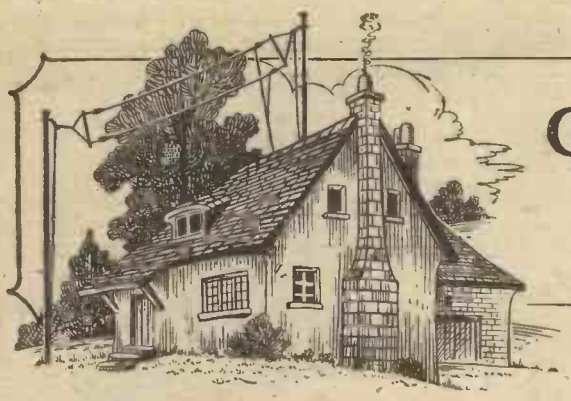
SIR,—Is an ordinary reader of WIRELESS, with no technical knowledge above the average, permitted to suggest what he thinks would be an improvement in your book? If so, I should like to suggest that you continue to give space to the short constructional hints and tips which are so very useful to people like myself.

The depth of my pocket prevents me buying all the components I want to use in my experiments and so I find the articles referred to extremely useful.

I remain,

Yours faithfully,

London, W.6. A. D. SCARDON.



Getting the Best Results from the "Superhet" Adapter

By L. H. THOMAS

AS was mentioned in the article describing the "Superheterodyne Unit" for use on short waves, successful loud-speaking with a set of this type depends more on the method of operation of the set than upon the initial construction. Assuming that the reader has followed the layout given by the diagrams and photographs, the following procedure should be adopted.

Interconnections

First, remove the by-pass condenser, if one is in use, from the short-wave receiver. Connect the "Input" terminals of the superheterodyne unit to the telephone terminals on this receiver, taking care not to reverse the polarity, as instability will often result. Should the polarity of the terminals on the unit not have been marked, the positive one is, of course, that connected to the side of the filter transformer marked "H." Connect a six-volt accumulator across the L.T. terminals, the fixed resistors making provision for the correct potential to be applied across the filament of each valve, if the valves suggested in the previous article are used. (These were: three of the .06-ampere type for the I.F. amplifiers, and two of the 4-volt power type as the second detector and L.F. amplifier.)

Battery Leads

The negative side of the H.T. battery is connected to the positive L.T. terminal, and the three positive H.T. terminals are connected as follows: H.T. 1 (I.F. amplifiers), 60 volts; H.T. 2 (second detector), 45 volts; H.T. 3 (note-magnifier), 90-120 volts. For grid bias about 9 volts should be used, if the anode voltage of the note magnifier is as high as 120 volts. With 90 volts on the anode, about 6 volts grid bias will probably be quite sufficient.

The first rheostat (on the left-hand side of the panel) should be placed in the "full-on" position, when the potential across the filaments of the I.F. amplifiers will be exactly 3 volts. The second and third rheostats should be switched on more carefully, or the emission of the filaments they control is liable to be impaired. As no fixed resistor has been placed in the filament circuit of the note-magnifier, a valve of the D.E.5 type may be employed if desired, nearly all the resistance being cut out of circuit.

First Steps

For the initial tests it will probably be preferable to wear headphones and leave the note-magnifier out of circuit. The telephones are therefore connected across the two upper right-hand terminals. With the potentiometer as far away from the negative end as it can be placed before the set goes out of oscillation (i.e., with the set just oscillating), tune in a C.W. signal on the short-wave receiver. Then adjust each of the small condensers incorporated in the intermediate frequency transformers until the maximum possible signal strength is obtained.

It is, of course, well known that every station tuned in will be heard on two separate settings of the dial of the short-wave set, on account of the fact that a beat note may be produced with either the upper or lower "channel" of the station. This effect may be rather confusing at first, but the operator soon becomes accustomed to it. Another effect that one needs to get used to, if there is any form of reaction control on the short-wave receiver, is that signals are just as strong when the initial detector is oscillating hard as when it is in the condition in which it is normally employed for C.W. reception. For this reason it is unnecessary to use any form of reaction control on the short-wave receiver, except for the purpose of preventing it from bursting into an audio-frequency "howl."

In view of the controversy on the subject of "echo or no echo" it is interesting to note that the newer studios show a marked decrease in the amount of draping used on the walls and ceiling.

Using the Loud-Speaker

When the loud-speaker is used no alteration in the operation of the set should be apparent, provided that the by-pass condenser across the L.F. transformer primary is of suitable size, and that the L.F. transformer is correctly connected. It will probably be found impracticable to operate the loud-speaker on the same table as, or very close to, the receiver, on account of the great degree of amplification obtained; if the valves tend to be at all microphonic a continuous howl will most probably occur, even if valve-holders of the non-microphonic type are used. This, however, is not a serious disadvantage, since it is rather uncomfortable for the operator to have the loud-speaker too close to him! The writer uses his almost on the opposite side of the room.

A Critical Factor

The only other point worth mentioning is that the filament voltage of the second detector may be found very critical. In the writer's case the best results are obtained with the valve working just *below* its rated voltage.

JOTTINGS BY THE WAY

(Continued from page 88)

which has the effect of minimising gassing. The main component of this circuit is an on-and-off switch. The off position produces occasionally the most soothing effects.

Q.—I suppose that you have some wonderful things up your sleeve, Mr. Wayfarer?

A.—Only this afternoon I killed two mosquitoes who were making their way there, and despite your good wishes I sincerely trust that there is nothing else. If, however, you mean to inquire whether the Professor and I will shortly startle the world with some epoch-making new invention, I may state quite definitely that the answer is in the interrogative.

Q.—May I ask one more question?

A.—No.

WIRELESS WAYFARER.

RESULTS OF "CARTOONIGRAFS" COMPETITION

No. 6.—THE PIRATE BOLD.

FIRST PRIZE: The pirate of old—we must say
Had the pluck this device to display
But the wireless fee dodger
Flies no "Jolly Roger"—
It's the "press gang" that gives him away.

A. HALLAS, 46, Imperial Road, Bulwell, Nottingham.

SECOND PRIZE: ***As he searches the "main" and relay.***

H. PEACOCK, 11 M.Q., R.A.F., Netheravon, Wilts.

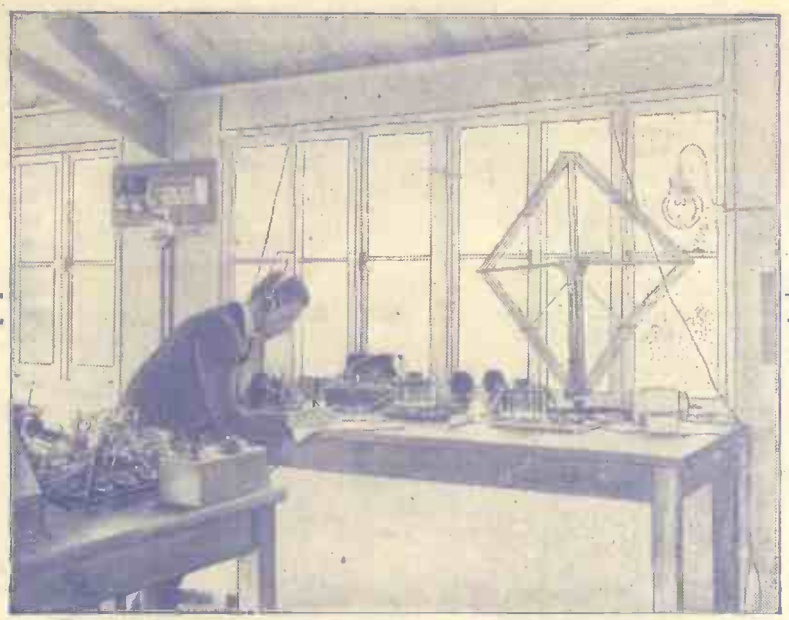
THIRD PRIZE:
Though he'd still "sweep the waves"—without pay.

H. DAWSON, 16, Monument Street, Peterborough.

CONSOLATION PRIZES:—The following fifty competitors have each been awarded a Consolation Prize, consisting of three Radio Press Handbooks or Envelopes, each book or envelope not exceeding 2s. 6d. in price. Will those readers whose names appear below, please communicate their choice by letter to the Editor, WIRELESS, Radio Press, Ltd., Bush House, London, W.C.2, marking the envelope "Consolation Prize"? Lists of Radio Press Handbooks and Envelopes will be found on page 106.

J. Williams, St. Mary's School, Garth Road, Bangor, N. Wales. **Rev. W. Bredin Naylor**, The Rectory, Fintona, Co. Tyrone, N. Ireland. **B. F. Ford**, The Green, Harleston, Norfolk. **Roger Davies**, Tre-Mor, Mackworth Road, Porthcawl, Glam., S. Wales. **A. Smith**, 165, Invicta Road, Sheerness-on-Sea, Kent. **F. A. George**, 40, Bell Street, Edgware Road, N.W.1. **F. G. Howland**, 68, St. Peter's Place, Canterbury. **J. K. Dewar**, 430, Mosspark Drive, Mosspark, Glasgow. **E. G. Jones**, 261, Tooley Street, London, S.E. **L. Willats**, 5, Sistova Road, Balham, S.W.12. **J. W. Ward**, 6, Howarth Street, Beresford Street, Liverpool. **A. Ellis**, 26, Cooksey Avenue, Small Heath, Birmingham. **R. J. Mobey**, 6, Gloucester Terrace, Swindon, Wilts. **M. Joseph**, 114, Alexandra Road, Hampstead, N.W.8. **William Carey**, 39, Bulverhythe Road, St. Leonards-on-Sea, Sussex. **James Jewell**, 7, Ranelagh Gardens, Ilford, Essex. **Cpl. W. Mockford**, Cpl.'s Room, R.A.F. Depot, Henlow Station, Beds. **C. Ashton**, 9, York Place, C. on M., Manchester. **J. H. Hollier**, 16, Merchant's Road, Clifton. **R. B. Starford**, 16, Queen's Drive, Broad Green, Liverpool. **George Marley**, 92, High Street, Byers Green, Spennymoor, Co. Durham. **M. W. Killeen**, 12, Church Street, Harpurhey, Manchester. **C. P. Clark**, 194, Kennington Road, S.E.11. **H. J. Allen**, 1, Clifton Avenue, Finchley, N.3. **William Hall**, 22, Greenlaw Avenue, Paisley, Scotland. **T. Howarth**, 9BK, Regent Street, Rochdale. **C. L. Sheasby**, 13, Tew Park Road, Handsworth, Birmingham. **Miss Ivy Grignon**, 135, Brightwell Avenue, Westcliff-on-Sea, Essex. **Wm. A. Goad**, 43, Rolt Street, S.E.8. **G. Y. Lumley**, 4, Greenclose Road, Whitchurch, Glam. **E. G. Dillaway**, "Lynton," Bath Road, Maidenhead, Berks. **A. G. Good**, 44, Mortimer Road, East Ham, E.6. **Thomas A. Smith**, 27, Patrick Street, Greenock, Scotland. **J. W. Higgs**, Nash Road, Thornborough, Buckingham. **E. Bilton**, 18, Granville Street, Hull. **John Schofield**, 130, Gas Street, Failsworth, Manchester. **R. W. Burns**, Field Head, Wakefield. **Oliver Benson**, 59, Downing Street, Farnham, Surrey. **W. Lupton**, 6, Wharton Terrace, West Hartlepool, Durham. **S. H. White**, 46, Central Road, Wembley, Middlesex. **W. G. Ireland**, 35, Rostrevor Avenue, Stamford Hill, London, N.15. **W. Sharpe**, President's House, Trinity College, Oxford. **A. Nevines**, 246, Meanwood Road, Leeds, Yorks. **D. S. Brooker**, 26, Rose Alley, Bishopsgate, E.C.2. **H. M. Pollard**, 14, Victor Road, Heaton, Bradford. **J. H. Bluestone**, 21, Claremont Avenue, Blackpool. **W. J. Offord**, 27, Greyhound Mansions, Hammersmith, W.6. **N. Lukey-Davies**, 75, High Street, Mountain Ash, Glam. **J. L. Stephens**, 43, Devonport Road, Shepherds Bush, W.12. **Robt. A. Millar**, 12, Whitethorn Avenue, Levenshulme, Manchester.

No. 37. **"The Tables Turned!"**



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