

# NEXT WEEK! BIG CHRISTMAS NUMBER AND FREE BLUE-PRINT OF THE HALLMARK THREE!



EDITOR:  
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## ROUND *the* WORLD of WIRELESS

### Next Week's Big Christmas Number

Next week's big Christmas Number captures and reflects the very spirit of the Festive Season. Excellent as our past Christmas numbers have been, this surpasses any of our previous efforts. In addition to the galaxy of special features which constitute our Christmas pie we shall also include with every issue a full-sized blueprint of the latest receiver to be produced in connection with our low-price campaign. This receiver we have named the **HALLMARK THREE**, a cognomen which aptly applies to its performance as well as to the high-class components from which it is built; but most important of all, the price for Kit A is 45s. only. The circuit is ultra modern and nothing has been sacrificed in order to get the cost down to this absurdly low figure.

### School Choir's Broadcast

THE Mountain Ash Central School Choir, conducted by T. W. Griffiths, will give a musical interlude in the feature, "Orig Hapus," for West Regional listeners, on December 4th. The choir is particularly pleased that this broadcast—the first—comes before the retirement of the headmaster of the school, who leaves at the end of the term after occupying the position for over twenty-seven years.

### Midday Concert from Manchester

RECENTLY returned from an American tour, Joseph Schuster, the famous German 'cellist (formerly principal 'cellist in the Berlin Philharmonic Orchestra under Furtwangler), will provide the Manchester Tuesday Midday Society's concert on December 4th, which will be relayed to North Regional listeners from the Houldsworth Hall, Manchester.

### Coquettale and Its Songs

ON December 4th Archie Armstrong, the well-known Newcastle baritone, will give a recital of Coquettale fishing songs from the North Regional, and preceding this Percy Mail, who is familiar to listeners as a naturalist, will speak of the Dale and its songs. The River Coquet runs through some of the most beautiful parts of Northumberland and is stocked with salmon and trout; the words of the inevitable fishing songs were written some eighty years ago and set to traditional airs.

### SPECIAL DOUBLE GIFT BOOK OFFER

Will Readers who have been collecting the Gift Tokens for their Presentation Volume(s) of

THE WIRELESS  
CONSTRUCTOR'S ENCYCLOPÆDIA  
and/or  
EVERYMAN'S WIRELESS BOOK

please note that the **LAST GIFT TOKEN, No. 6**

(provided they started collecting from the first announcement of this offer, see below\*)

appears on the back cover of **THIS** issue of

**"PRACTICAL WIRELESS"**

Will readers who are taking advantage of this wonderful offer affix the last Gift Token to their Subscription Voucher and forward the completed Voucher in accordance with the instructions thereon, TO-DAY.

### PLEASE DON'T DELAY

As announced last week, all applications will be treated in strict rotation. If you do not receive your volume within 15 days of the despatch of your application—notify by postcard, giving date application was made.

NOTE.—Carefully read instructions on your Subscription Voucher and make sure it is properly filled in before forwarding.  
\* This will not be your last Gift Token if you did not start collecting until after the first announcement—in which case you continue to collect until you have the necessary six Gift Tokens attached to your Subscription Voucher.

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"Double Gift" Presentation Department,  
14, SOUTHAMPTON STREET,  
STRAND, LONDON, W.C.2.

Any query regarding this offer must be accompanied by a stamped addressed envelope for reply.

### Problems of Amateur Drama

THE well-known Derbyshire playwright, L. du Garde Peach, is to broadcast the six remaining North Regional talks in the Problems of "Amateur Drama" series. Whereas Mrs. Joan Abbott, who opened the series, treated of acting, Peach is to speak of production; and his first subject, to be dealt with on December 4th, is "The Stage and its Setting."

### Talk on Underground Britain

CONTINUING the North Regional talks series called "In Search of Underground Britain," Pat Forrest, journalist and former Durham miner, will describe on December 5th a visit to a Lancashire colliery.

### Schools' Musical Festival

ONE hundred and twenty-six schools have entered for Birmingham's first Schools' non-competitive musical festival in the first week in December, the singers totalling over five thousand. The closing concert, to be given by senior choirs, is to be relayed from the Central Hall, Birmingham, to Midland Regional listeners on December 6th. Dr. Geoffrey Shaw, who is to conduct, is His Majesty's Chief Inspector for Music; he is also an active supporter of the Staffordshire and Worcestershire Schools' Festival.

### Henry Hall's Christmas Programme

HENRY HALL is arranging several interesting features for the Christmas season, and on December 22nd there will be a Guest Night, with a seasonable presentation of London stage stars as Henry Hall's guests. December 24th will bring a feature programme for the children. The Dance Orchestra will make merry, and play tunes for games and also dance music. Comedy numbers will be much in evidence in this programme, and Henry Hall will draw on his experiences as a father to give the kiddies the sort of entertainment that the youngsters like at this season. On December 25th, from 7.30 to 9.30, a Christmas Party programme will feature Christmas festivities, comedy numbers, stunts by the band and dance music. The late period, from 9.40 onwards, will be given over to straight dance music.

# ROUND the WORLD of WIRELESS (Continued)

## The Leeds Symphony Orchestra

THIS famous orchestra, conducted by John Barbirolli, will be heard from the Town Hall, Leeds, by Northern listeners on December 1st. With Egon Petri as piano soloist they will give a programme which includes Handel's "Overture in D minor," "Concerto No. 5 in E flat," by Beethoven, and two of Delius's works—"The Walk to the Paradise Gardens" and "A Village Romeo and Juliet."

## Hungarian Gypsy Band

ON December 17th this band, conducted by George Garay, will broadcast for the first time from the Hungaria Restaurant. It should be interesting to note the reaction of listeners to this unusual type of orchestra.

## Birmingham Philharmonic Orchestra

WALDO WARNER'S arrangement of Sir Arthur Crossfield's suite for strings, and Rutland Boughton's Three Folk Dances are in the Midland Regional programme to be given by the Birmingham Philharmonic String Orchestra on December 2nd, Johan Hock conducting.

## "Village Wooing"

THE first broadcast of the Shaw play, "Village Wooing," will be given on the National wavelength on December 3, and from the Midland Regional the following evening. The play is to be relayed twice from the Malvern Festival Theatre, by arrangement with Roy Limbert, founder of the Repertory Company there. The play was first performed in Texas. It consists of three conversations between a novelist and a strong-minded young woman, and has two scenes—the deck of a liner and a village shop. R. Lindsell Stuart produces and plays the part of the novelist. Phyllis Gill plays opposite him. Mr. Lindsell Stuart is an Amateur International "Soccer" player. Miss Gill was with Newcastle, Liverpool, and Rochester Repertory Companies and toured in South Africa as Godfrey Tearle's leading lady.

## New Studio Revue

ON December 4th, a new Studio revue, "Ye Olde Antique Shoppe," will be broadcast to Midland Regional listeners. It is concerned with the history of the curios displayed in a shop which has been bequeathed to two sisters. Charles Hatton, author of "Suicide Party" and the revue, "White Sails," has written the book and lyrics; Michael North, the music; and Constance Needham and Hilda Birch play the parts of the two sisters.

## Ross-on-Wye Orpheus Society

A CONCERT given by this Society in the New Theatre, Ross, is to be relayed on the Midland Regional wavelength on December 5. Frederick Parsons, the honorary conductor, has chosen an interesting programme, including Elgar's "As Torrents in Summer." The soloists are W. H. Reed, leader of the London Symphony Orchestra, and Cuthbert Reavely (baritone), who sang in opera on the Continent as "Carlo Rivoli."

## INTERESTING and TOPICAL PARAGRAPHS

### "In Manuscript"

A SERIES of West Regional programmes of unpublished works by Welsh musicians, under the general title, "In Manuscript," is arousing a great deal of interest. Hitherto the works chosen

have been solo and instrumental, but later it is hoped to include items for choirs. The third of the series will be given on December 3, when the artists will be Francis Russell (tenor) and the Cardiff Ensemble.

### "The Roosters" in Birmingham

IN the provinces the celebration of the Centenary of the Ancient Order of Foresters Friendly Society includes a pilgrimage to the grave of Little John at Hathersage, Derbyshire, a mass meeting in Nottingham, and a concert in Birmingham. In the latter event, the famous old wartime concert party, "The Roosters," will appear on December 8 in their original sketches and songs. The concert will be relayed to Midland Regional listeners.

### "Bluebeard"

THE B.B.C. announce that Gordon McConnell has started work on the Christmas Radio Pantomime, "Bluebeard." This production, on December 26th and 27th, will be in a way a period one, as it will definitely aim at the Drury Lane show of 1901, the book of which production by J. Hickery Wood is being used. In this Dan Leno was the dame—Sister Anne. His part in the radio version will be played by Leonard Henry, and the famous "ping pong" game, in which Sister Anne will not keep any of the rules, is being put over. The radio version will have the wit and wisdom but not the bloodshed of the Drury Lane show.

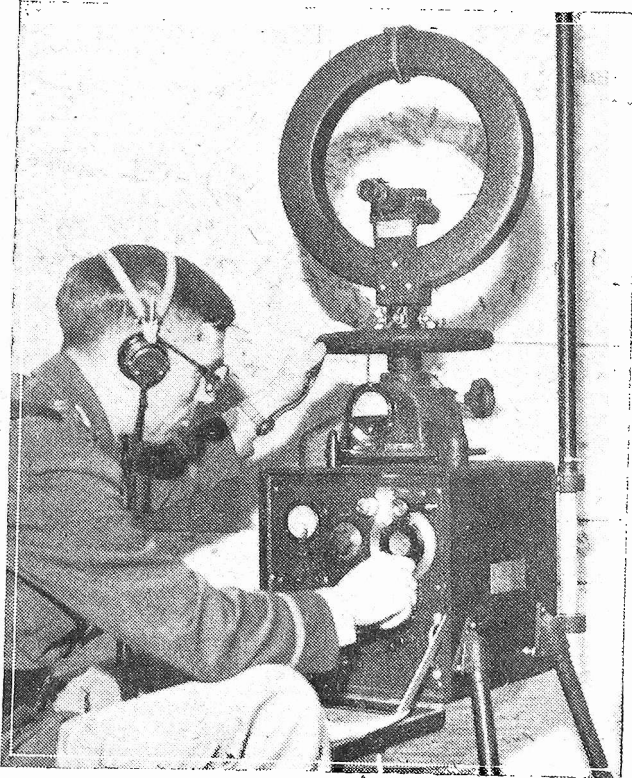
### Novel Programme from West Regional

"HOLD the Line, or Anywhere for a Shilling" is the title of a novel programme which will be broadcast on December 5th for West Regional listeners. A number of three-minute calls are put through to different parts of the West Country, and the subscribers include Kitty Adams, Dorothy Holloway, George Holloway, Brian Gaye, Beryl Tichbon, and Norman Jones.

### Anniversary of Famous Naval Battle

THE Battle of the Falklands—the only decisive Naval victory in the World War—will be recalled on its twentieth anniversary, December 8th, in a North Regional talk. The speaker, who uses the pseudonym "Escadrille," is a Naval officer who was serving in H.M.S. "Cornwall"—the ship which sank the "Leipzig"—at the time of the action.

## DIRECTION FINDING IN U.S. ARMY



A new type of portable radio direction finder used by the U.S. Army. The set has a frequency of from 400 to 14,000 kilocycles.

## SOLVE THIS!

### PROBLEM No. 115.

Jackson had built a super-heterodyne receiver, which, although it gave fairly good results, was rather troublesome on account of the occurrence of whistles throughout the tuning range. He decided that it would be preferable to modify the intermediate-frequency, and accordingly modified the windings on his I.F. transformers, and fitted a separate tuning condenser to the oscillator stage so that he could accurately adjust the oscillator winding. He found, however, that instead of being improved, he could now hear a French station all over the tuning dial. Why was this? Three books will be awarded for the first three correct solutions opened. Envelopes must be marked Problem No. 115 and must be addressed to the Editor, PRACTICAL WIRELESS, George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2, and must be posted to reach here not later than the first post on Monday, December 3rd, 1934.

### Solution to Problem No. 114.

Rogers had not gained any step-up by connecting his transformer in the manner described. In fact there was a transference of energy from the speaker lead (primary) to earth (secondary) and this gave a slight loss of volume. The following three readers successfully solved Problem No. 113 and books have accordingly been forwarded to them:

Mr. J. W. Filer, 24a, Brickgarth, Easington Lane, Co. Durham; Mr. R. S. Newbury, 141, Woodgrange Road, Southend-on-Sea; Mr. A. Foulkes, 6, Bromyard Avenue, Acton Vale, W.3.

## NEXT WEEK!

## BIG CHRISTMAS NUMBER!

Many Topical Features and  
FREE BLUEPRINT OF THE  
HALL-MARK THREE  
A low-price receiver at trifling cost!

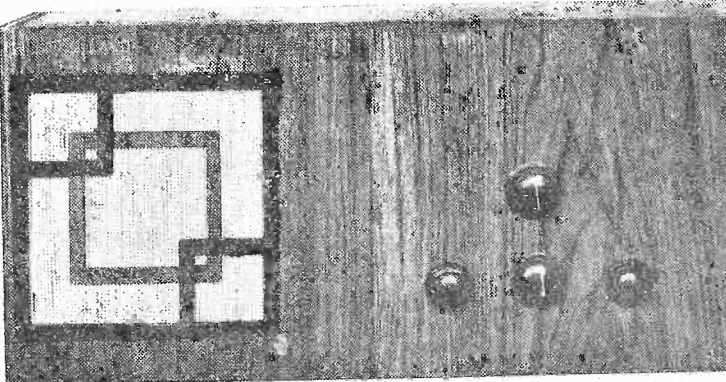
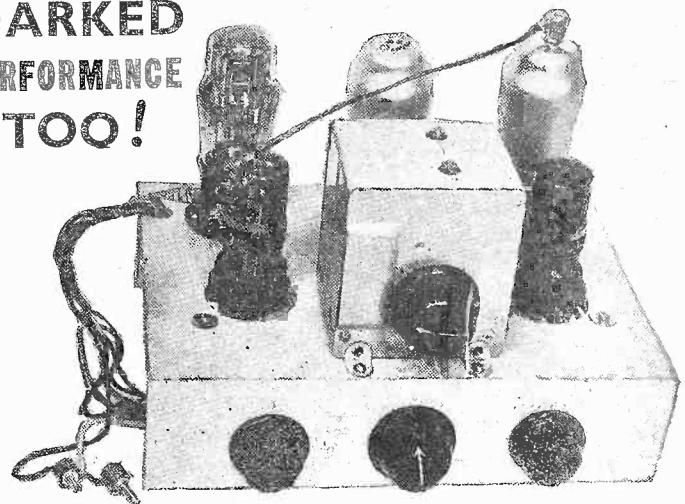
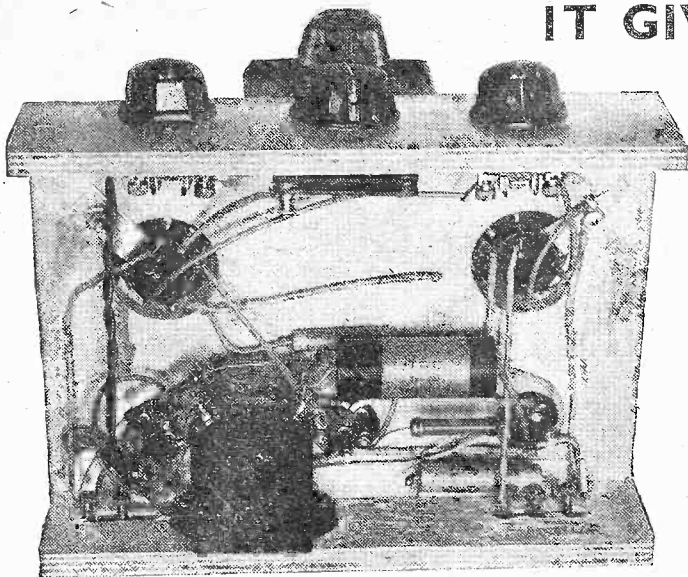
**OUR LOW-PRICE CAMPAIGN**

**ANOTHER FREE BLUEPRINT NEXT WEEK!**

**THE HALL-MARK THREE**

Preliminary Announcement Concerning Our New Low-price Economy Receiver, which Costs just over £2 and yet Employs a Modern Circuit and High-class Components—Hence Its Name!

**IT GIVES A HALL-MARKED PERFORMANCE TOO!**



These three photographs show the neat, compact, and simple lay-out of the Hall-Mark Three.

brought to fruition we shall place the necessary details before our readers. In this new three-valve receiver we have considerably cut down the initial expenses and yet have specified British-made valves; every possible expense has been saved. The receiver is ideal for those who wish to build a Christmas present for less fortunate friends, or for those who want a good stand-by receiver upon which the family may listen whilst experiments are being carried out on other pieces of apparatus.

Full constructional details will be given next week in our

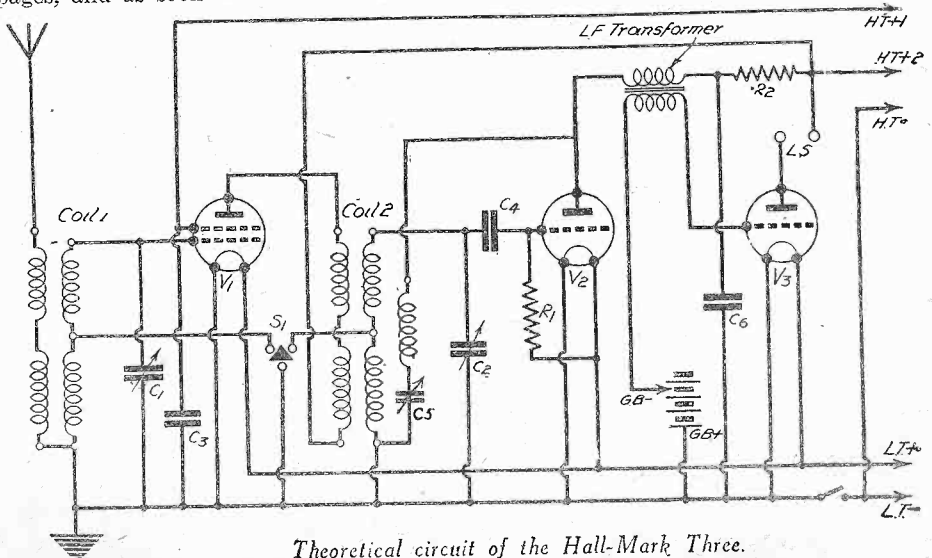
**A**LTHOUGH thousands of readers have written to thank us concerning the introduction of the £5 Superhet Three, there are many, judging by our correspondence, to whom the sum of £5 represents too great an amount to be expended on a wireless receiver. There are, of course, many listeners who do not want such a powerful type of receiver as a superhet, and who are quite satisfied with the local stations at good volume, and the ability to hear most of the more powerful continental stations when the home programmes are not to their liking. Obviously, therefore, this class of listener may be catered for by means of a quite economical receiver; and in furtherance of our Low Price Campaign, and to meet the demand called for by the above-mentioned listeners, we are next week publishing details for the construction of a new three-valver.

As may be seen from the above announcement, the receiver will be known as the Hall-Mark Three, and it will be an Economy Receiver in every sense—initial cost and upkeep cost. The illustrations accompanying these notes will give you an idea of the neatness of the receiver, as well as the simplicity of the complete apparatus. For those who can read a circuit diagram, the details of the receiver will be fully apparent. The popular S.G. detector, and power combination of valves is employed, and the minimum of components has been incorporated.

Although we have only recently issued a blueprint (of the Superhet Battery Three) we make no apology for again producing another receiver, as this new model is designed for those readers who did not wish to avail themselves of the superheterodyne

receiver. We are continually experimenting with a view to introducing new ideas in our pages, and as soon as a scheme has been

greatly enlarged Christmas Number, which will be on sale on Wednesday next, price 4d.



Theoretical circuit of the Hall-Mark Three.

# The Future of the Superhet

In This Article it is suggested that the Future Superhet Might Have Only Two (or Even One) Valve. By FRANK PRESTON

THERE is very little doubt that the superhet has at last come to stay—at least for a number of years. I say “at last” because superhets have been “fading” in and out of popularity for the past ten years at least. Many difficulties were experienced in connection with the earlier receivers of this type, and it was a long time before they were able to demonstrate quite clearly that they were able to give reproduction perfectly as good as that to be obtained from any other type of circuit. The fault—if such it may be termed—which survived longest was that a comparatively large number of valves was required. That this obstacle has now been broken down is clearly illustrated by the introduction of the “£5 Superhet Three,” which, although having only three valves, comprises all the stages which are necessary in a modern, high-grade superheterodyne receiver. It can be said, without fear of contradiction, that this latest “Practical Wireless” receiver represents the ultimate in the way of superheterodyne simplicity and reliability capable of being built with the available components.

## Multiple Valves

But just as the number of valves required for a superhet has gradually been reduced from eight or more (as many as sixteen valves are used even to-day in certain American superhets) down to three, so is there every possibility that in the future the number will be still further decreased. At first glance such a change might seem impossible, but some wonderful improvements have been effected in the design of British valves of late. In addition to the value of multiple valves, however, it is well to bear in mind the possibility of “reflexing”; that is, using one valve for both high- and low-frequency amplification. This system was very popular some ten years ago, and there is every possibility that it might be revived in the near future. Even in the past it was possible to obtain some quite good results with reflex circuits, but conditions are now far more favourable, present valves and components being far superior to their prototypes.

## Reflexing

I have recently carried out a number of interesting experiments with modern reflex circuits, and, as I pointed out in the article

entitled “Reflex Circuits for the Experimenter,” published in the issue of this journal dated September 1st, 1934, very promising results have been obtained. Also, in the issue dated November 24th, I described a two-valve reflex superheterodyne suitable for short-wave reception, and there is no reason why this should not

paying careful attention to the values of the coupling components and of the G.B. voltage. The arrangement is obviously a compromise, but it is a very good compromise, and possesses no serious faults.

## Two Pentagrids

There is a rather different direction in which the superhet may develop in the future. I refer to the use of two valves of the pentagrid, heptode, or octode variety, of which one is used as first detector and oscillator, the second being employed for I.F. amplification, second detection, and L.F. amplification. This sounds rather too much to ask or to expect, but a circuit somewhat on these lines has actually been used commercially on the Continent. I do not claim to have experimented with such an arrangement myself, but I do intend to do so, for the scheme opens up a new and interesting field. Moreover, if it proves practicable, the circuit will be very adaptable for use in portable receivers, since it can be made extremely compact and need not be too expensive.

In case any reader would like to interest himself in the suggested scheme the general circuit arrangement is given in Fig. 1. It is not claimed that this will give good reception, but there appears to be no reason why it should not be developed. The first difficulty which arises is in connection with the possible interaction between the three stages confined within the second valve because, as is well known, this type of valve is designed to give electron mixing. But

this need not necessarily prove to be a difficult obstacle at the comparatively low frequency at which the valve functions.

There is a third method by which the number of valves in a superheterodyne might be limited to two; by using a multiple valve of the driver class B type as I.F. amplifier, second detector, and L.F. amplifier. The connections for this valve would be approximately as shown in Fig. 2, where

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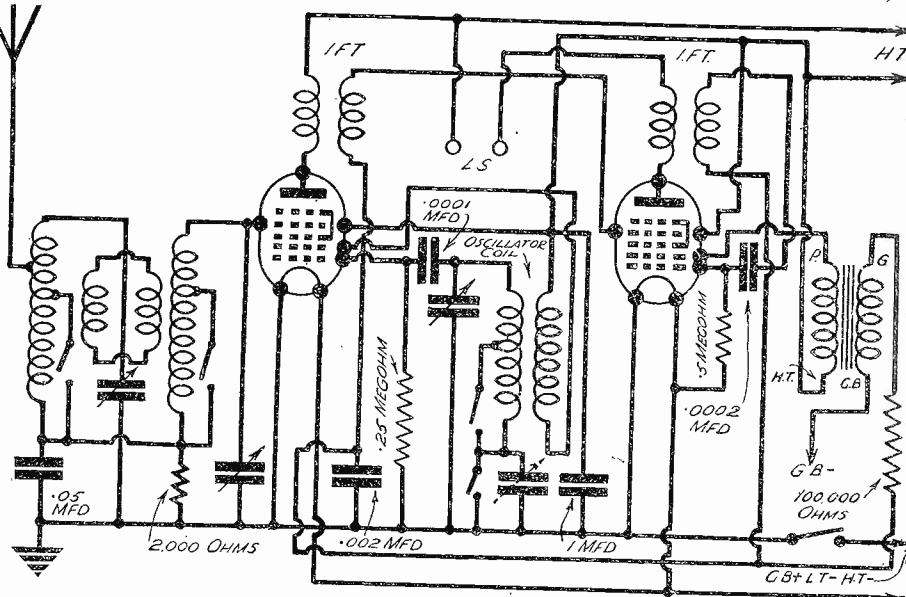


Fig. 1.—The rather unusual two-valve superheterodyne referred to on this page, and suggested as a basis for experiment.

be modified for broadcast use, by using a pentagrid in place of the pentode first detector-oscillator. The general arrangement of the set would be similar to that of the short-waver described, with the exception that a band-pass filter would be required between the aerial and the modulator grid of the first valve, and standard 150-kc. I.F. transformers would be used for coupling the intermediate-frequency stages. Another modification which is well worth a

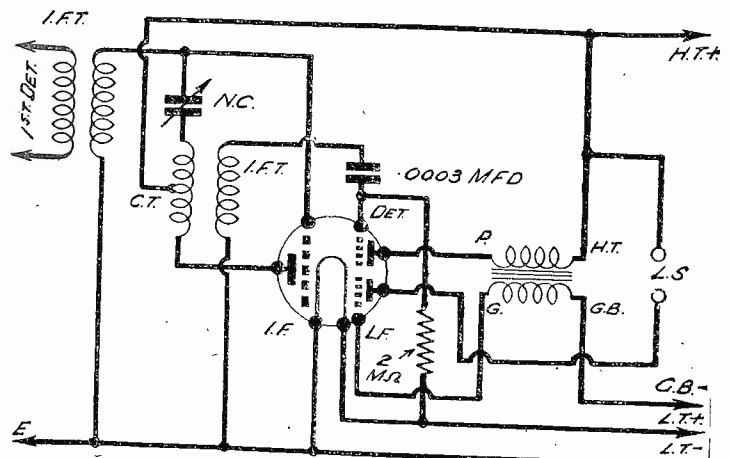


Fig. 2.—Another futuristic suggestion for using a driver class B valve for I.F. amplification, second detection, and L.F.

# Whistle Interference

How Whistles are Caused and Simple Methods of Curing Them

By W. J. DELANEY

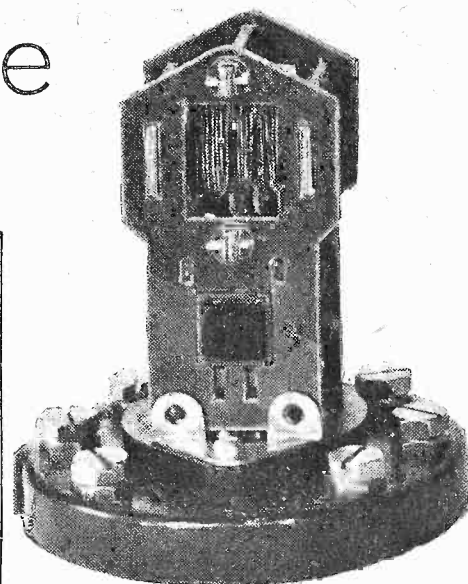
**M**ANY worth-while programmes are spoiled for the majority of listeners owing to the accompaniment of whistles which are received with the signal. This trouble is very prevalent in the neighbourhood of a transmitting station when the receiver in use is of the superheterodyne type, but it may also be experienced when only a simple receiver is being used. The latter interference is generally due to the fact that the received station is working on a wavelength very close to another station, and the side-bands of the two stations overlap and set up a separate note, an effect which most listeners now know as a heterodyne. Those readers who have studied the superheterodyne circuit know that it makes use for its efficiency of a special circuit which is tuned to a frequency slightly different from the desired station, and that this circuit is coupled in such a manner that the oscillations from it beat with the oscillations from the desired station, and a completely different frequency is generated from the difference between the two frequencies. This heterodyne may be caused outside the receiver and was at one time very troublesome in the European ether, although the recent Lucerne scheme has done a great deal to eliminate it. On the long waves, however, some whistling is still

not possible to design a receiver of the superheterodyne type which is entirely free in all parts of the country, and very much depends upon the proximity of the nearest transmitting station. The second-channel whistle is caused by the incoming signals from the nearby station beating with either the I.F. frequency or with harmonics thereof. Thus to effect a complete cure it is necessary to prevent the local station from affecting the aerial, a feat which would be found exceedingly difficult.

### Other Whistles

The two forms of whistle which have been mentioned may be said to be the only ones which trouble the user of a modern receiver, and it should be unnecessary to state that the whistle caused by the excessive use of reaction must be cured by a more judicious use of the receiver. On no account should the reaction control be advanced to the point where the whistle is produced. To ascertain whether a whistle is due to your receiver or a transmission it is only necessary to turn the tuning control. If you are oscillating and producing the whistle, the note will vary as you tune to a station, arrive at the exact tuning point, and pass away from it again. The note first appears of a very high pitch, will drop in pitch and intensity as the exact tuning spot is found, and then will rise again in both pitch and intensity when the tuning control is further turned. On the other hand, a second-channel whistle, as well as a heterodyne whistle caused by interfering stations, will retain its note unless the station (or stations) in the case of the latter vary their frequency.

If you are using a superheterodyne, and are not certain whether a whistle is due to second-channel or heterodyne, the following data will enable you to ascertain the cause of the trouble. Ascertain the frequency of your nearest station, and add to that frequency double the frequency used in your I.F. circuits. Now tune to the point on your tuning scale represented by that frequency. As an example, suppose you live somewhere in the London area. The two London stations have frequencies of 1,149 kc/s (National) and 877 kc/s (Regional). Assuming that the I.F. frequency is 110 kc/s, which is the normal value, we should expect to find the most prominent whistles at 1149—(2 x 110) and 877—(2 x 110). This gives us 1149—220 or 929, and 657 kc/s. A glance at the list of European transmissions shows us that a frequency of 929 kc/s falls between Brno transmitting with a frequency of 922 kc/s, and Brussels No. 2 with a frequency of 932 kc/s, whilst 757 kc/s coincides practically with Cologne (Langenberg) on 658 kc/s. The latter station is immediately above the North Regional (668 kc/s) and is therefore readily identifiable, whilst the second-channel whistle from the National station will be located just above Poste-Parisien. The North Regional and Poste-Parisien transmissions are mentioned as they are well received by even a modest receiver and form more readily identified points



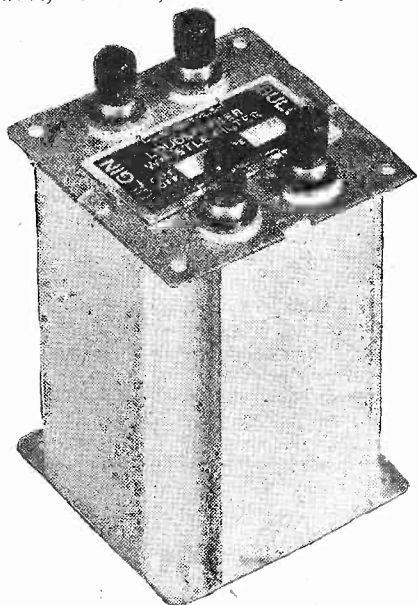
The Goltone Whistle Filter

than the other stations. This second-channel problem is, of course, one good reason for selecting a different frequency for the I.F. stages, although it is not such a simple problem to select one which will not bring its whistles in the range of the normal tuning band.

### Curing the Whistles

However, having located the cause of our whistles, the next problem is to get rid of them. If only a heterodyne whistle spoils your reception, the simplest cure, and, in fact, the only one, is to filter it out by means of a tuned circuit. The arrangement is exemplified in the tone control circuit employed with a pentode valve for a similar purpose, although in the case of the heterodyne whistle we have a little more difficulty. Obviously, the removal of the whistle will also remove all musical frequencies of that frequency and above, and consequently the filter must be so designed that the cut-off point is most accurately located. It is of little use arranging to introduce a filter (to cut off frequencies above, say, 4,000 cycles and then to erect such a filter only to find that it exerts a gradual attenuating effect from about 1,000 cycles upwards. Probably the simplest solution is to purchase one of the specially-designed filters sold by Messrs. Wearite, Bulgin, or Ward and Goldstone. These may be obtained to have cut-off points at any desired frequency, and they may be relied upon to do their job thoroughly. A 1 henry choke and some condensers arranged as shown below

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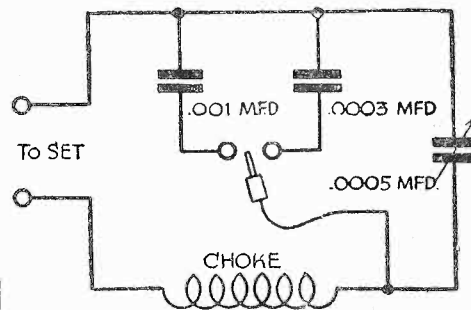


Another form of commercial heterodyne whistle filter.

very evident on each side of Droitwich, but no doubt this will be removed in due course. On the medium waves there is very little trouble from this cause, the principal points of trouble being found to be due to commercial stations as distinct from broadcasting stations.

### Second-channel Whistles

Those readers who have built the Superhet. Three, in either the battery or A.C. types, may find that it is particularly free from second-channel difficulties in most parts of the country. Unfortunately, it is



Another circuit for a whistle filter, using a 1 henry choke.

# POINTS ABOUT AIR-CORE TUNING COILS

**A**LTHOUGH there are very many high-class commercially-made tuning coils, of both the air-cored and the iron-cored types available for the constructor to incorporate in sets, many amateurs prefer to make their own. This is not wholly due to the fact that the home-made article is cheaper, but in a great measure can be attributed to the preference of the keen constructor for incorporating as much as possible of his own handiwork in his set.

It is not a difficult matter to design and to make satisfactory solenoid tuning coils.

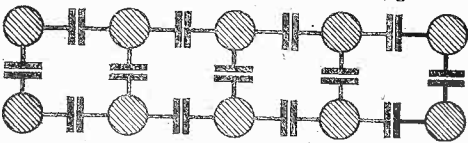


Fig. 1.—Showing how some of the self-capacity effects are distributed in a double-layer coil.

## Principles Involved

In the first place, it must be remembered that the process of tuning, for which, of course, our coils are required, consists in adjusting an electrical circuit until it is in resonance with the signal it is required to receive. The term "in resonance" means that the circuit will accept and build up energy at the desired frequency or wave length, but it is not very sensitive to signals of other frequencies.

A circuit is brought to resonance by the process of arranging that its inductances and capacity are of exactly the correct value. The wavelength to which a circuit is in resonance or "in tune" can be computed from formulae or from special charts. Put into words, we say the wavelength squared is equal to a constant times the product of the inductance in microhenries and the capacity in microfarads. The expression is only given to indicate that the wavelength to which a circuit is tuned depends upon the values of inductance and capacity.

## Actual Figures

Most readers know that the inductance of a circuit is found chiefly in the coil, and the capacity chiefly in the condenser. It will therefore be clear that if a coil and a condenser of fixed capacity are in association, it will be tuned to one wavelength only. To be able to tune in any wavelength, we must be able to alter either the inductance or the capacity, and in modern radio engineering the tuning is nearly always done by adjusting the capacity by means of a variable condenser.

Actually, of course, it is usual to have one winding on the coil for tuning between 200 and 550 metres, and another winding for the long waves, the "wave-change" switch being used for cutting out the long-wave winding when it is desired to listen on the medium waves. The normal capacity of the average tuning condenser is .0005 mfd. at maximum setting, and it is not a very difficult matter to calculate from the expression mentioned previously the correct inductance for a medium-wave coil tuning up to 550 metres using such a condenser, and for a long-wave coil tuning up

## Some Interesting Data Concerning Ordinary Solenoids in which No Iron Core is Employed

to, say, 2,000 metres with the same condenser.

But to assist those who dislike calculations, the approximate values are given below:—

Medium-wave coil—approx. 175 microhenries.

Long-wave coil—approx. 2,000 microhenries.

## Special Points

Before going into the details of winding specifications, we must consider some special points. Not only must our coils be of the correct inductance, but they must be as free as possible from certain sources of losses, which, if present, will seriously affect the efficiency of the receiver, either by reducing the amount of amplification, or by making the tuning "flat" or unselective.

The main things to guard against are first, self-capacity of the coil; and second, high radio-frequency resistance; and we will consider each in turn.

Each individual turn of a coil acts as the plate of a very small condenser, so that the distributed capacity is as shown in Fig. 1. It is necessary for the capacity of a resonant circuit to be due as much as possible to the tuning condenser, where its amount can be controlled. If the distributed capacity of the coil is high, tuning will tend to be flat, and, in addition, much of the signal energy will be shunted away from the tuning circuit through this unwanted capacity, and volume will be lost.

In order to reduce this loss to a minimum it is necessary to take care of two things. First, the H.F. voltage between adjacent turns of the coil must be kept as small as possible. This condition is best met, of course, in the familiar single-layer winding, which should always be adopted for short- and medium-wave windings, as at those comparatively high frequencies the condenser effect is the most serious. In the case of long-wave windings, where the number of turns is so great that a single-layer coil would be impracticable, "bunched" windings are usual, but the winding is usually divided up into several sections in different slots, such as indicated in Fig. 2.

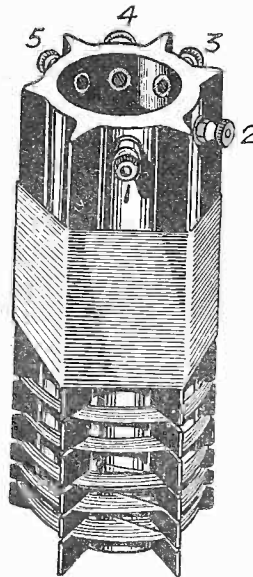


Fig. 2.—A tuning coil showing the long-wave windings divided into sections.

The second point which helps to reduce self-capacity is to keep the amount of solid dielectric (insulating material) to a minimum. For this reason, coils for very short-wave working are usually made self-supporting, and have no formers.

## H.F. Resistance

Next for consideration comes the question of high-frequency resistance. It may seem curious, but it is nevertheless true, that the resistance of a coil, taken under ordinary direct-current conditions, is less than when taken under high-frequency-current conditions. A coil with high H.F. resistance is susceptible to losses, and the damping effect produced results in poor selectivity.

The difference between D.C. and H.F. resistance is mainly due to what is known as "skin effect," which means that, although a direct current may be considered as permeating the whole of the section of a wire, the current distribution of a radio-frequency current is not uniform. The current is confined mainly to the surface of the conductor, as shown in Fig. 3. For this reason, many very efficient coils are wound with "Litz" wire, which consists of a large number of very fine strands, each separately insulated. This wire is rather expensive, and difficult to connect efficiently, and solid wire of fairly thick gauge is quite satisfactory for medium-wave coils. The windings given in this article refer to such wires.

In calculating the windings for coils of various inductances, a number of factors have to be taken into consideration. In the case of radio-frequency coils, the somewhat simple formula which applies to low-frequency coils is not accurate. Unfortunately, no one has been able to discover the true mathematical law which governs coil design, so any calculations must be based on what are known as "empirical" formulae, that is to say, rules of thumb which have been devised as the result of many experiments.

For those who have not the inclination or the time to work out windings for themselves, here are two tried and recommended specifications for medium-wave coils; in

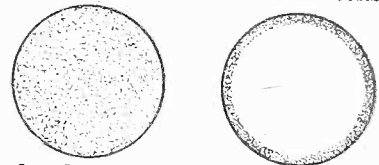


Fig. 3.—Indicating two cross-sections of a conductor, that on the left carrying a steady D.C. current (even distribution of current over the whole section) while that on the right carries an H.F. current (current flow confined to a "thin skin").

each case 58 turns of wire will be wanted. Use No. 28 double-silk-covered wire on a 2 in. diameter former, or No. 24 wire on a 2½ in. diameter former. For a long-wave coil to work in conjunction with the above, wind a total of 260 turns of No. 36 double-silk-covered wire on a 1½ in. diameter slotted former, dividing the turns between four slots, each about ¼ in. deep.

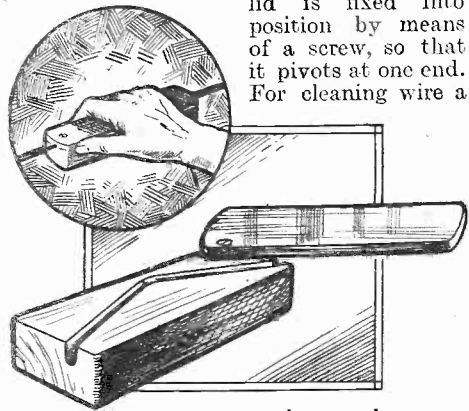


# READERS' WRINKLES

THE HALF-GUINEA PAGE

## A Wire-straightening Device

THE easily-made device shown in the accompanying sketch will be found very useful for straightening wire, and also for cleaning. A piece of hard wood about 6in. by 2in. by 1 1/2in. thick is grooved as shown, the groove being about 3/16in. wide by 3/8in. deep. After this is done a lid is fixed into position by means of a screw, so that it pivots at one end. For cleaning wire a

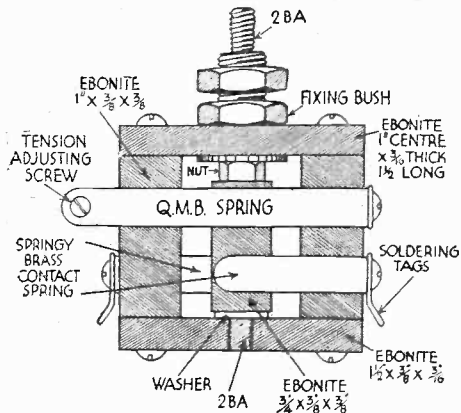


An effective wire-straightening device.

strip of emery cloth is pressed into the groove, but for straightening wire this is not necessary.—G. W. ARNOLD (New Barking).

## Making a Q.M.B. Switch

HERE is a cheap, and simple, method of making a useful Q.M.B. switch. A piece of ebonite, 7/8in. long by



A simple home-made Q.M.B. switch.

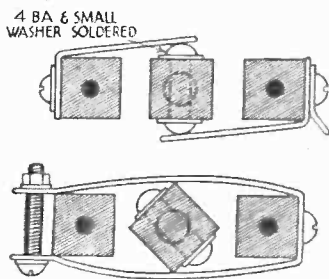
3/8in. by 3/8in., is drilled through its length and tapped 2B.A. A piece of 2B.A. rod, 2 1/2in. long, is screwed into this until about 1/2in. projects. It is then drilled at right angles and tapped 4B.A., a short 4B.A. brass stud being screwed through. A brass washer is slipped on and soldered to the stud, which is then filed down until only a small amount projects on each side. A piece of ebonite 3/16in. thick is cut 1 1/2in. in length by 1in. wide in the centre, and tapering to 3/8in. at the ends. This piece is fitted with a fixing bush. Another piece 3/16in. thick is made 1 1/2in. long by 3/8in. wide, having a 3/16in. diameter hole

## THAT DODGE OF YOURS!

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drilled centrally to act as a bearing. Two pieces of 3/8in. square ebonite, 1in. long, are used as side supports. The ends are drilled and tapped so that the front and back may be screwed to them. The Q.M.B. spring and the brass contact springs are also screwed to the supports as shown.

A knob, screwed 2B.A., is fitted to the



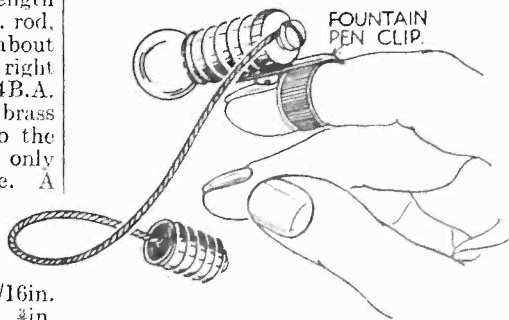
Sections through the home-made Q.M.B. switch, showing the contacts and springs for giving a snap action.

spindle, and the switch can be turned on or off with a rotary action.

The nut and bolt fitted to the spring is used to adjust the tension.—C. E. GREAVES (Birtley).

## A Useful Finger Lamp

THIS handy device, for use when tinkering inside a set, is made from an expanding fountain pen clip. The metal spear point with ball end is cut off, leaving enough metal for drilling a small hole to take a set screw for attaching a standard flash-lamp bulb-holder. A length of twin fine silk flex connects this to a flash lamp socket made from a burnt-out

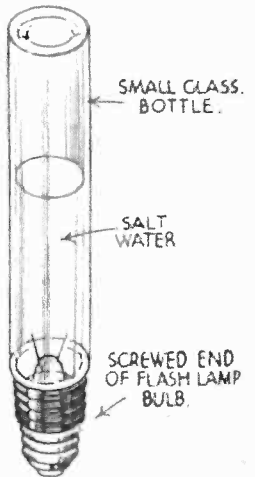


A useful finger-lamp device.

flash lamp bulb, the wires being soldered to the side and contact on the base. After fixing the wires the interior of the socket is filled with sealing wax. The socket screws into any flash lamp or torch, and the expanding clip grips firmly on the index finger.—A. SAGE (Lancaster).

## A Simple Tester

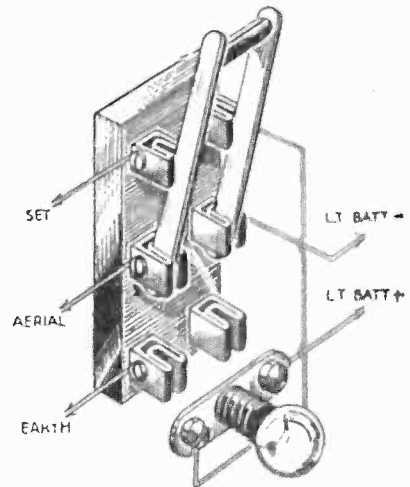
I HAVE found the simple tester, shown in the sketch, very useful in ascertaining the flow of very small currents. A small circular glass bottle is half filled with salt water. Then an old flashlight bulb is carefully broken so as to leave the two fine wires intact. It is then inserted into the neck of the small bottle (a fairly tight fit) and sealed in with pitch by means of a hot iron. Screw the tester into a small holder, such as a fuse bulb holder, and connect up the wires. If current is flowing, bubbles, which are plainly visible, will rise to the top of the salt water.—EDWARD J. WOOD (Dunkerton).



A simple tester.

## A Warning Light for Earthing Switch

THIS handy device acts as a reminder to earth your set after switching off. In place of the usual S.P.D.T. earthing switch insert a D.P.D.T. switch. Connect up the switch as before, and to the vacant side connect in series your L.T. supply and panel bulb, or a special warning bulb. Thus the light will remain on until the set is earthed.—H. PARKIN (Rotherham).



Fitting a warning light to an aerial/earthing switch.

# FROM ST. MARTIN'S TO THE COMMODORE

In This Article Readers are Taken on a Trip with the B.B.C. Outside Broadcast Engineers to a Number of Places from which Relays are Made, Ranging from St. Martin-in-the-Fields to the Popular Broadcasts on Saturdays from the Commodore Theatre

LET us clamber into the big green van, owned by the B.B.C. outside broadcast engineers, and accompany them on a trip to a number of places from which programmes are relayed; the first one on our list is St. Martin-in-the-Fields.

As the van draws up outside the famous Church in Trafalgar Square, take a look at the pavement artist who (with his pictures propped up against the churchyard railings), broadcast recently in the "In Town To-night" series. The B.B.C. expert dragged this anonymous supporter of St. Martin's up to the studio to broadcast!

But inside St. Martin's there is work to be done. This is one of the regular check-ups on the B.B.C. microphone lay-out. Ask the engineer in charge what he knows about the microphone arrangements at some of London's famous churches, and he will tell you that St. Martin's (which is still the most popular radio church), presents fewer problems to the electricians than do any of the others. At St. Martin-in-the-Fields the microphones are nearly always in the same position, and only one alteration in the wiring and microphone lay-out has been made since St. Martin's first came on the B.B.C. outside broadcast list.

Millions of people probably listen in to the services and these services (which, of course, are given at a special time) attract very large congregations. It is no uncommon sight on a Sunday evening to see hundreds of people queuing up to get into St. Martin's during the radio service, and there must be something about the simplicity of the broadcast services which draws so many Londoners to the church itself, although they could just as well follow the service over the radio.

## Only Two Microphones

There are only two microphones to do all the work at St. Martin's, and if you walk about in the dimmed light of the church for a few moments you will see where the B.B.C. experts have placed them.

One microphone is suspended on a wire cable about half-way down the body of the church, and is well above the heads of the congregation, the other microphone being installed in the pulpit. The organ, which broadcasts so well, is on a balcony at the end of the church remote from the altar.

The B.B.C. wanted to make a feature of St. Martin's organ, and when the church first came on the outside broadcast list, the engineers put a third microphone, sprung up from a wire suspended across the balcony. It was found, however, that this microphone was not very effective in picking up the singing of the congregation, and was too sensitive to the organ.

The service is conducted from the pulpit, so there is no need to have a large number of microphones for the choir.

As in all outside broadcasts, the service has to be controlled by an electrician. The man who does this job sits up in a little room on the right-hand side of the church

at the top of a winding flight of stairs, and through a small window he can see what is going on in the body of the church below. There is a red light in front of the pulpit reading desk, and the electrician up in the listening room can hear on his own headphones what is happening back in the B.B.C. studio. Immediately the announcer has made the opening to the St. Martin's service, and when the bells have been broadcast, the red light on the pulpit desk flashes, and the service begins.

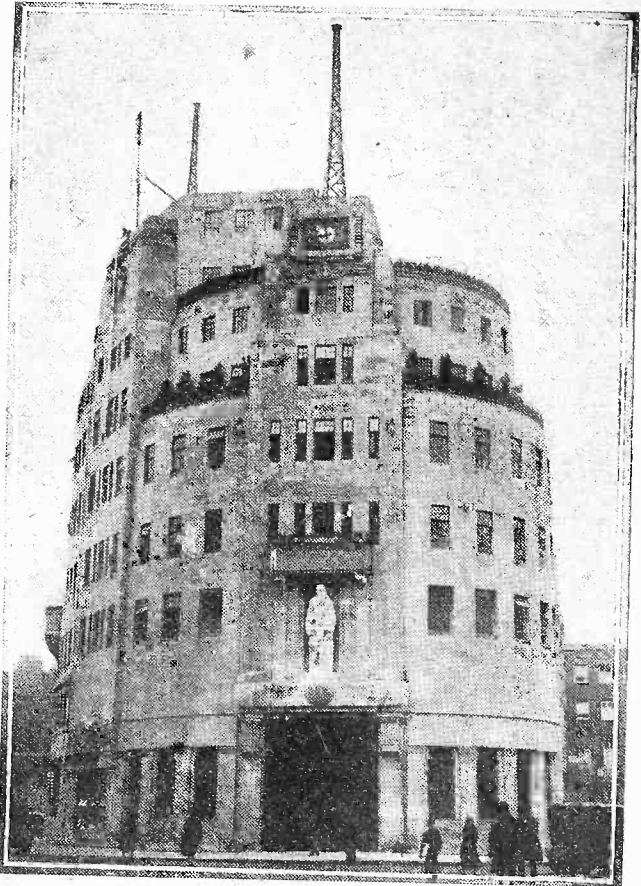
## At Sadler's Wells Theatre

Well, our microphone checking is done here and then the B.B.C. van sets off again through Islington, pulling up at Sadler's Wells Theatre—the latest opera centre to be on the B.B.C. outside broadcast schedule. This famous old theatre became derelict, of course, and was finally pulled down and replaced by the present red-brick building, opened in 1931. It suits the B.B.C. very well, as the interior, being plain, results in good acoustic properties for the microphone.

There are also one or two interesting things about the building itself which are a help to broadcasts. For instance, Miss Lilian Baylis (who, of course, is in charge of Sadler's Wells and the Old Vic), has her own private window at the back of the circle balcony. One of the B.B.C. commentators used this in a description, which was included as part of the recent broadcast of "The Devil Take Her." There's not much checking to be done here of the microphone position, for this is one of the most recent B.B.C. installations.

All the control apparatus is below stage, and there is an ingenious indicating system so that the man at the controls, although unable to see the actors and actresses on the stage, can anticipate the particularly loud and soft portions, and can even, by means of the indicator, tell when a "star" is about to come forward to the footlights. The microphone is turned full on so that the radio audience does not miss a word! Not all B.B.C. installations have this indicator scheme, and in many cases where relays have to be done, it is difficult to get the microphones up in the correct position.

At one of the engineer's offices at Broadcasting House is a special file in which, on sheets of squared paper, are kept accurate records of the microphone positions at each outside broadcast spot. Pencil sketches are made showing just how the microphones are fitted up, so that when the green van goes off on one of its trips the engineers in charge know beforehand where the



*Broadcasting House, the headquarters of British broadcasting*

microphones will have to go, and how the wiring will be arranged.

It is not by any means straightforward, and all sorts of freak effects are noticed at some relays.

## Arranging the Orchestra

For instance, at one West End of London cinema the microphone arrangements are most unusual. Practically every week a piano solo or a lengthy piece combining piano and orchestra is given. And yet the piano is right at the back of the orchestra pit and is well away from the microphone. Some curious sound reflection effect appears to make this a good position, and if the B.B.C. outside broadcast engineers did not keep a check on this in their file at Broadcasting House, they would constantly be getting the microphone positions wrong.

The strings are in front of the microphone on the left, and the wood winds in front on the right. The cellos are behind the strings, and the brass in the right-hand corner of the hall behind the wood winds. The string basses are tucked away in an alcove at the extreme right-hand side of the orchestra pit. It was found on a balance test that if the bass was in the body of the orchestra pit there was too much "boom" and echo.

Now we go back across London to the Commodore Theatre in King Street, Hammersmith. Every National programme listener knows the Commodore, for every Saturday lunch time a relay is made from there of the very versatile Commodore Theatre Orchestra.

There are eighteen in the orchestra, and they broadcast from the big green and cream café of the Commodore.

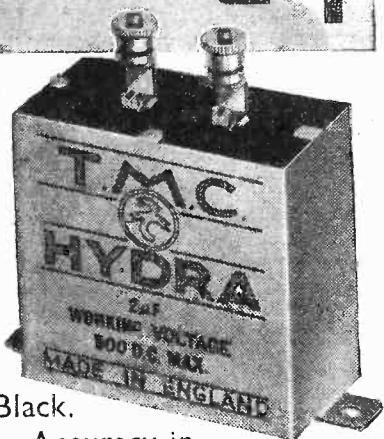
Visitors are not allowed in to see the orchestra broadcasting during B.B.C. time, but, for an hour every Friday night, the

(Continued on page 387)



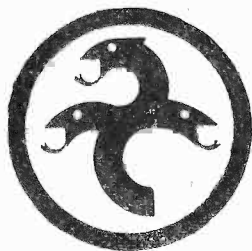


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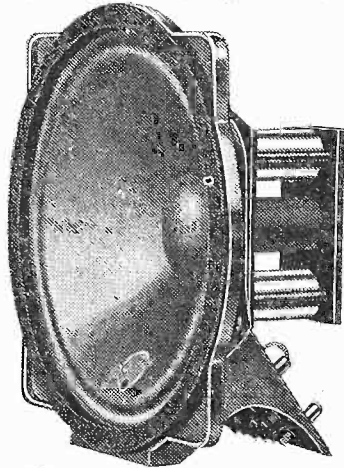
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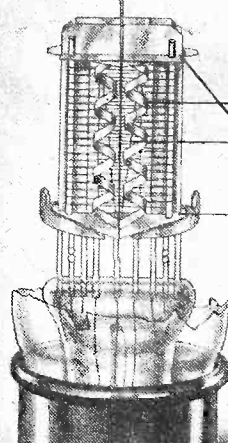
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**FROM ST. MARTIN'S TO THE COMMODORE**

*(Continued from page 384)*

orchestra gives a special "broadcast" programme on the stage, and this really shows how it is all done.

The Saturday broadcasts from the Commodore have become one of the "spot" features for the B.B.C. programme compilers. There is something very satisfactory about these broadcasts on the technical side, for there is a noticeable echo in the transmission which adds brilliance to the orchestra, and makes it compare favourably with the type of transmission the B.B.C. gets from the now famous Grand Hotel at Eastbourne.

**Microphone Arrangements of the Commodore Theatre**

Before talkies came in Joseph Muscant

and his Orchestra used to play in the cinema itself, and the microphones were suspended above the orchestra in the orchestra pit. But when talkies came along, it was impossible to broadcast at a suitable time from the cinema, so Joseph Muscant and his orchestra went up to the café. The orchestra now plays in this large room on the first floor, and gives a programme specially arranged for broadcasting. The B.B.C. engineers have carefully worked out the microphone positions downstairs in the cinema, and when the new arrangements came into being they had to shift the "mike" and amplifiers up to the café, and make a new test to find out where the microphone should go. Eventually it was found that one of the microphones could be put just in front of a huge flower basket in the centre of the café. This flower basket

was used as a basis of measurement, and the engineer took radial measurements from this and so found the proper positions for each member of the orchestra.

The conductor himself stands on an old soap box while broadcasting, and just recently the B.B.C. have installed one of the new condenser microphones in a metal case, shaped like a torpedo.

We are here at the Commodore only an hour or so before the Saturday broadcast is to begin. Hurriedly the microphone arrangements are checked, and a test made of the 'phone line through to Broadcasting House. Then we pack back into the van and speed off home . . . not to Broadcasting House, as you might think, but to the headquarters of the B.B.C. outside broadcast staff at Clapham, where the B.B.C. has a large research station.

# THE A.C. INDUCTION GRAMOPHONE MOTOR

In This Article the Construction and Working of This Type of Motor is Briefly Explained. By L. A. HODGES

FOR those listeners who have an A.C. supply available the most popular of electric drives for the gramophone section of the set is the induction motor. This motor has no commutator and brushes with their usual sparking troubles, which often introduce unwanted noises in the reproduction. It is of the variable speed type, mechanically controlled, is self-starting, and is standardized for the regular supply voltages of 110 to 250 at 40 to 60 cycles. It is also very compact, taking up probably less room directly underneath the motor board than most mains transformers, and will render good service for a number of years with very little attention.

**Construction**

To most wireless constructors, and particularly radiogram enthusiasts, a brief study of this type of motor—the induction type—its design, principle, and construction, is particularly interesting. It is, of course, generally known that the electric motor converts electrical energy into mechanical energy, the latter in our case being the rotation of the gramophone turntable.

In Fig. 1, the A.C. induction motor can be seen directly underneath the top plate of the radiogram. It consists of a steel shaft on which is mounted a rotor core built up from stampings with solid copper bar winding in the slots of the stampings, and short-circuited at the ends with copper end rings. This rotor core rotates between the poles of a field magnet, this latter again being built up with stampings and shaped with two poles, its magnetic field being provided by two field coils of fine copper wire, one coil being wound on each

pole. It is these field coils which are connected across the supply mains, and thereby electrically excited, which causes the rotor to rotate in its bearings. The reason for such a motion, which is the theory of the induction motor, hardly concerns us directly here, but we are directly concerned with its high speed.

**Obtaining 78 r.p.m.**

The natural speed of the motor is very

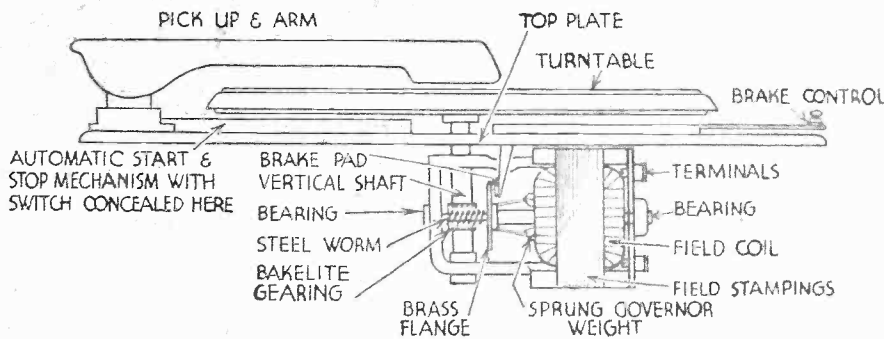


Fig. 1.—Side view of an A.C. induction motor mounted beneath the top plate of a radiogram.

high, but by a centrifugal system of sprung weights (shown in Fig. 1) fitted to the rotor shaft the speed is governed, and is maintained at about 2,000 r.p.m. Now as the speed of the turntable carrying the gramophone record must be 78 r.p.m., it is obviously necessary to introduce some reduction gearing.

This is brought about by a worm being turned on the rotor shaft which runs horizontally, and engaging with a bakelite thread (for silent operation) fitted to another shaft running vertically and carrying the turntable. The result of this gearing is to give the vertical shaft a speed of about 100 r.p.m. For adjusting this speed accurately to 78 r.p.m., a brake-pad engages on a flange fitted to the rotor shaft, and is controlled by a lever projecting just outside the edge of the turntable.

**Automatic Stop and Start**

In those electric gramophone motors fitted with an automatic starting and stopping device the mechanism is arranged between the underside of the turntable and the top plate, and so out of sight when the turntable is in position. When the pick-up arm is in its normal position—i.e., resting away from the record—the switch for the motor is "open," and the action of bringing the pick-up arm to the edge of the record for playing automatically closes the switch by the operation of the mechanism underneath the turntable. When the pick-up arm reaches the end of the record, the hidden mechanism automatically opens the motor switch again.

**Running Cost**

This typical type of A.C. gramophone motor is easily fitted to the top plate which carries the motor and turntable, and manufacturers supply it complete with pick-up and arm, the whole assembly costing just a little over £3. For those desirous of fitting their own pick-up, etc., the price of an actual motor would not be much more than £1. The current consumption of these motors is about 10 watts, a very low figure, and at 4d. per unit the motor could be run for 100 hours for 4d., and for those on the domestic tariff or power scales, the price of running is negligible.

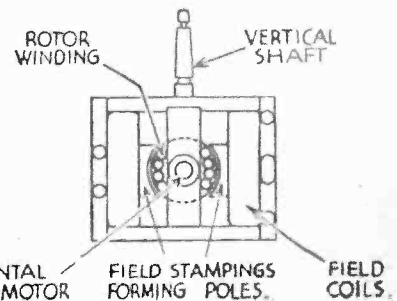


Fig. 2.—End view of motor, showing the field coils and rotor.

# MORE ABOUT— ELECTRICAL INTERFERENCE

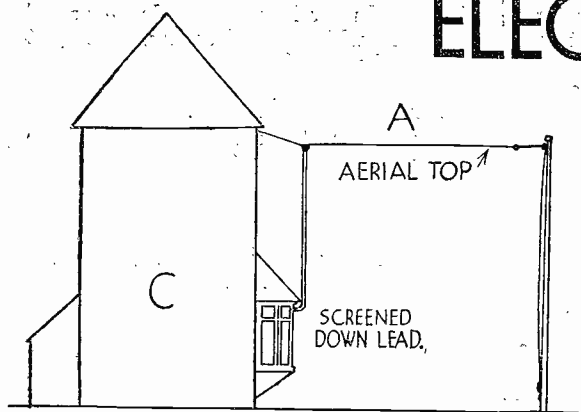


Fig. 1.—The inverted-L aerial shown above is likely to pick up interference due to the fact that it is in the radiation zone of electrical apparatus in the building C.

**D**URING the last few years there has been a considerable increase in the number of complaints of interference with wireless reception caused by electrical apparatus. This type of interference causes a background of mush and crackles, somewhat similar to atmospheric, but more persistent.

The growing use of electricity for a diversity of purposes must affect the question, and as the grid system of power distribution grows, this aspect will become more important.

## Write to the B.B.C.

The B.B.C., in conjunction with the Post Office Engineering Section, carefully investigate complaints of electrical interference and, when possible, suggest suitable methods of suppressing the trouble at the source; that is, by suitable fitments to the offending electrical appliance.

It is often possible to reduce, if not completely eliminate, a background of interference, by slight modifications of the receiver, or the aerial and earth. The unwanted interference may be picked up on the aerial, in a similar manner to the normal signals, but, on the other hand, if the receiver is of the all-mains type, or a battery set used with a mains H.T. unit, the impulses may be introduced by the mains wiring. For simplicity, these two types of interference may be termed "picked up" and "mains borne."

## Improve the Aerial and Earth

Irrespective of which variety of interference is the trouble, attention to the aerial and earth will be well worth while. It is quite usual for the substitution of a highly-efficient outdoor aerial and a good earth, in place of an indifferent aerial and earth, to reduce interference background by 70 per cent.

The earth connection is particularly important, when interference-radiating apparatus is fairly close to the receiver. In these circumstances, a buried earth is usually preferable to a water-pipe connection. In town districts, where a considerable amount of interference is radiated near ground level, a high aerial with a screened down lead may be used. The horizontal top span of the aerial should be as high as is conveniently possible, and the ends should be well away from walls (Fig. 1). Unless the top span of the aerial can be arranged higher than neighbouring buildings, the

# Ways and Means of Dealing with the Trouble Caused by Man-Made Static

full benefit of the screened down lead will not be obtained. By using special screening tubing and aerial transformers only a very slight loss of signal strength will be caused.

It is also advisable to bring the end of the screened down lead close to the receiver, in order to minimise possible pick-up of interference at ground level.

## Mains Filters

"Mains-borne" interference can be overcome by inserting a filter in the mains leads to the receiver or H.T. unit. Several manufacturers supply suitable filters and components, and the type required consists mainly of two special chokes and two condensers connected across the mains in the well-known manner. When possible, a separate earth should be used for the connection to the filter, and if this is not practicable a separate lead should be provided. The lay-out should be carefully arranged, as it is essential to keep the input leads of the filter well away from the output leads.

The two H.F. chokes must be of low resistance, and can each be made by winding 120 turns of 28 s.w.g. insulated wire on a 2in. diameter former of wood or fibre, 3in. long. The filter may be arranged in a small hardwood or metal box near the receiver.

If it is desired to mount the filter inside the receiver it should be placed well away from other components, or inside a metal screening case. In either case, when a metal box is used it should allow at least one inch spacing between each choke, and a similar clearance between the chokes and the inside of the case. The screening box should always be connected to earth.

It is only possible to deal very generally with interference problems as there are

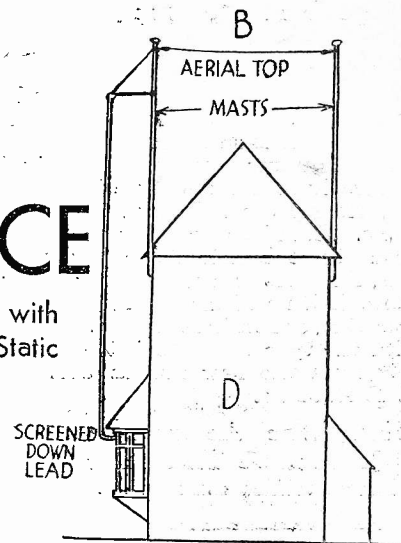


Fig. 2.—This type of aerial, marked B, has greater freedom from interference than that shown in Fig. 1.

many factors involved, but the suggestions made in this article should prove of help in all but very severe cases.

## A Remarkable Recording Feat

**A** WONDERFUL achievement in recording took place in London recently when Mark Hambourg, the great pianist, with his fifteen-year-old daughter Michal, made a record in the Savoy Hotel, over the telephone lines to the H.M.V. studios at St. John's Wood. It was on the occasion of a luncheon given by the "His Master's Voice" gramophone company to celebrate the twenty-fifth anniversary of the first recording for the gramophone by Mark Hambourg.

The famous pianist and his daughter played as a duet a Bach Cantata. The microphone above the piano in the luncheon room converted the sounds into minute electrical currents, which were passed through the ordinary G.P.O. telephone lines to the H.M.V. studios at St. John's Wood, where they were amplified ten million times and cut wavy lines, three-thousandths of an inch deep, on the soft revolving waxes. Immediately afterwards, the guests present were astounded to hear the performance reproduced back to them, including Mark Hambourg's comments, through a loud-speaker in the room.

Later Mr. Hambourg said how amazingly the technique of the gramophone had progressed since the first days, when he climbed the stairs of a city warehouse to make his first gramophone records. "Queerly enough," he said, "we found that the piano which gave the best results was one of execrable tone, it seemed to suit the recording horns better than a superior instrument. Other pianos were tried, from time to time, but the old tin kettle always gave the best results. It was not until 1925, when H.M.V. electrical recording was adopted, that we were able to make records under ideal conditions, and now I can remake them again and again until I have got a perfect performance. In the good old days the dear old ladies used to say 'the pianist, God bless me, he plays like a machine,' now they hear the machine, and say 'God bless me, the machine plays just like an artist'."

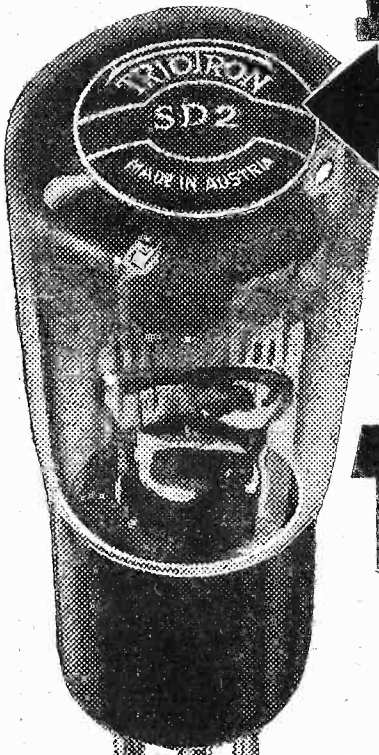
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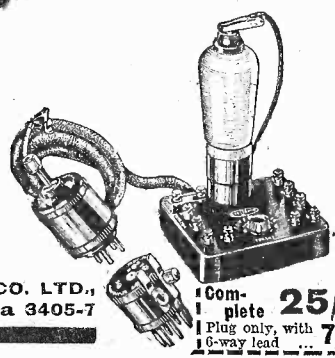


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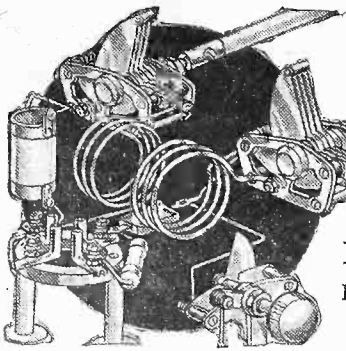
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# Short Wave Section

## IMPROVING THE SHORT-WAVE SET

Hints to Beginners on the Design and Operation of Short-wave Receivers.

**S**HORT-WAVE reception has a great deal of interest for many amateurs, and quite simple inexpensive receivers can provide reception of stations from all parts of the world when conditions are favourable. Even a simple two-valver can give very good results on short waves, providing due attention is given to several small points.

On medium waves minor deficiencies in a receiver may not greatly affect results, but in a short-wave set a slight irregularity may be the cause of failure to obtain even mediocre results. In fact in a short-wave set the small details are almost as important as the components used. Naturally the components should be of reliable make, and fortunately the constructor is well catered for in this respect.

### Importance of Layout

When arranging the layout care should be taken to ensure that all the leads in the detector and H.F. stages are as short as is reasonably possible. It is particularly important that the leads connecting the tuning condenser to the coil and also the reaction circuit wiring be short. It is best to arrange the tuning coil directly adjacent to the variable condenser as shown in Fig. 1. The lead from the tuning coil to the grid condenser, or grid terminal in the case of an H.F. stage, should obviously be short, but this is not of such importance as the coil leads. If a metal panel is used, with the variable condenser moving vanes automatically connected to this, the appropriate terminal of the coil should be connected to the panel by as short a wire as possible.

When the coils are made by the constructor it is advisable to arrange the reaction winding close to the grid winding, and so enable reaction to be obtained with low settings of the reaction condenser. If the coupling between the grid and reaction windings is too loose, a greater amount of reaction-condenser capacity will be necessary to obtain oscillation, and this often increases the minimum wavelength receivable.

### Threshold Howl

Even when care has been taken suitably to arrange the layout and wiring, minor defects may be present, but these can almost invariably be remedied easily if tackled in the correct way. Possibly the effect known as "threshold howl," or "fringe noise" as it is termed in America, is one of the most usual defects. This trouble manifests itself by a deep howl as the reaction condenser is tuned almost to oscillation point. As close adjustment

of reaction is essential for good short-wave results, "threshold howl" can completely mar the performance of an otherwise excellent receiver. This effect can be prevented when constructing the set by using resistance-capacity or a parallel-fed L.F. transformer between the detector and the following stage. However, when the fault is met with in

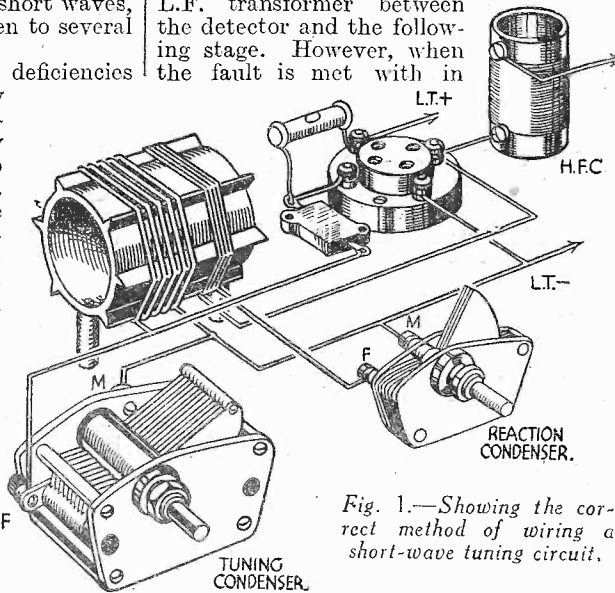


Fig. 1.—Showing the correct method of wiring a short-wave tuning circuit.

practice, it can usually be remedied by connecting a .5 or 1 megohm grid leak across the secondary terminals of the L.F. transformer. If this should not prove entirely successful, a grid stopper of .1 megohm should be connected in series with the grid lead of the valve following the detector. In extremely obstinate cases, the insertion of a 10,000 ohms resistance of the grid leak type between the H.F. choke and the L.F. transformer terminal usually effects a complete cure.

### Erratic Reaction

Apart from threshold howl, reaction control may be fierce or reaction may not be obtainable at certain dial readings. Inability to obtain reaction over portions of the tuning range is often due to the aerial coupling being too tight. It is usually possible to reduce the degree of coupling by some means. For example, the lead from

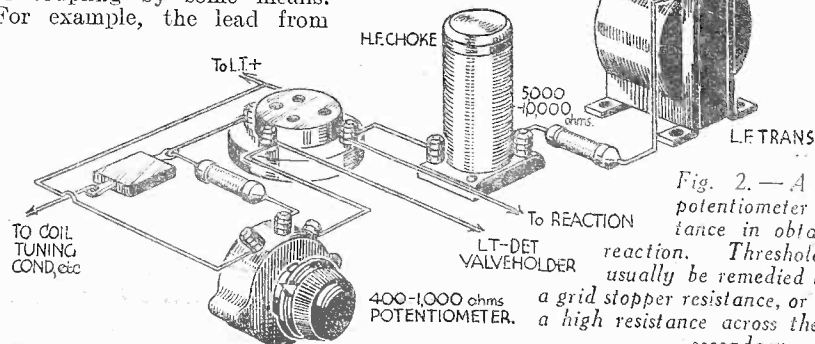


Fig. 2.—A grid return potentiometer is of assistance in obtaining smooth reaction. Threshold howl can usually be remedied by the use of a grid stopper resistance, or by connecting a high resistance across the transformer secondary.

the aerial terminal is sometimes attached to one of the turns of the coil by a spring clip. In this case, moving the clip to a coil turn nearer the earthed end will reduce the coupling. In other cases, a variable or preset condenser is provided in the aerial circuit, and reducing the capacity of this should prove of assistance.

When no variable adjustment is provided, a .0001 mfd. (maximum) preset condenser can be connected in series with the aerial lead-in. Unscrewing the knot of this preset condenser will enable a lower degree of aerial coupling to be obtained.

### Detector Grid Potential

Fierce reaction may be due to an unsuitable valve being used, and if an alternative detector valve is available it should be tried. Variation of the detector H.T. voltage may prove of assistance. A high-valve grid-leak is of assistance in obtaining smooth reaction control and, in practice, up to 5 megohms is satisfactory. A variation of the detector-grid potential enables almost any desired degree of reaction-control smoothness to be obtained. The connections of a potentiometer control of detector grid potential are shown in Fig. 2 and when the slider is turned to the negative end reaction control will be very smooth but signal strength somewhat reduced. A satisfactory setting, to compromise between smooth reaction and maximum signals, can easily be found by trial. The remedies previously suggested for threshold howl are also shown in Fig. 2.

### Hand Capacity

The common bugbear of short-wave receivers, hand or body capacity, should normally be completely absent if the detector circuit wiring is correctly arranged. Metal panels and metallized chassis have possibly largely contributed to the comparatively few complaints of this trouble recently, and if hand capacity is experienced, a metal panel should certainly be tried.

An effect similar to hand capacity can be caused by the tuning or reaction condenser being insufficiently rigid. A whippy panel can also be the trouble. If these points are in order, the effect of disconnecting the earth should be tried. Frequently a short waver will give best results using no earth connection, particularly if this has a long lead.

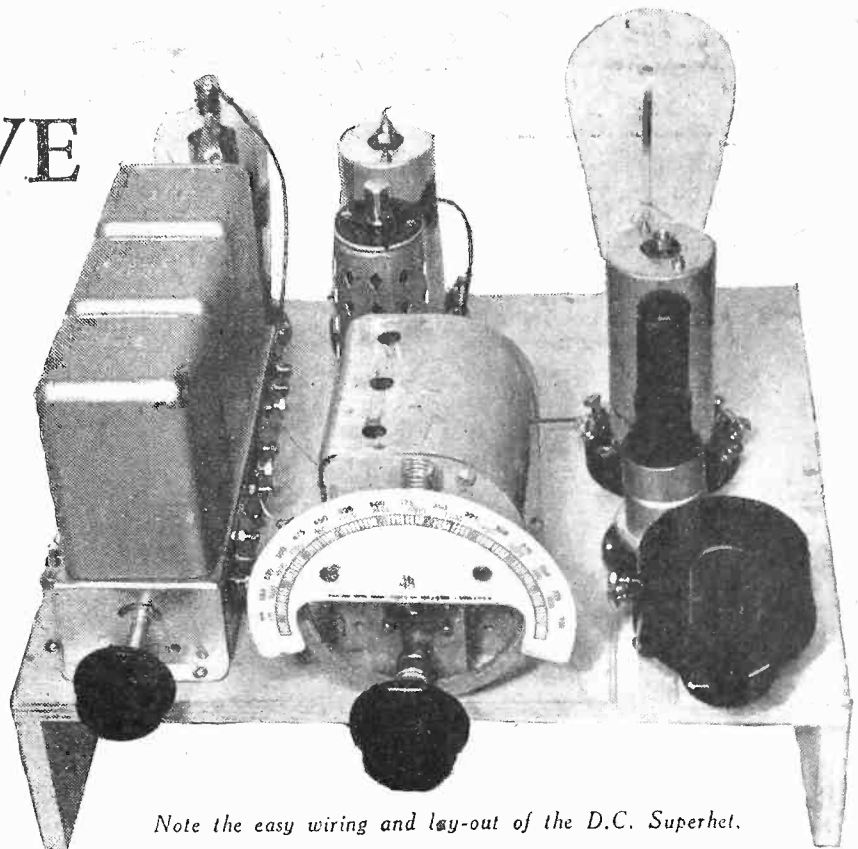
In extreme cases it may be necessary to mount the condensers a few inches behind the panel on brackets.

# OUR D.C. THREE-VALVE SUPERHET

NO sooner had the issue of PRACTICAL WIRELESS containing details of the Battery Superhet Three appeared than readers commenced to write to us. Letters of congratulation; letters with queries; letters concerning the utilisation of old parts, and sundry other miscellaneous communications began to pour in, but quite a large percentage of the first post contained requests from readers for a model of this receiver for use on D.C. mains. Although an examination of the electric supplies of the country reveals that only a very small proportion consists of direct current mains, it would appear that there are many thousands of listeners who are so served and who wish to build their own receivers. Manufacturers have catered for these listeners by supplying their standard receivers in two types, A.C. and D.C., although it is true that there are quite a number which are not obtainable in D.C. form. It would appear that the removal of the necessity of rectifying the mains supply would render the design of a wireless receiver much simpler, but there are other problems bound up with the supply which do not make the design of such a receiver the simple matter which it at first appears.

## Our D.C. Receivers

We have, in the past, described two complete D.C. receivers, the D.C. Ace and the D.C. Premier, and in addition certain Universal models have appeared in our pages. In spite of the number of requests which have been received from readers, it



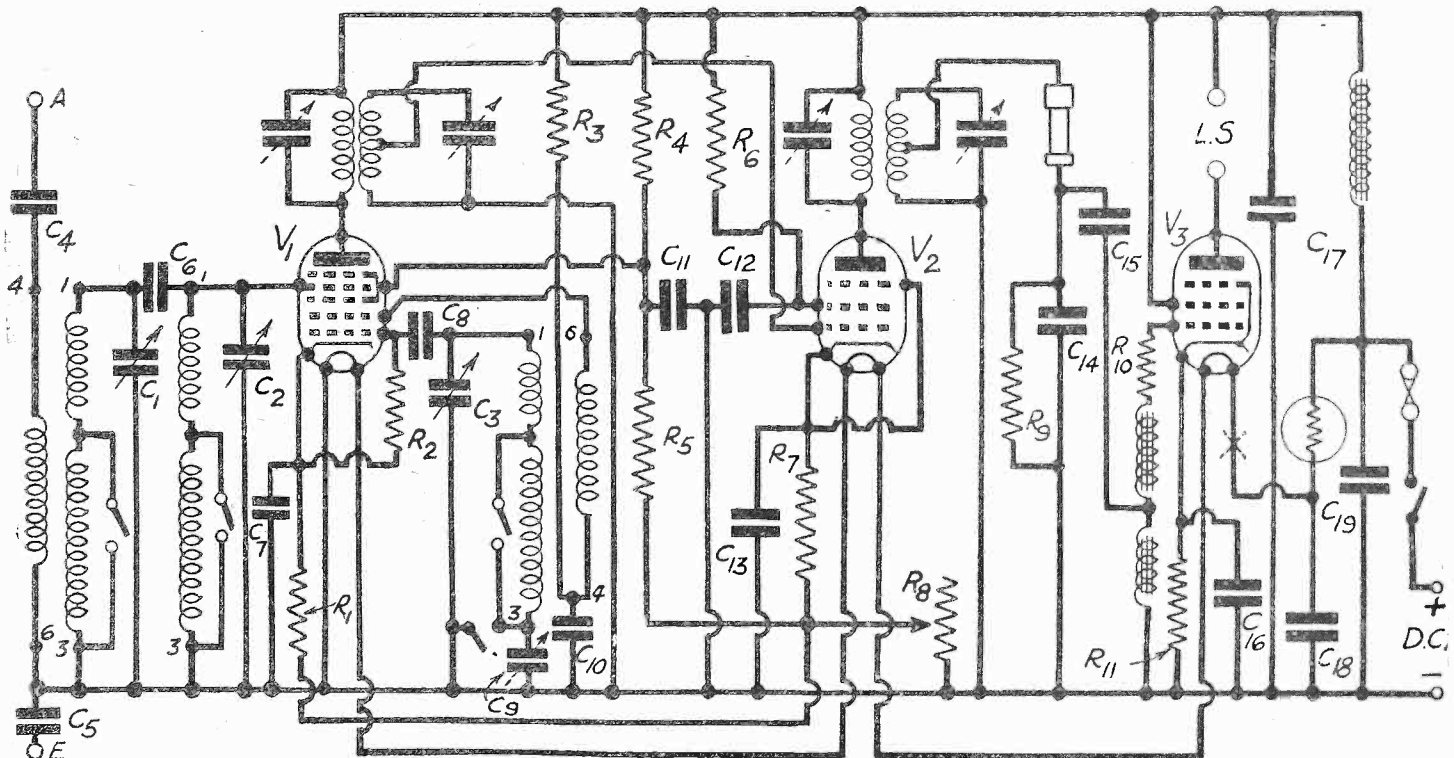
Note the easy wiring and lay-out of the D.C. Superhet.

## A FIRST-CLASS DESIGN!

*A Marked Advance on D.C. Practice!!*

This D.C. Version of Our £5 Battery 3-Valve Superhet is a Highly Efficient Programme Getter. Its Special Features are: No Background Noises, Absolutely Stable, Hair-line Selectivity

would appear that these two D.C. receivers were not made up in the quantities which we were led to expect. The manufacturers of the components employed in these receivers informed us that there was very little demand, and thus we were forced to the conclusion that the D.C. experimenters were in the minority. For this reason, therefore, we have refrained from describing many D.C. receivers, but now, in response to the rather large number of requests, we have designed a D.C. version of our very latest receiver, the Superhet Three. We



Theoretical circuit of the D.C. 3-valve Superhet.

# A Satisfactory Three-Valve D.C. SUPERHET AT LAST! Special Request of Hundreds of Readers, it Represents a Marked Advance in Receiver Design—the Last Word in Efficiency

must express the hope that all D.C. experimenters who are in search of a really up-to-date, easy-to-construct receiver will make up this instrument and thus testify to the fact that there is indeed a demand for D.C. receivers.

## The Circuit

The circuit of this new receiver is shown on page 391, and it will be noted that in fundamentals it is identical with both the battery and the A.C. superhets. That is to say, for the benefit of those who have not yet made the acquaintance of these receivers, three valves only are employed in a circuit which employs the full superheterodyne principle. The first valve is a pentagrid, carrying out the combined function of first detection and frequency changing; the second valve is an I.F. amplifier, and this is followed by a Westector, or metal rectifier, performing as a second detector. Finally, a pentode output stage is employed, and this is coupled to the second detector by an auto-transformer. Thus the novelties in the circuit may be stated to be the utilisation of the new pentagrid type of valve (doing the work of two separate

stability; less valve hiss; reduced background noises; simpler construction; reduced running costs; and more trouble-free operation are only a few which come readily to mind. In this particular circuit the valves which have been chosen are of Osram manufacture, designed to operate with a heater potential of 13 volts. The types are as follow: X.30, W.30 and N.30. The current taken by each of the heaters is .3 amps. and therefore to regulate this current and to provide a breakdown for the mains voltage it is necessary to insert a barretter in the heater leads. The particular component which we have selected is also of Osram manufacture and is the type 301, which has a mean current rating of .3 amps and gives a voltage range of 138 to 221 volts, with a control of from 3 to 4 valves. This particular barretter is fitted with an E.S. cap, and not a standard 4 or 5-pin base, and it is essential that the particular porcelain holder which we specify be used to hold this barretter, as it gets very hot in use, and it may be found that any other type of base will crack or, in any case, will not adequately dissipate the heat. For smoothing purposes, and to prevent hum, two condensers are joined across the heater supply, a 0.1 mfd. condenser on the mains side of the barretter, and a 0.5 mfd. condenser on the receiver side. It is absolutely essential to include these condensers in the circuit, and no economy should be effected by leaving them out if good stable working is required. A further condenser will be seen in the earth lead, and this also is an essential part of the receiver, just as important as the coils. Firstly, it will be seen that one side of the mains supply is joined to the common earth line of the receiver, and it is intended that this shall be the H.T. negative

supply. Consequently, if the D.C. negative line is earthed, this would automatically enable the receiver to be connected up in quite a straight-forward manner. In the event, however, of the D.C. positive mains lead being earthed, there would be a danger of short-circuiting the D.C. mains when the

## NO BACKGROUND NOISES!

receiver was joined to earth, and (thus the inclusion of the condenser in the earth lead prevents a direct connection from being made back to the mains wiring. There is a further safeguard to be found in the fact that the receiver is insulated from the live mains, and the aerial circuit may be touched whilst the receiver is switched on, a practice which is not recommended but which might inadvertently be done by a listener or constructor. The inclusion of a small condenser in the aerial lead completes the insulation of the receiver from direct or indirect short-circuits with the mains and thus complies with all safety regulations.

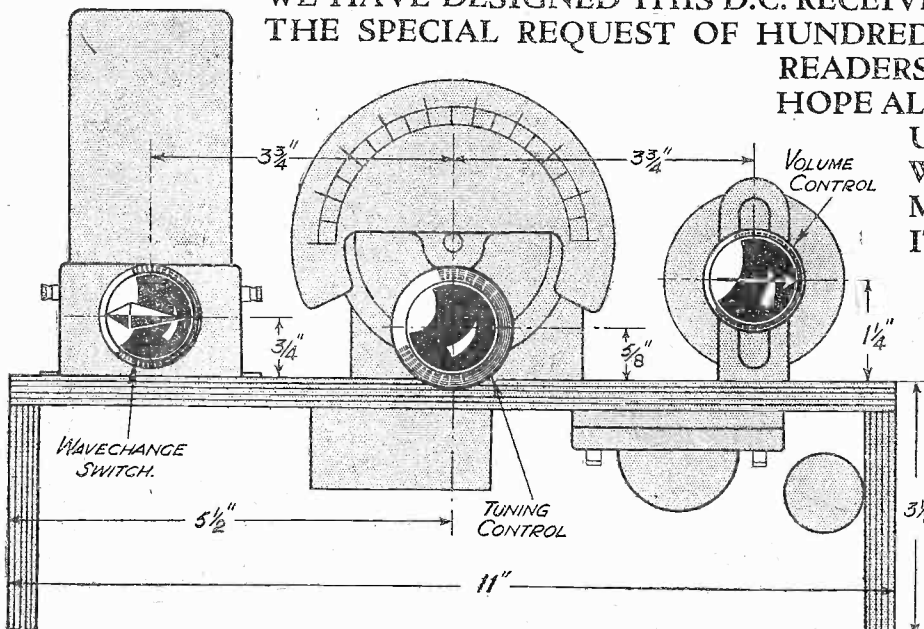
## HAIR-LINE SELECTIVITY!

valves) and the use of the Westector in place of a valve for second detection. By these means it is possible to obtain, with only three valves, a circuit which in the normal course would require no less than five, and the improved results which are obtained by reducing the total number of valves are not far to seek. Increased

## Volume Control

For the purpose of volume control a potentiometer is joined in the screening-grid potential divider, and with the inclusion of a small fixed resistance in the cathode leads of the first two valves this enables the grid potential to be varied and thus make full use of the variable-mu characteristics of the pentagrid and the I.F. valve. The values chosen for this part of the circuit enable the control to function very smoothly, bringing signals from a mere whisper right up to the full capacity of the output stage. The W.30 is designed to operate with 250 volts on the screen, and therefore we have only included a small series resistance in this part of the circuit, it being wasteful to employ a potential divider, and in practice there has been found no necessity to employ a by-pass condenser. Further economy in construction is to be found in the supply of the extra grid of the output pentode, where a direct connection is made to the H.T. positive line. To assist in smoothing a rough D.C. supply, and to eliminate any commutator ripple which might be present, a standard smoothing circuit is to be found

WE HAVE DESIGNED THIS D.C. RECEIVER AT THE SPECIAL REQUEST OF HUNDREDS OF READERS. WE HOPE ALL D.C. USERS WILL MAKE IT.



Front of panel layout.

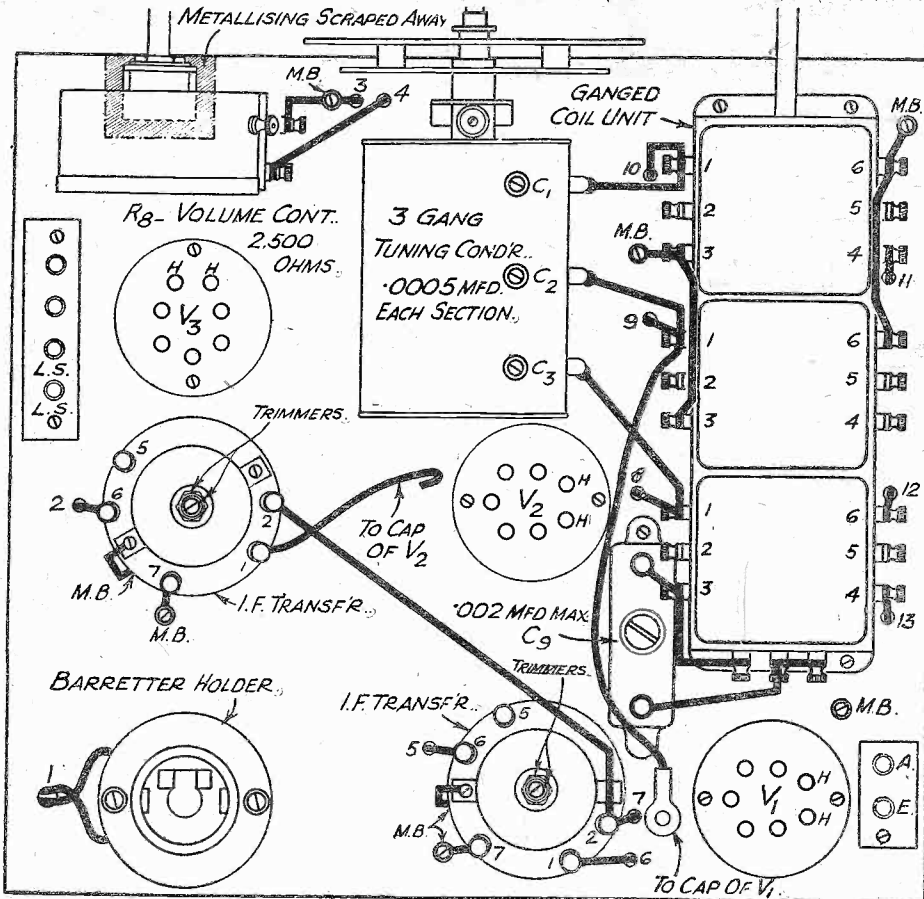
## LIST OF COMPONENTS

- Coils—Three-gang Superhet. Telsen, type 476.
- Variable Condensers—Three-gang Superhet. J.B., type 2124B, with drive.
- I.F. Transformers—Two P.W. 110 k/c. Varley.
- Fixed Resistances—100,000, R9; 60,000, R4; 50,000, R2; two 30,000, R5, R6; two 20,000, R3, R10; 500, R1; two 300, R7, R11. Dubilier 1 watt type.
- Volume Control—Varley 2,500 ohms potentiometer, R8.
- Potentiometer Bracket.
- Fixed Condensers—Seven .1 mfd (Tubular), C5, C7, C10, C11, C12, C13, C19; two .5 mfd., C15, C18 (Tubular); one 4 mfd. C17 (type LSA); one 25 mfd. (25 volt electrolytic), C16; one .0005, C4; two .0001, C8, C14. Dubilier.
- Preset Condenser—.002 Graham Farish, C9.



ully Designed at the  
ce on Normal D.C.

WIRING DIAGRAMS OF THE D.C. 3 VALVE SUPERHET.



between the mains and the various stages, a Wearite choke and a 4 mfd. condenser forming the essentials of this part of the receiver.

The remaining details are similar to those in the previous two receivers, and readers should turn to previous issues if there are any other points about which they need explanation.

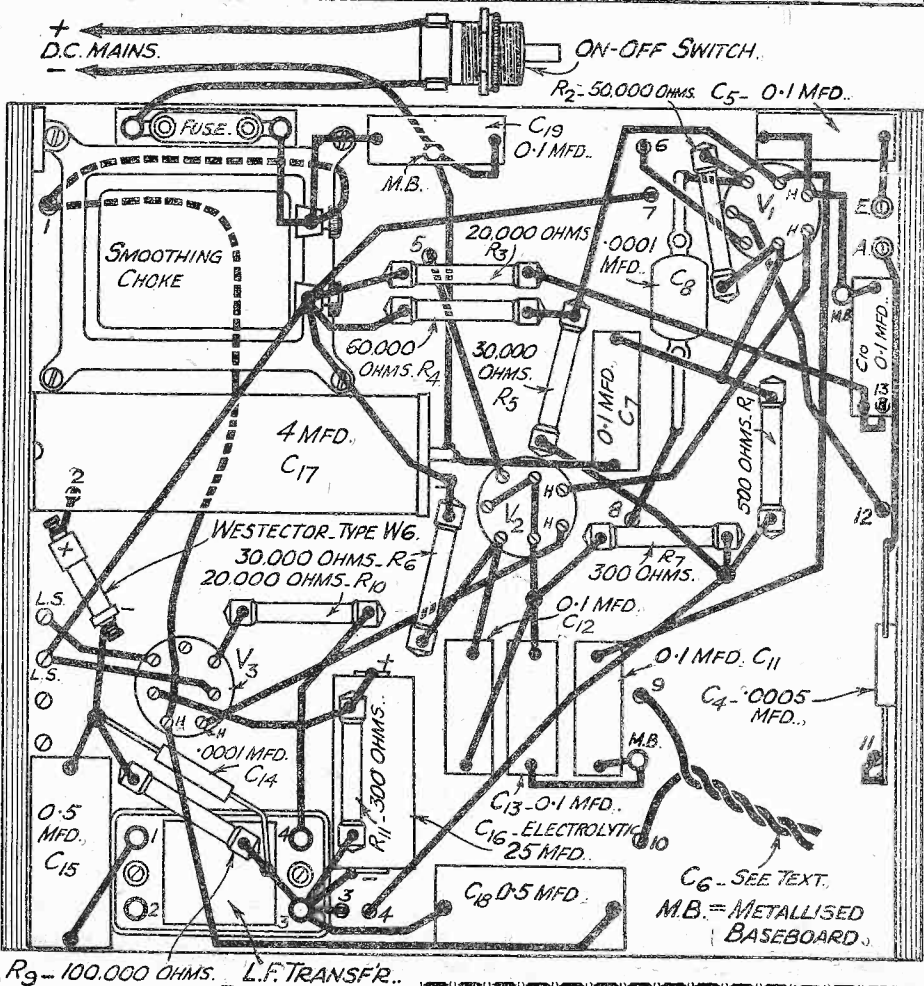
Construction

The receiver is built upon a standard Metaplex chassis, the actual dimensions being 10in. by 11in., with runners 3in. deep. The receiver is therefore very compact. Commence construction by laying each part on the upper side of the chassis, using the wiring diagram and the photographs as your guide. When satisfied that each part is in its position (laying the valveholders upside down for this purpose) mark the position of all screw fixing-holes and the holes through which the wiring passes, using the scribe of the Practical Wireless Tool Kit or a similar sharp instrument for the purpose. Now remove the parts and place them on one side for the time being. Cut out the holes

ABSOLUTELY STABLE  
ON BOTH WAVEBANDS!

for the valveholders, using a 1/16in. bit, and to avoid splitting the surface of the plywood, cut the holes half-way through the wood, turning the chassis over and completing the cutting from the opposite side. Next cut out the holes for the aerial and earth and loud-speaker sockets, and with a 1/16in. drill make all the holes for the connecting leads. The work of assembly may now be commenced, and to facilitate handling it will probably be found preferable to lay the chassis on the bench or table on its upper surface, and carry out all wiring and the fitting of components on the underside, leaving out the wiring which passes through the chassis until the remaining parts are in position. This method of assembly removes the necessity for continually reversing the chassis and from the difficulty of balancing the receiver on two or three odd points on the upper side, although to those who are not accustomed to receiver-building it may lead to diffi-

(Continued on next page)



MENTS.

- Westinghouse, type W.6.
- Transformer—Graham Farish Max. type.
- Choke—Wearite, type H.T.13.
- Valveholder—Q.M.B.
- Resistor—500 m/A.
- Metaplex, 11in. by 10in. by 3in. Peto-Scott.
- Leads—Good quality flexible—length according to position of Mains Socket.
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### THE D.C. THREE-VALVE SUPERHET

(Continued from previous page).

culties concerning the accurate wiring of the receiver. For those constructors it may be found preferable to mount every part in its place and then to wire the circuit in its actual theoretical order, commencing from the aerial and working through the circuit, stage by stage.

#### The Barretter Holder

A word of caution should be given here concerning the fitting of the special E.S. holder for the barretter. The wires for this should be attached before the holder is mounted on the chassis, and when making these connections extra care should be taken to see that no bare wire projects from the screws, and that the insulation of the wire is carried right up into the sockets on the underside of the holder. It must be remembered that this screws direct on to the metal surface of the chassis, and this is joined to D.C. negative. The holder is wired in the D.C. positive lead and thus contact between the wires to the holder and the chassis will result in a short-circuit of the mains. If, therefore, there is any doubt regarding the insulation of the wire to the holder, a disc of paxolin, thin ebonite, or even stiff well-dried cardboard should be placed underneath the holder before it is finally screwed into place.

#### A Dial Light

It will be noticed that no dial-light has been specified or shown in this particular receiver, but for the benefit of those readers

who desire a fitment of this nature, there is no difficulty in fitting it. The heater wiring should be broken at the point marked with a cross in the theoretical circuit, that is to say, immediately following the barretter. The ends of this break should then be joined to the dial-light holder on the tuning dial. In other words, one side of the barretter is joined to the D.C. positive line, whilst the other side is joined to the 0.5 mfd. condenser. From this point a lead is taken up to the dial light holder, and the remaining contact on this holder is joined to the heater terminal on the output pentode, and from there the wiring continues as in the theoretical wiring diagram. The bulb to be used in the dial light is a 6.5 volt (S type) Osram bulb with a 0.3 amp. filament. These bulbs cost 9d. each.

#### A Fuse-holder

As a safety device it may be considered worth while to use one of the special main connector plugs fitted with fuses, and in that case two 1-amp. fuses should be included in the plug. Full protection is thus afforded to the receiver and to the house wiring. Alternatively, two separate cartridge-type fuse-holders may be mounted on the chassis, and the mains leads may be connected to them.

#### Operation

The manner of operation, trimming, etc., is exactly the same as in the previous two models. Readers should, therefore, refer to the two previous issues regarding this part of the adjustment.

## NEXT WEEK'S BIG CHRISTMAS NUMBER!

Next week's issue is packed with topical articles and illustrations, and reflects the spirit of the festive season. It contains also a

## FREE BLUEPRINT OF THE HALL-MARK THREE

The latest receiver in our low-price series—a hall-marked specification and performance for 45/-.

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### WHISTLE INTERFERENCE

(Continued from page 381)

will prove very satisfactory. The choke may be constructed by winding about 5,000 turns of 32 s.w.g. enamel wire on a lin. former.

For the second-channel interference it is necessary to limit the effect of the local transmission, and although this may be done by cutting down the size of the aerial, this is a poor measure of precaution, as all other transmissions will also be reduced. A band-pass aerial circuit also proves valuable. The most appropriate way, however, is to employ the old familiar wave-trap, although it will be necessary to have two separate traps, one for each local transmission. These may conveniently be wired in series in the aerial lead, and in the interests of efficiency the coils should be of the modern iron-core

type. The tuning point will thus be more sharply defined, although it is not essential to employ coils of this type. The ordinary tuned circuit capable of tuning to the wavelength of the locals with a minimum of added capacity is indicated, and a coil may be home-made or a simple plug-in coil may be used. Alternatively special iron-core coils, two of which are wound as one unit and mounted in a metal screening can, may be obtained from Messrs. Ward and Goldstone, Messrs. Colvern, or Messrs. Wearite, and these may be mounted in a small cabinet and fitted as an external unit or fixed on the receiver itself. The traps are adjusted, of course, when the receiver is tuned to the transmission upon which the interference is experienced. The actual adjustment will depend upon the type of coil, the efficiency, etc. If a coil is purchased, no doubt the manufacturers will supply the necessary details.

## PROGRAMME POINTERS

### The Prudhoe Gleemen

ONE of the oldest male voice choirs in the North-east, the Prudhoe Gleemen (most of whom are employed at the Prudhoe Colliery), will broadcast from their village assembly room on December 5th.

### Boxing Day Programme

ANOTHER feature programme will be given at 5.15 p.m. on December 26th. It is to be designed chiefly for children, with numbers to which games can be played and choruses sung. Henry Hall will also be at the microphone with the B.B.C. Dance Orchestra on New Year's Eve, in addition to the Savoy Bands. Dance music during the Christmas season also comes from the May Fair Hotel (December 21st) and the Hungaria Restaurant (December 24th).

### "Mother Goose" Pantomime

ON December 3rd Scottish listeners will have a foretaste of the coming pantomime season when they will hear part of a rehearsal of *Mother Goose* at the Alhambra Theatre, Glasgow, and also an interview with Kitty Reidy, the principal boy. The rehearsal of *Mother Goose* will be under the personal direction of Julian Wylie.

### Concert by the Scottish Orchestra

THE programme of the Scottish Orchestra, to be relayed to Scottish schools from the St. Andrew's Hall, Glasgow, on December 5th, will include the overture, "Fingal's Cave," by Mendelssohn; Air from Suite in D, by Bach; Scherzo and Finale from Symphony No. 5 in C Minor, by Beethoven; and Invitation to the Waltz, by Weber-Weingartner.

### Accordion Music from Coventry

ON December 7th variety will be relayed from the Coventry Hippodrome to Midland Regional, including Macari and his accordion.

## BOOKS RECEIVED.

### "THE WIRELESS AND GRAMOPHONE TRADERS' YEAR BOOK AND DIARY—1935"

COMPLETE specifications of more than 400 wireless receivers and radio gramophones by about sixty manufacturers are included in the 1935 edition of "The Wireless and Gramophone Traders' Year Book and Diary." The feature mentioned is unique, as is also a similar section giving the characteristics of all the current types of valves on the market. In conjunction with the latter there are diagrams and tables giving the base connections of radio valves. Other subjects dealt with include the legal aspect of such matters as the public performance of gramophone records and the hire-purchase system, and technical matters such as electrical interference are amply considered. Mains voltages in more than 1,000 districts is amongst the information included. In the Directory section are 1,800 addresses of manufacturers and wholesalers, together with their telegraphic addresses and telephone numbers, 1,300 proprietary names of radio and gramophone products, and a buyers' guide to goods supplied under more than 200 different headings.

Of quarto size (10 1/2 in. by 8 in.), it contains some 250 pages, including those devoted to a really practical diary, and is priced at 5s. 6d. (or 3s. 6d. to subscribers to "The Wireless and Gramophone Trader"). Those connected with the radio and gramophone trades, to whom only are copies available, can be supplied on application to The Trader Publishing Co., Ltd., Subscription Department, Dorset House, Stamford Street, London, S.E.1.

# P E T O - S C O T T

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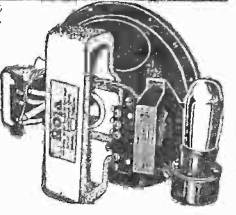
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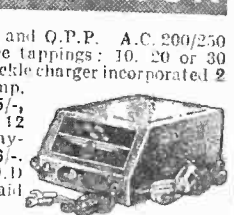
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SUPPLEMENT TO "PRACTICAL WIRELESS"

# AMATEUR TELEVISION

## PRACTICAL METHODS OF SYNCHRONISING

By H. J. BARTON CHAPPLE, B.Sc., A.M.I.E.E.

WITH most forms of mechanically-operated television receivers in use at the present time the drive applied to the scanning member—that is disc, drum, screw, etc.—is asynchronous. In other words, the electrical sources of supply for the driving motor are in no way linked up with the transmitter, and, in consequence, to secure the steadiest image the motion of the receiver is checked or controlled in one of several manners to maintain the required conditions of synchronism.

Methods of this nature have a particular virtue in that the necessity for developing considerable power in the synchronising system is avoided, and under proper operating conditions, with apparatus designed carefully and fed in the correct manner, quite weak "triggering" signals can be included in the radiated television signal from the transmitter to keep the receiver in check.

### Using Established Methods

With the early forms of television, inventors made a careful study of existing picture telegraphy methods in an endeavour to apply the principles to television. For example, one picture-telegraphy arrangement operated in such a manner that the rotating element carrying the built-up picture at the receiver was actually reduced to rest to await the arrival of a releasing signal when the mechanism was running too fast. The idea gave birth to a television synchronising system in which periodic pulses were sent out from the transmitter, and after being received and amplified, these were used at the receiver to energize a form of electro-magnet. Close to this rotated a thin disc of soft copper mounted on the shaft of the motor driving the scanning member, as shown in Fig. 1. At one section of the disc a portion was cut away, and the signal pulse energization of the electro-magnet had no effect on the disc when this missing segment was passing at the identical moment of the receipt of the synchronising pulse.

If, however, the motor tended to run too fast, the phase altered until a part of the copper disc periphery was under the electro-magnet when it was excited. In this way eddy currents were produced in the copper, due to electro-magnetic induction between the magnetic field and the moving conductor in it. This absorbed energy and thereby exerted a braking action on the disc, and so slowed down the motor until normal conditions prevailed. A careful analysis of the scheme will make it evident that a receiver using the method described had to be adjusted permanently so that it tended to run slightly faster than the transmitter drive, because there is no accelerating action engendered by the system when the receiver is running too slowly.

### Modifications

Although capable of giving reasonably satisfactory results, and, of course, being superior to receivers using no form of synchronising beyond continual manual operation of a variable resistance in the motor field-winding, the scheme is inefficient,

This is because the amplified synchronising pulses are used directly to influence the moving member of the image-reconstituting device. To overcome this, other schemes have been developed whereby there is an

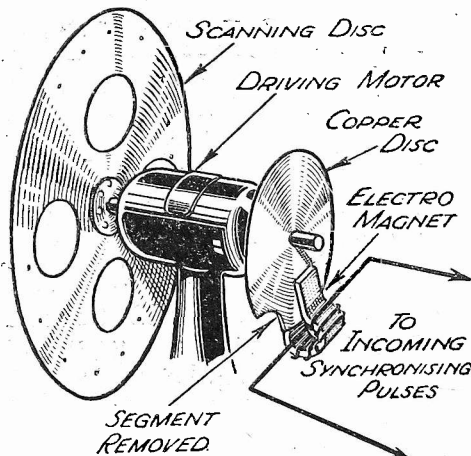


Fig. 1.—One form of automatic synchronising, using an electro magnet operating with a copper disc.

indirect application of a retarding torque. A short description of one of these arrangements will suffice to show what is meant.

A small alternating-current generator capable of delivering a fair amount of power at low voltage is driven by the motor attached to the scanning member of the receiver. The generator is designed to have a high periodicity, that is, some figure

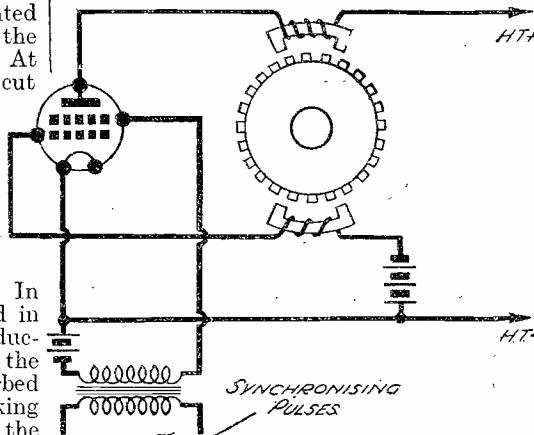


Fig. 2.—Showing the arrangement of the phonic wheel and double stator windings.

between one thousand and five thousand cycles per second, at its synchronous speed, while from the transmitter is radiated a synchronising signal of the same periodicity and waveform. When received, this synchronising signal is balanced against the voltage derived from the local generator in a suitable circuit, so that as long as synchronism persists no power is taken from the generator.

When the television receiver runs fast, however, the local and incoming signals end to come into phase. The resulting

current developed in the circuit is passed to a form of electro-magnetic brake similar to that just described, except that the disc has no segment removed. In this way energy is lost in two ways by the rotating element of the scanning member. First of all, there is the load imposed on the generator coupled to the motor shaft, and, secondly, the eddy current braking action of the copper disc. A method of this nature is capable of being designed to give a very fine control of any tendency to image-hunting, the prime consideration for this to happen being the choice of a sufficiently high synchronising impulse periodicity.

### AN INGENUOUS SYNCHRONISING SCHEME

AMONGST the many synchronising schemes which have been tried with mechanical type receivers is one which is shown theoretically in Fig. 2. In practice this consists of a phonic wheel (a toothed wheel with teeth size equal to gap size), having two stator windings. One of these windings is connected in the grid circuit of a three- or four-electrode valve, while the other is inserted in the anode circuit. The core of the grid circuit stator is preferably polarized so that when the phonic wheel or armature is given a slight turn, fluctuating potentials are applied to the grid of the valve, and this in turn gives rise to corresponding fluctuations in anode current.

Provided the disposition of the grid and anode stators is such that the variation in anode current caused by the phonic wheel teeth passing the grid stator are, in a sense, tending to increase the torque of the wheel, then the wheel and scanning device to which it is attached will start almost from rest. It will then run up to a speed at which the power input to the rotor just balances the losses brought about by friction, air resistance, and eddy currents. If, however, synchronising signals from the transmitter are applied to an auxiliary grid as indicated in Fig. 2, or, alternatively, in series with the grid stator-winding if preferred, then the machine will tend to run synchronously with the periodicity of the applied pulses.

Under conditions which obtain in actual practice this device forms quite a useful method for providing any periodic electrical signal with "artificial inertia." To obtain good starting and running conditions the position of either the grid or anode stator should be adjustable about the axis of the phonic wheel, or rotor, to allow or compensate for such effects as inductance, hysteresis, etc.

### OUTDOOR TELEVISION

MANY of the apparently good points about the Iconoscope may only prove hypothetical, although it seems highly probable that the invention will prove of inestimable use for daylight television transmissions. At present, when daylight is employed certain difficulties arise, but experiments with the Iconoscope show that the sensitivity is higher and thus the day of the televised news-event is probably nearer at hand. It is, of course, too early to forecast, but a study of the principles of the Iconoscope reveals that there are great possibilities in it, and if only the sensitive cells can be accurately controlled, both as regards manufacture and in use, television apparatus may be considerably modified.



# THE BEGINNER'S SUPPLEMENT

THE EASY ROAD TO RADIO.

## A.V.C. SIMPLY EXPLAINED.

A Description of the Methods of Fitting A.V.C. to Your Set.

THE whole question of automatic volume control is inclined to be very misleading to the lesser-experienced constructor, and it is one concerning which many misunderstandings exist. It is not that A.V.C. is difficult to understand, or even to apply, but the limits of its useful application are not always realised. Most of the more expensive commercial receivers are specified as being fitted with A.V.C., and this frequently leads the inexperienced constructor to believe that a set without it is not up to date, and not so efficient as it might be. When this point of view is accepted it appears that a large majority of the home-constructor receivers are lacking because they do not include automatic volume control.

### A.V.C. Reduces Signal Strength

The first point that should be emphasised, therefore, is that A.V.C. is not an unmixed blessing, and that it is not necessarily a desirable feature of every set. As most readers are well aware, the principle of A.V.C. is that it tends to "level up" the volume on all stations and at the same time, and by the same means, eliminate fading. This it can only do by reducing the volume of more

a few special instances which will be mentioned later. This explains why the principle is often not applied to the simpler home-constructor receivers which we so frequently describe. Although A.V.C. might be desirable in many of these simpler sets, the additional cost which its incorporation entails is often not considered to be worth while.

to be preferred in the case of an existing superhet, however, if the alteration is to be made in the simplest possible manner. The extra components and connections required are clearly shown in Fig. 1, where it will be seen that a "Westector" high-frequency metal rectifier is connected in series with a .001-mfd. fixed condenser between the anode of the second detector valve and the earth line. A load resistance of 100,000 ohms is connected in parallel with the "Westector," and a lead is taken from the upper end of this to the grid circuit of the variable-mu valve or valves, as shown. A .25-megohm decoupling resistance is included in the A.V.C. lead, and the lower end of the grid coil or I.F.T. secondary is disconnected from

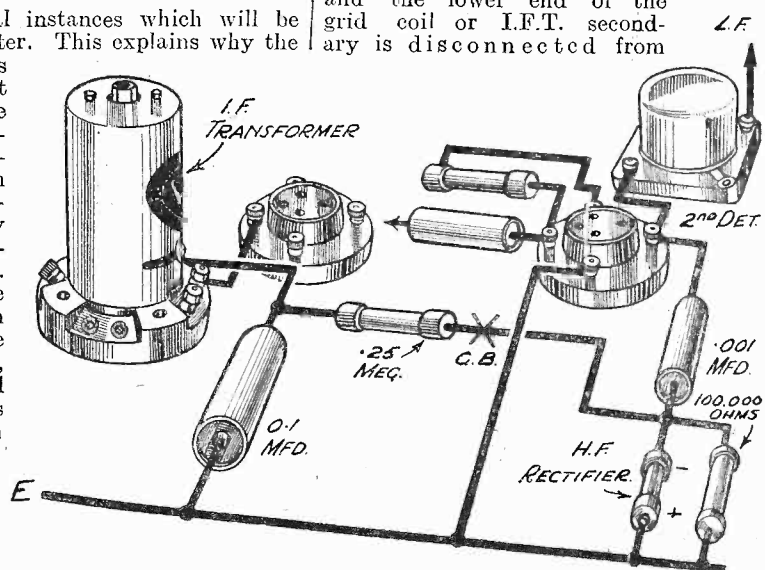


Fig. 1.—Showing a simple method of adding A.V.C. to a superhet. The same connections can also be used in the case of a "straight" set.

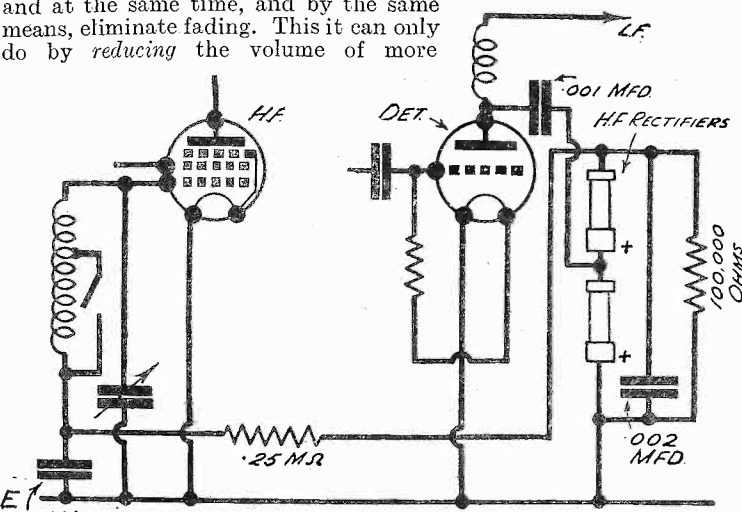


Fig. 2.—A method of adding a system of "voltage-doubling" A.V.C. to a "straight" circuit receiver.

powerful signals, because it certainly cannot increase the volume of the weaker ones. From this it is quite evident that if the receiver is not capable of bringing in a fair number of transmissions at greater strength than is actually required, the addition of A.V.C. can produce no beneficial effect.

This is equivalent to saying that A.V.C. is worth while only in the case of powerful and sensitive multi-valve sets, except in

such as the "£5 Superhet Three" the cost of A.V.C. is practically nil, but if it is to give really satisfactory results with a receiver of the "straight three" type the expense entailed is appreciable. The method of applying A.V.C. to the remarkable receiver just mentioned has recently been described, so there is no need to make further reference to it. Quite a different method is generally

### The Cost of A.V.C.

The actual cost of A.V.C. naturally varies according to the type of receiver with which it is to be used, and might well vary from ten shillings or so up to a pound or more. In the case of a superheterodyne of modern, high-class design,

earth and joined, instead, to the A.V.C. lead. In order to "complete" the "broken" tuned circuit a .1-mfd. non-inductive condenser is joined between the lower end of the grid winding and earth. It is important that, when using this, or any other A.V.C. circuit to be described, that any by-pass condenser between the anode of the detector valve and earth should be removed. In

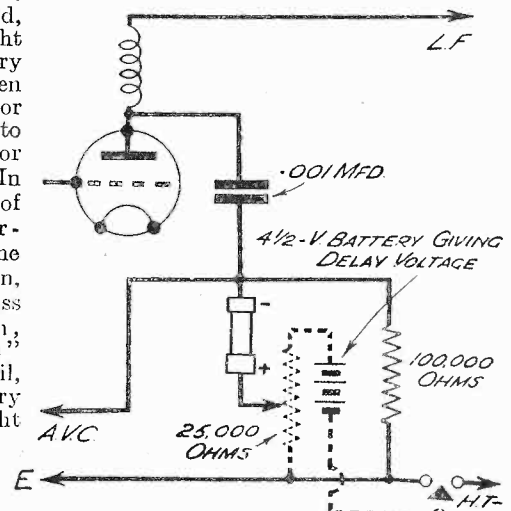


Fig. 3.—Showing how "delay" can be introduced into the A.V.C. circuits shown in Fig. 1 and Fig. 2. The connections are described in the text.

the same way, if a differential reaction condenser is fitted, the lead from this to earth should be disconnected.

The principle upon which this circuit arrangement depends is as follows: A certain amount of the high-frequency currents appearing in the anode circuit of the detector are rectified by the "Westector," so that the "upper" (or negative) end of this becomes negative with respect to earth. The negative voltage developed across the rectifier is fed back to the variable-mu valve(s) as grid bias, and it will be seen that this voltage will vary according to the intensity of the signal currents being handled by the detector valve.

Although the arrangement described is most suitable for use in a superheterodyne, it can also be employed with some measure of success in a "straight" receiver, provided that it has at least one (but preferably two or more) efficient variable-mu H.F. stage. When the set was previously fitted with a potentiometer for varying the variable-mu grid voltage the modification is slightly simpler than described above, since it is only necessary to remove the potentiometer and transfer the lead from the centre terminal (slider) to the negative end of the rectifier.

**Most Effective at Low Frequencies**

Before proceeding further it might be desirable to explain briefly why the form of A.V.C. described is more suitable for use in a superheterodyne circuit. The reason is that the metal rectifier is appreciably more effective at the low frequencies of the I.F. amplifier than it is at the frequencies of the received signals. It is because of this that a complete A.V.C. effect can rarely be obtained with a "straight" receiver, especially when tuned to the medium-wave band, without the use of more complicated circuits. In fact, with a "straight" circuit it is seldom possible to secure any more than a form of anti-fading effect, which is sufficient to minimise fading on transmissions which are normally received at fairly good strength.

Some improvement is to be obtained in the latter case, however, by using a pair of "Westectors" wired in series as shown in Fig. 2. When this is done a certain amount of voltage step-up is produced, this being almost equivalent to the so-called amplified A.V.C. employed in some of the more pretentious factory-built receivers.

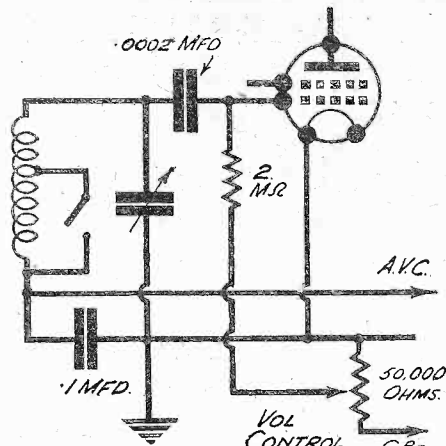


Fig. 5.—The above circuit shows a simple method of combining A.V.C. with manual volume control.

**Delayed Action**

It was pointed out above that A.V.C. reduces signal strength, and this is a point which must carefully be considered. When either of the simple circuits given are used there must—if the system is functioning correctly—be a certain degree of loss on all signals, powerful or weak. In the case of the more powerful ones, the slight loss is generally of no consequence, but it might attain serious proportions where weaker signals are concerned. Because of this it is usually a wise plan to introduce some form of "delay," so that the A.V.C. effect will

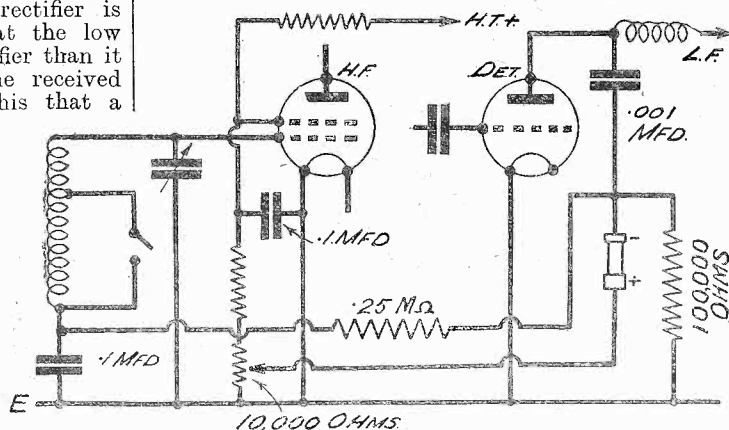


Fig. 4.—This circuit illustrates another and better method of obtaining the "delay" voltage; it is taken from the screening-grid supply circuit.

not come into operation until signals attain a certain intensity. By employing some arrangement by means of which this result may be achieved there need not be any serious disadvantages to outweigh the benefits which are so well known. There are various methods of introducing delayed operation, and the

simplest is that shown in Fig. 3, where a voltage is interposed between the positive end of the "Westector" and earth. This voltage is opposite in polarity to that developed across the rectifier, with a result that a negative bias is passed on to the variable-mu valve(s) only after the voltage rectified by the "Westector" is greater than the "opposing" voltage.

The "opposing" voltage might be obtained from a 4½-volt G.B. battery or, better still, from a 25,000-ohm potentiometer connected across the battery, as shown in broken lines. When the latter method is adopted the most suitable delay voltage can readily be found by trial and, if necessary, eliminated altogether in special circumstances. One slight objection to the scheme is that the on-off switch must be provided with an additional contact, in order to prevent the 4½-volt battery being "drained" while the set is out of use.

**Combined Manual and Automatic Control**

An entirely different method of obtaining the delay voltage is shown in Fig. 4, where a 10,000-ohm potentiometer is connected in series with the fixed, or variable, potentiometer used to supply the screening grid of one of the H.F. valves. The desired voltage can be found by trial, simply by altering the setting of the potentiometer.

It is often desirable to combine both manual and automatic variable-

mu volume control, or at least to apply a minimum negative bias to the variable-mu valve(s). This introduces slight complications, but there are various methods by which it can satisfactorily be accomplished. When the receiver employs indirectly-heated valves the method is obvious, since it is only necessary to adjust the value of the resistance in the cathode-earth lead. With a battery set a fixed negative bias can easily be arranged simply by inserting a G.B. battery at the point marked G.B. in Fig. 1; best results will generally be obtained by inserting the plugs so that a voltage of 1½ is obtained.

The simplest method in the case of a battery set is to break the grid circuit(s) of this variable-mu valve(s), as shown in Fig. 5, insert .0002-mfd. fixed condenser(s), and connect a 2-megohm grid leak to the centre terminal of the customary 50,000-ohm variable-mu potentiometer.

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## OUR SIMPLE "BUY BRITISH" COMPETITION

Result of the Simple Contest which  
Appeared on Page 226 of Our Issue  
dated October 27th, 1934.

Readers will remember that we offered fifty prizes of British-made Hivac valves (each prize equal to the value of 25s.) to the fifty readers who most nearly forecast the number of foreign valves which were imported into the British Isles during the three months of August, September and October, 1934.

The following readers' entries were the nearest, and Hivac valves to the value stated above will be sent to each of them in accordance with the rules of the competition.

- B. W. Newton, 7, Clarendon Crescent, Sale, Cheshire.  
George R. Hughes, 53, Gladstone Road, Wallasey, Cheshire.  
C. G. Moody-Smith, 19, Balcaskie Road, Eltham, S.E.9.  
H. J. Barnes, 76, Ridge Avenue, Winchmore Hill, N.21.  
I. Higginbotham, 4, Copper Street, Macclesfield, Cheshire.  
Hugh Ernest Gill, 89, Stanton Street, Newcastle-on-Tyne.  
H. C. Williams, 109, Claude Road, Cardiff.  
J. B. Walters, 14, Egerton Road, Pye Hayes, Birmingham.  
Cecil H. Moore, Charlton, Swindon, Wilts.  
John Swan, 32, Andrew Street, Lochgelly, Fife.  
Ivor Omand, 57, West End, West Calder, Midlothian.  
John L. Adam, Dalhousie Road, Milliken Park, Kibbarchan, Renfrewshire.  
E. Walker, 2, Glasford Street, Tooting, S.W.17.  
Joseph Thos. McLeod, Jeffrey Gardens, Ince, Bar, nr. Wigan, Lancs.  
F. Bryan, 6, Grove Terrace, Norwood, Beverley, E. Yorks.  
L. Charley, "Romola," Gillview Road, Hucclecote, nr. Gloucester.  
Iain Sinclair, 50, Ralstone Avenue, Crookston, Glasgow, S.W.2.  
Bernard Leighton, 16, Birch Grove, Rusholme, Manchester.  
George McMillan, 11, Dock Place, Leith, Scotland.  
John MacGregor, 21, Holland Park, Belfast.  
H. G. Clark, 1, Trinity Street, Liverpool Road, Islington, N.1.  
J. R. Godolphin, 144, Felsham Road, Putney, S.W.15.  
A. Laird, 6, Ann Street, Greenock.  
B. Newcomb, The Wilderness, Victoria Avenue, Westgate-on-Sea.  
S. E. Dumbrell, 54, George Street, Hove, Sussex.  
W. Saunders, 4, Brenchley Road, Maidstone, Kent.  
Samuel Nicolson, 131, Ardgowan Street, Glasgow, C.3.  
James Montgomery, 56, Woodvale Street, Belfast, Ireland.  
E. W. Badder, 5, Mayfield Park N., Fishponds, Bristol 5.  
W. Williams, 15, Southlands Avenue, Southbourne, Bournemouth.  
J. G. Pitchay, 25, Parkhouse Gardens, Sherburn, Durham.  
Drew. Adie, 366, Tweedmuir Road, Hilington, Glasgow.  
R. Lewis, 74, Green Way, Maidstone, Kent.  
A. Dixon, 22, Coach Lane, Hazelrigg, Dinnington Colliery, Newcastle-on-Tyne.  
T. E. Griffiths, 26, Marlboro Road, Newport, Mon.  
James Laing, 10, Moorhouse Street, Salford 5, Lancs.  
A. A. Chinn, 21, Chapel Street, Coventry.  
Richard Dixon, Lahinch, Co. Clare, I.F.S.  
R. Mullings, 6, Wards Road West, Ilford, Essex.  
T. Carless, 43, East Parade, Steeton, nr. Keighley, Yorks.  
A. Goodale, 28, Cromford Road, Wandsworth, S.W.18.  
Victor Sparkes, 13, Dault Road, Wandsworth, S.W.18.  
Matthew Forrester, 8, Flass Street, Durham City.  
J. Booth, 7, Mornington Road, Wanstead, E.11.  
E. Wanderson, 5, Agnes Gardens, Dagenham, Essex.  
C. Powell, 1, Garfield Terrace, Devonport, Devon.  
A. J. Blackmore, 40, Fair View, Barnstaple.  
H. H. Powell, 27, Worcester Road, Kingswood, Bristol.  
James Knight, 17, Brantwood Avenue, Dundee.  
L. C. Walters, 12, Kirkstall Avenue, Tottenham, N.17.



Mr. F. J. Camm (Editor, *Practical Wireless*) says:—"As near perfection as I believe perfection possible."

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Mr. H. J. Barton Chapple, Wh.Sc., B.Sc. (Hons. Lond.), A.C.G.I., D.I.C., A.M.I.E.E., Hon.M.I.W.T. (the great radio and television authority):—"For tonal quality it is the best speaker I have heard so far."

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A. H. K., Brierley Hill.

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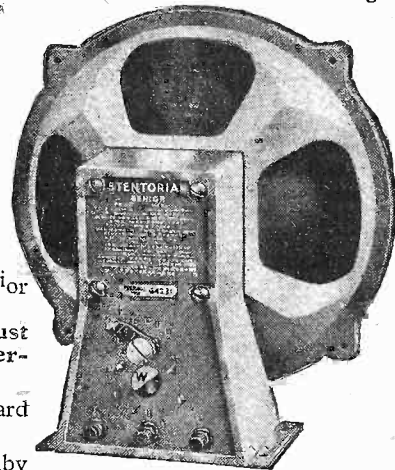
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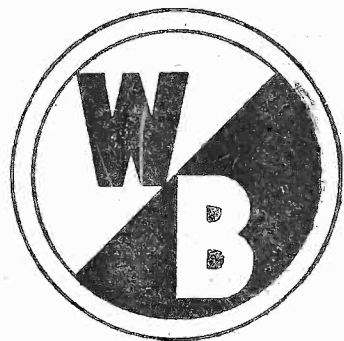
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PRACTICAL LETTERS FROM READERS

The Editor does not necessarily agree with opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

"All-Mains Pentode Three"

SIR,—May I congratulate you on producing such a fine set as the £5 Superhet Three. I would also like to second the remarks of A. G. Brommage (Hampstead) concerning an "All Mains Pentode Three" with the alternative of a Westinghouse metal rectifier in place of a valve rectifier for the mains portion.—R. OWEN (Didsbury).

An Economy Set

SIR,—I am—in agreement with your Northampton correspondent, and agree that a real economy set would be popular, say one that would get ten stations worth listening to. This, I think, would satisfy numerous readers of your interesting paper. The superheterodyne fans have been well catered for.—H. RILEY (Bradford).

Eight-Valve Superhet Wanted

SIR,—I want to take this opportunity to thank you for your excellent paper. It certainly lives up to its name, PRACTICAL WIRELESS. Could you publish in the near future a real "super" set, seven or eight valve-battery superhet, and also a two-valve short-wave superhet adaptor, in each case keeping the cost down as much as possible?

I would have built the £5 Superhet if I had been in England when it was published. It is a wonderful set.—D. HORTON-GEORGE (Whyteleafe, Surrey).

"A Mains Pentode Three"

SIR,—As suggested by Mr. A. G. Brommage, a "Mains Pentode 3" would be very welcome. Some time ago I made up the "Mains A.C. 3" published in the Olympia edition of PRACTICAL WIRELESS two years ago, and no doubt you could accommodate most of the parts, such as coils and 2-gang condenser, speaker, and the majority of the fixed condensers. Probably it will be better to have the output valve resistance coupled to the detector stage.

What about publishing it as a good radiogram also, using a cabinet of pleasing design but not too expensive. I think this side deserves more consideration, as I cannot remember you ever issuing a receiver as a radiogram, although I appreciate you always make provision for a pick-up.

Personally, I would like to see a few more articles about testing "Mains Sets," as these seem to develop more troubles than a good battery set.

I have improved my knowledge of radio from the articles issued in your excellent publication, and I wish it every success.—J. ROYSTON (Chadwell Heath).

The £5 Superhet Three: Another Tribute

SIR,—After a week's operation of this set I feel I must write and tell you what I like about it. There are several outstanding points such as:—

- (1) Its uncommon simplicity.
- (2) Its selectivity, range and volume, and

its methods of varying the first-named to suit local conditions.

- (3) Its compactness and neat appearance.
- (4) The ingenuity of its designer, and its good quality.

I can confirm from experience that this set really does do all you claim for it, and stations which with a professional superhet were not receivable or not clear now come in at quite good volume on an aerial 20ft. long and a very poor earth, or with the outdoor aerial entirely cut off and using an indoor one only. I have been building sets for seven years now, and must have constructed between thirty and forty, but this superhet—which has always been my most intriguing study, due to its constant selectivity—is the most ingeniously conceived and compact little set I have ever seen.

I trust it will be built by hundreds of thousands, as it deserves, and take this opportunity of congratulating you on the evolution of such a brilliant design, characterised by all the attributes of the best commercial superhet available to-day, combined with unusual compactness and simplicity.—V. E. HOLDAWAY (Clapham, London, S.W.).

£5 Battery Superhet Three

SIR,—You will no doubt receive enough letters to sink a ship if all home constructors think as I do. I can only say thanks for the simple, practical and much-needed set you have produced—almost like a rabbit from a hat. If you have got your eye on a "two," but—nuff said. Somebody else might suggest a one-valve. In the meantime you have produced something for which you can feel excusably proud. I don't write letters to those who express themselves in terms of megohms, decibels, etc., but your production makes me break a rule. If I say we are greatly indebted to you for your great effort, I feel I am only voicing the gratefulness of many thousands of wireless enthusiasts who, like myself, a hardened constructor for ten or more years, know when they spot a real winner.

And now might I ask a question about the pick-up. The top photoprint on page 203—issued November 17th—shows plug sockets for a pick-up. Your printed diagram on page 198 of the same issue does not show the connections. Perhaps you will deal with this point in a later issue.—Yours sincerely, ARTHUR N. RELTON (Aberdeen).

[Pick-up connections for the Battery. Model were given on page 323 of our issue dated November 17th.—Ed.]

£5 Superhet Three and A.V.C.

SIR,—I am particularly interested in your latest set, the £5 Superhet Three, and I intend to build same. I am stationed at Bere Island, Co. Cork, and fading here is very bad, even on the English stations. I have listened to quite a number of sets, and the only successful ones seem to be those which are fitted with automatic volume control. I am anxious to know if it is possible to incorporate some form of automatic volume control in your superhet three. If so, I should be



pleased if you would give me some information as to the necessary alterations required.—P. F. CUBITT, Spr. R.E. (Bere Island, Bantry Bay).

[A.V.C.: and the Superhet was dealt with on page 323 of our issue dated November 17th—Ed.]

THE FUTURE OF THE SUPERHET

(Continued from page 380)

it will be seen that the driver portion is used for the I.F. stage, whilst the two "halves" of the class B portion are used for detection and L.F. amplification, respectively.

A Neutralised Triode

It may seem rather decadent to use a triode for I.F. purposes, but if it is neutralised, as shown, there is no reason why it should not prove quite satisfactory. Neutralised circuits are not to be recommended for use in a "straight" circuit, because they must be accurately adjusted each time a change is made from one wavelength band to another. For I.F. purposes, however, the well-known and once-popular neutrodyne circuit is quite satisfactory, due to the fact that the tuning circuits always remain at the same resonant frequency. In order to employ a neutralised form of I.F. coupling, it is necessary to make use of an I.F. transformer with a centre-tapped primary, but such transformers are available, and can easily be made for experimental purposes. It will be seen from Fig. 2, that one half of the primary provides the neutralising coupling through the neutralising (variable) condenser marked N.C.

After giving a little thought to the circuits mentioned above, the idea of a future two-valve superhet does not appear to be very remote. In fact, who can say that we shall not, one day, have a single-valve superhet?

CUT THIS OUT EACH WEEK

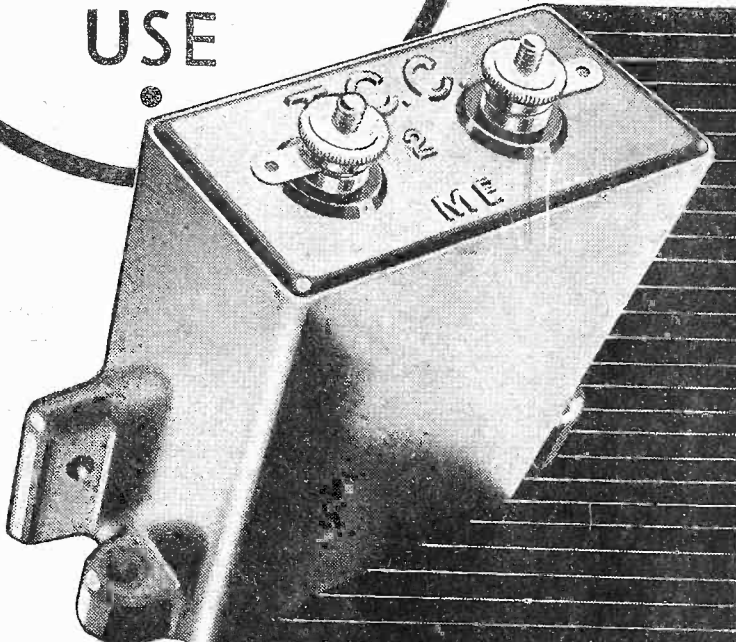
Do you know

- THAT the actual percentage of distortion which may be tolerated in a receiver governs the power output which may be obtained.
- THAT owing to the above point push-pull amplifiers will deliver a greater A.C. output than double that of each of the individual valves used in the amplifiers.
- THAT screening the down-lead must be carefully carried out in order to reduce capacity losses between lead and screen.
- THAT it often proves worth while to screen the H.F. choke in a simple detector circuit.
- THAT a fixed condenser may be inserted in the reaction circuit in order to avoid risks of short-circuit due to a faulty reaction condenser.
- THAT the wiring of the electric-bell system makes a good aerial.
- THAT the gas pipes do not prove worth while for earth connections on account of the insulation of the joints.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL WIRELESS. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

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EXPERTS  
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**UNSCREW** the back of this or that commercial set — lift up the lid of another, turn to the specification of the 'star' receivers. Ask any serious experimenter, or any expert — ask your radio dealer — Always T.C.C....

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Complete Kit of parts for this remarkable set exactly as used by Mr. F. J. Camm.

**7/6** KIT A. Complete parts. Cash or C.O.D. £5, or 7/6 secures delivery, balance by 11 monthly payments of 9/3.

**12/-** KIT B. Complete parts, including specified valves. Cash or C.O.D. £7/5/6, or 12/- secures delivery and balance by 11 monthly payments of 13/3.

**2/6** W. B. Stentorian Senior P.M. Speaker. Cash Price £2/2/0, or 2/6 with order and 11 monthly payments of 4/-.

**2/6** W.B. Stentorian Standard P.M. Speaker. Cash Price £1/12/6, or 2/6 with order and 11 monthly payments of 3/-.

**4/6** Rola FR7 P.M. Moving-Coil Speaker, with Universal Transformer. Cash Price £2/9/6, or 4/6 with order and 10 monthly payments of 5/-.

**5/-** Atlas T10/30 H.T. Eliminator and Trickle Charger combined. Cash Price £3/9/6, or 5/- with order and 12 monthly payments of 5/11.

**5/-** VALVES. Every type of valve replacement supplied on convenient terms. 3 Valves—Mullard, Cossor, Marconi, S.G., Det., Power. Cash Price £1/5/0, or 5/- with order and 5 monthly payments of 4/7.

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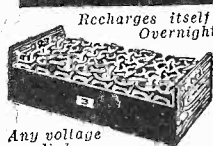
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More striking praise for the Standard Wet Battery. "I have had my present cells on a 3-valve set going 10 hours a day for 12 months. An ordinary dry battery lasted 7 weeks. And now the crowning glory it is streets ahead of dry H.T. for television, as you know cracking and noises show up in flashes," writes R.S. Gives abundant pure current year in year out. Saves pounds. Annual replenishment is all that is necessary. 120 volts, 12,500 m.a. £2 carriage paid. An investment. ALL STANDARD H.T. SPARES SUPPLIED. — WET H.T. BATTERY CO. (L.P.W.), 95, Dean St., W.1.

Any voltage supplied



By JACE

### Nosmo King Listens In

ACCORDING to information received from Highbury, the Cossor people recently succeeded in snapping Nosmo King, the mystery man of the B.B.C., in his dressing-room. The illustration on this page shows Hubert King trying to get Africa on the Cossor Superhet so that Nosmo can listen to his adopted people.

### New Radio Receiver with Fluid-light Tuning

MANY stage stars and other celebrities, who divide their time between their homes, country cottages, and theatre dressing-rooms, are using the new "His Master's Voice" "Superhet Portable Fluid-light Six." This ingenious receiver is completely self-contained, having its own built-in aerials. Florence Desmond, who is now appearing in the new Cochran revue "Streamline," is one of the stars who uses this instrument. She enjoys radio entertainment in her flat during the day, takes it along to the theatre in the evening, connecting it to the electric light supply in her dressing-room, and at week-ends enjoys entertainment from it in her country retreat.

This amazing wireless receiver is just plugged into the A.C. electric light in the same way as a standard lamp, and is extremely simple to operate, for the H.M.V. system of fluid-light tuning is used, which shows exactly when a station is being received dead accurately. The instrument has six valves, which enables a very large selection of European stations to be received with ease, for the illuminated wavelength scale bears the names of the principal stations. The automatic volume-control feature keeps all transmissions at the same volume, and counteracts any tendency of fading. The reproduction is particularly pleasing, for a wide range moving-coil loud-speaker is built into the neat walnut cabinet.

The "Superhet Portable Fluid-light Six" can also be used for reproducing gramophone records in conjunction with a gramophone pick-up, thus making it equal in performance to that of an expensive radio-gramophone.

### "The Causes of War"

TO correct misunderstanding in certain quarters, the B.B.C. re-states the intentions and conditions governing the series of talks entitled "The Causes of War," which began on October 12th and continues until December 14th.

The causes of war are being discussed from different standpoints by a number of contributors eminent in various spheres of life. The range of speakers is as wide as possible. There is no censorship of the material contributed to this series, but it is expressly designed that each contribution should treat the subject from a special angle. Unfortunately, this was not made clear to Professor Haldane, with the result that his approach was not from the standpoint of the scientist and biologist, as was required in order to maintain the general balance of the series. When the mistake was discovered it was too late for Professor Haldane to prepare another paper.

November 30th: Major Douglas.

December 7th: Sir Josiah Stamp.

December 14th: Sir Austen Chamberlain.

### Training Footballers by Loud-speakers

THE advantages of a good "Sound-reproduction Equipment" for providing musical entertainment additional to



Nosmo King, mystery man of the B.B.C., listens in to a Cossor superhet.

that furnished on certain occasions by a band, and for broadcasting announcements to the supporters, were recently pointed out to the officials of the Sheffield Wednesday Football Club and to the Club's supporters. As an outcome the "Supporters' Club" presented the football club with a G.E.C. 12 watts A.C. equipment with a turntable outfit and a microphone. Already this equipment has been found in every way a decided asset, not only as a means of keeping supporters entertained and supplied with information, but as a means for team training. With the microphone, Mr. Walker (the manager) is able to speak to a player during a practice match without any stoppage of play. The success which has attended this method of conveying instructions suggests that the idea will be widely copied.

## RADIO CLUBS AND SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

### THE RADIO, PHYSICAL AND TELEVISION SOCIETY

THIS society had a very interesting lecture and demonstration on "Television" on Wednesday, November 14th, at headquarters, 72a, North End Rd., West Kensington. The lecturer, Dr. C. G. Lemon, explained very lucidly the theory of television and the different methods of scanning were explained. Several novel inventions were shown, among them being a white glow-lamp for television purposes. Some records of actual B.B.C. television transmissions were shown, and a vision transmitter was demonstrated, and various objects were televised. Those able to stay on were amply rewarded by the very good pictures shown by the B.B.C.

May we remind readers of PRACTICAL WIRELESS that meetings of the society are held on alternate Fridays at 8 p.m. Further details of lectures, etc., can be obtained from the assistant hon. sec., M. E. Arnold, 12, Nassau Rd., Barnes, S.W.13.

### INTERNATIONAL SHORT-WAVE CLUB (LONDON)

THE London Chapter held its annual general meeting on Friday, November 16th, at which an election of officers took place. Officers for the coming year are as follows: President, J. E. Underhay; Secretary and Treasurer, A. E. Bear; Chairman, J. E. Hunter; Television Adviser, A. W. Nobb, F.T.S.; Technical Advisers, G. Hayes and C. H. Durrant.

The meeting was followed by a "junk sale," which not only provided many fine bargains, but created much amusement. The meeting concluded with a description and demonstration of an R.C.A. Allwave Receiver by Mr. A. R. Sinclair. Mr. Sinclair's talk was most interesting and many stations were heard at great strength.—A. E. Bear (Secretary), 10, St. Mary's Place, Rotherhithe, London, S.E.16.

### THE CROYDON RADIO SOCIETY

THE Croydon Radio Society had members of the Short-wave Radio and Television Society of Thornton Heath as guests for the meeting on Tuesday, November 13th, in St. Peter's Hall, S. Croydon. Mr. W. J. Bird, Vice-Chairman of the home society, presided. Mr. E. N. Shaw was the lecturer, and a most interesting evening was spent when he described his experiences in short- and ultra-short-wave transmission and reception.

Even more fascinating were Mr. Shaw's explorations into the ultra-short-wave world. Here again, quite orthodox apparatus, as for the short waves, was needed for reception. He used a super-regenerative receiver, and he described its interesting features, such as the quench coils, which, in a word, "chopped" up the howl which would otherwise have been produced by reaction. To ascertain if he was on 5 metres, he used a signal generator of his own construction and the explanation of its functioning proved very absorbing. Transmitting experiences also came in for much comment, and even here the apparatus was of a very simple nature. Nor was television overlooked, and Mr. Shaw made clear the possibilities of it on ultra-short waves.—Hon. Sec., Mr. E. L. Cumbers, Maycourt, Campden Rd., S. Croydon.

## CATALOGUES RECEIVED

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed with applications for catalogues. No other correspondence whatsoever should be enclosed.

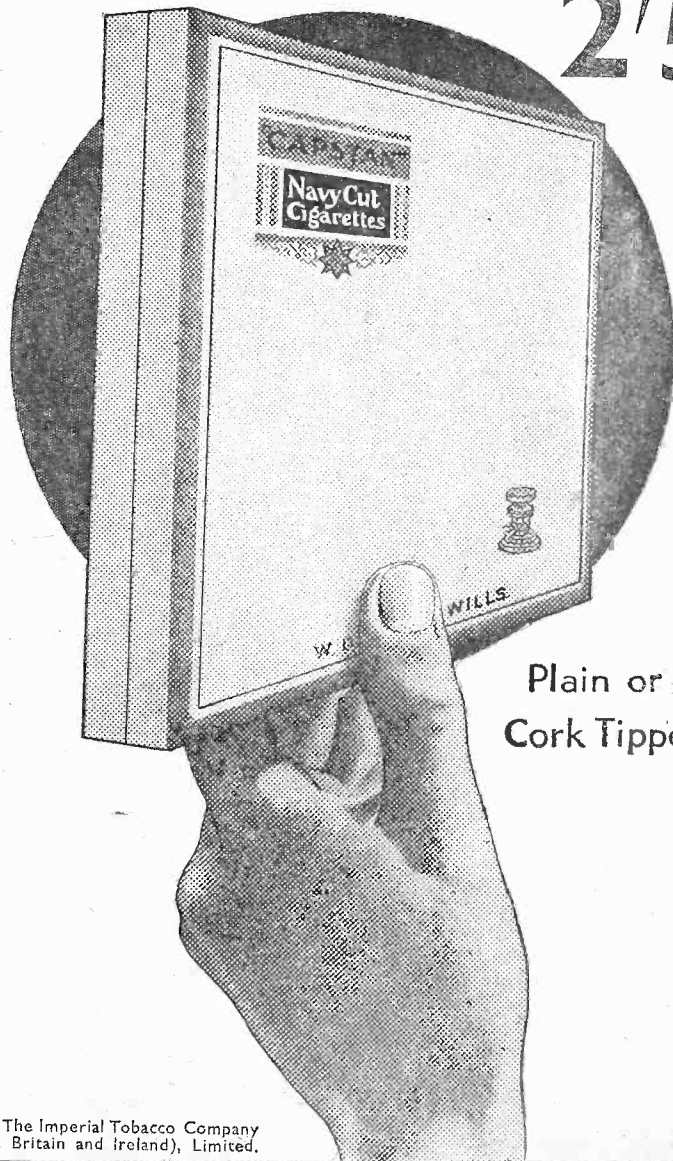
### A FERRANTI VALVE GUIDE

THE name of Ferranti is, of course, associated with components of really high class, and the introduction by this firm of valves, for battery and mains supplies, enables them to supply a very complete range of all the accessories for modern wireless-receiver construction. The new valve guide, which is issued by Messrs. Ferranti, gives, in its introductory pages, details of the construction of the valves. Such points as the getter, the bulbs, and other interesting details of manufacture are fully explained, and two pages are used for each valve type. On one page is the full technical details of the valve, with its various characteristics and a photograph of the valve-base connections. On the opposite page is the usual characteristic curve chart and one or more theoretical circuits showing the application of the valve in question to a normal receiver. The range of valves is most comprehensive, extending from the modern heptode or frequency changer to standard full-wave valve rectifiers. The guide is completed with a list of all the valve types, A.C., universal and battery, and a chart of equivalents of the Ferranti and the valves manufactured by the remaining valve manufacturers.

# WILLS'S CAPSTAN CIGARETTES

Flat Fifty  
Cardboard Box

2/5



Plain or  
Cork Tipped

Issued by The Imperial Tobacco Company  
(of Great Britain and Ireland), Limited.

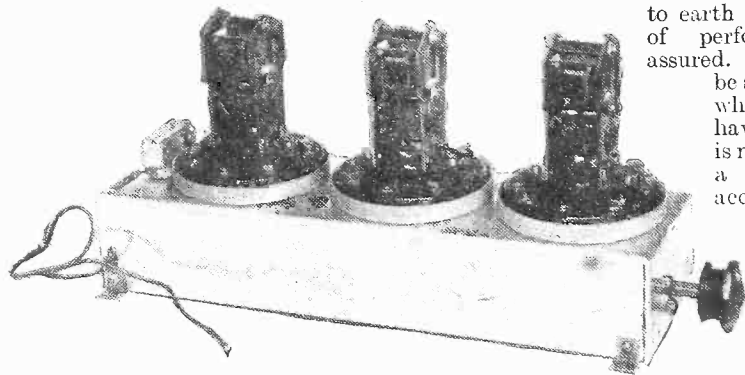
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# FACTS & FIGURES

*Components tested in our Laboratories*

### Goltone Iron-core Coils

THE illustration below shows the very unconventional appearance of the Goltone tuning coils. It is usual to expect to see the modern coil wound upon a solid former, although the iron-core which is now so commonly employed is often of a small square section and thus reduces the general dimensions of the coil. In the Goltone coils, however, the bobbin upon

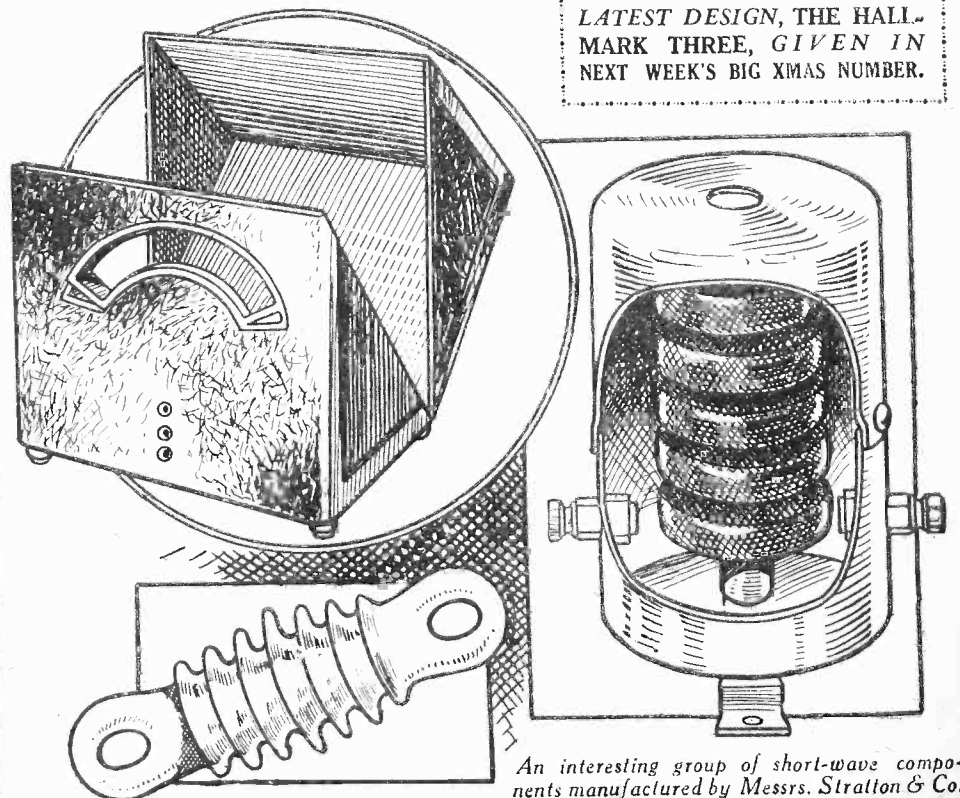


*A three-gang coil assembly of the new Goltone iron-core coils.*

which these are wound is not only small, but is held in place by means of strips of paxolin which are shaped and provided with slots so that the two sections (long and medium-wave windings) may be supported at right angles, one above the other. The separation between adjacent sections of each winding is carried out with a mica-like material, and thus the reduction in the amount of solid material which is employed in the complete coil, together with the method of supporting the entire assembly, greatly reduces the losses which are incurred. Actual figures show that these coils have a self-capacity of only 26 mmfds. on the long-wave band and a self-capacity of 17 mmfds. on the medium-wave band. The coils are wound with an inductance of 157 microhenries for medium waves and 2,200 microhenries for the long waves. There are six types of this coil available, ranging from a simple detector-grid coil (or aerial coil) to a special oscillator unit for use with pentagrid or heptode valves. The price per coil is 9s. 6d. To facilitate the construction of a receiver incorporating these coils, special bases are obtainable inside which a special switch is built. These bases may be obtained for single coils, or for sets of two, three, or four coils. In the illustration, three coils are shown mounted on a base, the combination being designed for a super-heterodyne receiver and employing band-pass tuning and an oscillator unit. The complete set, as shown, costs 23s. 6d. (including pick-up and Q.M.B. mains switch), or 22s. 6d. if any coil other than the oscillator is included. The makers are Messrs. Ward and Goldstone.

### Eddystone Short-wave Components

A VERY careful study is required of the conditions on the short waves when designing components for use at these very high frequencies. Messrs. Stratton and Co. have specialized in this work for many years and three of their specialities are illustrated at the foot of this page. To avoid hand-capacity and other effects it is advisable to enclose a short-wave receiver in a metal box, and to earth the box. Stability of performance is thus assured. In the group may be seen a very neat box which Messrs. Stratton have produced, and this is made to hinge across a diagonal, so that access may readily be obtained to all parts of the receiver. It is finished with a glossy stoved paint inside and a brown crystalline finish on the outside, and four small rubber feet are fitted on the base. It may be obtained with the escutcheon gap or without for 27s. 6d. The size is 9½ in. by 8 in. by 8 in. The component on the right of the cabinet is a special



*An interesting group of short-wave components manufactured by Messrs. Stratton & Co.*

screened H.F. choke, in which six honeycomb coils are spaced on a hollow steatite former, the whole being mounted in a copper screen. The design of this choke renders it highly suitable for use on the broadcast band as well as on the short waves, and the range over which it gives adequate choking effect may be stated to be approximately 12 to 2,000 metres. The natural wavelength of the choke is in the neighbourhood of 2,400 metres. A similar model, with a smaller winding, is also obtainable for use on wavelengths between 10 and 200 metres. The price of the former is 5s. and the latter 3s. 9d.

For adequate insulation of the aerial system a long leakage path is necessary, and although this may be obtained by using a number of small insulators in series, greater tensile strength is obtained if a single insulator is employed. Owing to the design of the special steatite insulators shown in the illustration in question, a very long leakage path is obtained, and the insulator is not unduly heavy. There are thus several advantages to be obtained by using a device of this nature for the support of the aerial. A very high glaze is imparted to the surface and this tends to prevent the accumulation of moisture and dirt, and the breaking strain is of the order of 400 lbs. The overall length is 3½ in., and the price is 9d.

### New Ferranti Models

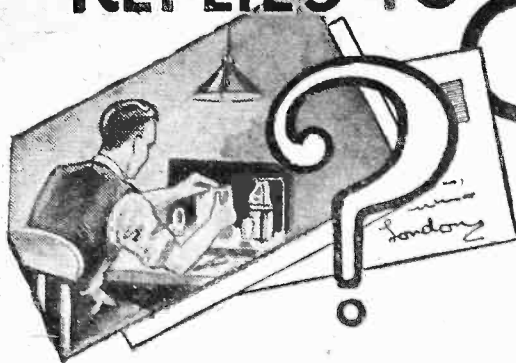
MESSRS. FERRANTI inform us that following the success of the Arcadia radiogram, three new models have now been introduced. The Arcadia Autogram, selling at 39 guineas complete with automatic record changing; the Lancastria Radiogram, selling at 24 guineas, and the Lancastria Autogram, selling at 33 guineas, with automatic record changing.

### OUR LOW-PRICE CAMPAIGN ADVANCES!

FREE BLUEPRINT OF OUR LATEST DESIGN, THE HALL-MARK THREE, GIVEN IN NEXT WEEK'S BIG XMAS NUMBER.

REPLIES TO

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS



If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to the Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2.

QUERIES and ENQUIRIES by Our Technical Staff

The coupon on Cover must be attached to every query.

SPECIAL NOTE

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

- (1) Supply circuit diagrams of complete multi-valve receivers.
- (2) Suggest alterations or modifications of receivers described in our contemporaries.
- (3) Suggest alterations or modifications to commercial receivers.
- (4) Answer queries over the telephone.

Please note also that all sketches and drawings which are sent to us should bear the name and address of the sender.

Additionally, we have already published several designs such as you require. Perhaps if you consult the index for the past two volumes you could locate the one most suited to your needs.

A Smoking Resistance

"I have built the 'Atom' portable and had good results the first time I tried it, but the next time the 1,000-ohm resistance started smoking when I plugged in the H.T. I replaced the resistance with a new one, but the same thing occurred again. Would you please advise me what is wrong?"—R. Crawford (Glasgow).

The probability is that condenser C4 is punctured or otherwise faulty and is causing a short-circuit of your H.T. supply at that point. Replace the present condenser by one which is known to be in order and see if this improves matters. The resistance certainly should not run hot, and in the original model it did not even get warm after a whole evening's operation.

Adding a Second S.G. Stage

"I have a home-constructed three-valve A.C. mains receiver, and am thinking of adding another S.G. valve. I already employ one S.G., one detector, and one super power, and would like to know how best to employ another S.G. valve."—L. Barnes (Ipswich).

We cannot see the necessity for adding a further valve to your circuit. Would it not be preferable to increase the L.F. amplification by using a pentode in place of the power? The extra H.F. stage may lead to all sorts of instability and may necessitate a complete re-design of the receiver, whereas a change to a pentode output stage would not require much alteration, and would give a good increase in signal strength.

ORDER NEXT WEEK'S BIG CHRISTMAS NUMBER NOW!

Packed with Special Articles and Illustrations  
Free Blueprint of our New Receiver—THE HALL-MARK THREE!

Reading Radio Society

"I have for some time been a regular reader of your periodical, and amongst other things I have been very interested in the reports of the various radio societies. Up to the present, however, there has not been any mention of a radio society in or near Reading. Is there any such institution? If so, can you give me the address of its secretary?"—R. Huett (Reading).

We do not know of a society near you, but if there is one, and the secretary will let us know, we will pass on the information to you.

Circuit for Cossor Empire Coils

"Could you let me have the blueprint for Cossor Empire coils (unscreened) for a three- or four-valve battery set, and a circuit for the British General Tuner?"—D. Ward (Darlington).

We regret that we have no details of the Cossor coils, but Messrs. Cossor may be able to assist you if you communicate with them at Highbury Grove, London, N. We have a blueprint here (Blueprint H No. 8, price 1s.) in which the older pattern British General Tuner is employed, and the new tuner, with a short-wave winding, was employed in the Unipen, a one-valve receiver described in PRACTICAL WIRELESS No. 56. Back numbers of P.W. are obtainable from this office, price 4d., post free.

A Broken Coil

"I have a Lotus aerial coil, and unfortunately I nipped the last turn of the top half, breaking it and making it about six inches shorter. Will this affect it in any way? Could you tell me what gauge of wire, etc., to use to rewind it?"—R. Butterfield (Nelson).

The loss of the wire will only reduce the overall tuning range. That is to say, instead of going up to 550 metres or whatever is the maximum tuning range of the particular coil, it will fall slightly short of that wavelength. It will, however, tune slightly lower, and thus all your stations will be found to have moved up the dial a few degrees. There is, therefore, no need to rewind it.

THE QUERIES COUPON APPEARS ON COVER III.

Faulty Grid Leak

"I have built a two-valve R.C.-coupled receiver, using six-pin coils. I have a 60-volt H.T. battery and a 2-volt L.T. accumulator. When the set is switched on I get a little music for about a minute, and then it vanishes. I can get very faint signals by putting my finger on the phone terminal, otherwise the set is dead. Can I cure this?"—R. F. M. (Sherwood, Notts).

It would appear that the R.C. unit is faulty. Probably the grid leak is disconnected or broken down entirely, or the coupling condenser is leaky. Try a transformer or another unit in its place. Your sketch of the connections of the coil is not very clear, although it appears that the reaction circuit is incorrect. The reaction condenser should be joined between the anode of the detector valve and one side of the reaction winding, and the other end of this winding should be earthed.

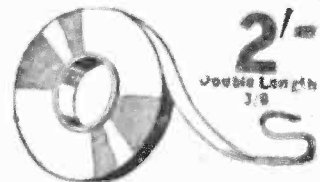
Emission Tester Wanted

"I find that on taking over a radio shop I have had several requests for testing emission of different valves. I have looked up the Encyclopædia and found near enough what I require, but I would like you to come to my aid and give me a theoretical circuit of a suitable tester for battery use."—E. S. (E.2).

We are very sorry indeed that we cannot extend our Free Advice Bureau to the design of special apparatus. There are several commercial units available for this purpose, costing only a few guineas.

PIX THE WORLD'S HANDIEST AERIAL

A highly efficient self-adhesive strip Aerial that gives a wonderful pick-up clear of interference: Fixed in a jiffy without tools. Press it anywhere you want to run it and it sticks. Lightning proof, neat, efficient; just the thing for a modern home. PIX, London, S.E.1.



PIX INVISIBLE AERIAL

**Miscellaneous Advertisements**

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face type and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. Radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical Wireless," 8, Southampton Street, Strand, London.

**PREMIER SUPPLY STORES**

ANNOUNCE a City Branch at 165 and 165a, Fleet St., E.C. (next door to Anderson's Hotel), for the convenience of callers; post orders and callers to High St., Clapham.

OFFER the Following Manufacturers' Surplus New Goods at a Fraction of the Original Cost; all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra, I.F.S. and abroad, carriage extra. Orders under 5/- cannot be sent c.o.d. Please send for illustrated catalogue, post free.

STUPENDOUS Purchase of Set Manufacturers' Stock.—All electric 3-valve (S.G. det. pen.) set, in walnut cabinet, with moving-coil speaker, 200-250 volt, 40-60 cycles, chassis built, 200-2,000 metres, with 4 valves, £4/19/6.

ALL-ELECTRIC 3-stage Amplifiers, 200-250v., 40-60 cycles, 10 watts undistorted output, complete with 5 valves, and Magnavox Super 66 energised speaker, £12/10/0.

ELIMINATOR Kits, including transformer, choke, Westinghouse metal rectifier condensers, resistances, and diagram, 120v. 20 m.a., 20/-; trickle charger, 8/- extra; 150v. 30 milliamps with 4v. 2-4 amps., C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps., with 4v. 3-5 amps. C.T., L.T., 30/-; 300v. 60 m.a., with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps. L.T., 27/6.

PREMIER Chokes, 40 milliamps, 25 hys., 4/-; 65 milliamps, 30 hys., 5/6; 150 milliamps, 30 hys., 10/6; 60 milliamps, 80 hys., 2,500 ohms, 5/6; 25 milliamps, 20 hys., 2/9; 250 milliamps, 30 hys., 20/-.

ALL Premier Guaranteed Mains Transformers Have Engraved Terminal Strips, with terminal connections, input 200-250v., 40-100 cycles, all windings paper interleaved.

PREMIER H.T.7 Transformer, output 135v. 80 m.a., for voltage doubling, 8/6; 4v. 3-4a., C.T., L.T., 2/- extra; with Westinghouse rectifier, giving 200v. 30 m.a., 17/6.

PREMIER H.T.8 and 9 Transformers, 250v. 60 m.a. and 300v. 60 m.a. rectified, with 4v. 3-5a. and 4v. 1-2a., C.T., L.T. and screened primary, 10/-; with Westinghouse rectifier, 18/6.

PREMIER H.T.10 Transformer, 200v. 100 m.a. rectified, with 4v. 3-5a. and 4v. 1-2a., C.T., L.T., and screened primary, 10/-; with Westinghouse rectifier, 19/6.

PREMIER Mains Transformer, output 250-0-250v. 60 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 1-2a. (all C.T.), with screened primary, 10/-.

PREMIER Mains Transformers, output 350-0-350v. 120 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 1-2a. (all C.T.), with screened primary, 10/-.

PREMIER Auto Transformers, 100-110/200-250v. or vice versa, 100-watt, 10/-.

WESTERN ELECTRIC Mains Transformers, 300-0-300v. 65 m.a., 4v. 1-2a., 4v. 2-3a., 6/6; 500-0-500v. 150 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 2-3a., 4v. 1a. C.T., 4v. 1a. C.T., 19/6.

SPECIAL Offer of Mains Transformers, manufactured by Phillips, input 100/110v. or 200-250v., output 180-0-180 volts m.a., 4v. 1 amp., 4v. 3 amps., 4/6; 200-0-200v., 4v. 1a., 4v. 3a., 4/6.

PREMIER L.T. Charger Kits, consisting of Premier transformer and Westinghouse rectifier, input 200-250v. A.C., output 8v. 1 amp., 14/6; 8v. 1 amp., 17/6; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6; 2v. 1 amp., 11/-.

B.T.H. Truspeed Induction Type (A.C. only), Electric Gramophone Motors, 100-250v., 30/- complete.

SPECIAL Offer B.T.H. Gramophone Motors. A.C. and D.C. 100-250v., 30/-; listed, £3/3/0.

COLLARO Gramo. Unit, consisting of A.C. motor, 200-250v. high quality pick-up and volume control, 49/-; without volume control, 46/-.

EDISON BELL Double Spring Gramophone Motors, complete with turntable and all fittings, a really sound job, 15/-.

SPECIAL Offer of Wire-Wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8 watts, any value up to 15,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

CENTRALAB Potentiometers, 400 ohms, 1/-; 50,000, 100,000, 1/2 neg., any value, 2/-; 200 ohms, wire wound, 1/-.

POLAR STAR, manufacturers' model, 3-gang condensers, fully screened, 7/6, with trimmers; unscreened, 5/-.

AMERICAN Triple Gang 0.0005 Condensers, with Trimmers, 4/11; Utility bakelite 2-gang 0.0005, screened, with Uniknob trimmer, and complete slow-motion dial, 3/6; Polar bakelite condensers, 0.00035, 0.0003, 0.0005, 1/-.

(Continued at top of column three)

**ELECTRADIX BARGAINS**

**FREQUENCY RECORDS.** Great demand for these. We can deliver from stock any of the Nos. 90 to 99 previously advertised at the price of 2/6 per record, or 20/- for the 20/7,000 cycles set of ten.

**LESIDX MICROPHONES** reproduce your voice amplified from your radio set to loud speaker.

**FUN ON YOUR RADIO**

**5/- MICROPHONE BUTTONS** for all purposes. Usually sold at 3/6. Our price has always been 1/-. We have supplied thousands to home users.

**HOME BROADCASTING** by your family and friends.

**A NEW PRACTICAL HOME MICROPHONE** for broadcasting at home. It is a general purpose, robust mike, with solid bakelite body, back terminals, front metal grille. No. 11. New design, finely finished 5/6

No. 11A. Special in solid brass body, unequalled at the price on speech and music, 7/6.

**P.W. No. 11 TABLE MIKE.** No. 11, 5/6 This is a splendid Microphone for speech and music. The bakelite case, containing a 2-in. mike and transformer, is on a bronze pedestal. It Switch and plug sockets are fitted on the case. It stands unrivalled for quality and price 15/-.

**PEDESTAL MIKES.**

Lesdix No. 10B Pedestal, 10in. high, 12/6. Lesdix Superior No. 12BB Ring, 14in. Pedestal, 18/6. W.E. Type Table Model, 5in. dia., for lectures, 35/-.

Studio Recording Mikes. B.T.H. Moving Coil P.M. £5; Amplion, £5; Browns D, £8; Igranite Transverse, £8; Western Electric P.A., £10; Siemens H. Ribbon, £50 Moving Coil for £15; famous Marconi-Reisz B.B.C. Model, £18.

**GROONERS Lapel Mikes for Dance No. 12 "B.B."** Bands. American type model 12/6 18/6

**Ericsson model transmitters,** standard type, with stand and mouth-piece, as illus., 4/6. Postage 1/-.

**PARTS for Home Constructors.** Buttons 1/- each. Microphone Carbon Granules, in glass capsule, for four buttons. Grade No. 1, 8d., No. 2, Medium 1/-; No. 3, Fine, 1/6; Carbon, solid back, blocks, 4s. Mouthpieces, curved or straight, 10d. Carbon diaphragms, 5s 3/4. 6d. Panel Brackets, pivoted, 5/-.

Reed Receiver for Button Amplifier making 3/-. Headphones, L.R., 2/9.

**"MICROPHONE MARVELS"** Illustrated Booklet by Lafone, 9d. post free.

**LIGHT SENSITIVE CELLS.** Small sensitive resistance model, gold grids, moisture-proof. L to D ratio 5 to 1, 5/- each. Mounted in Bakelite, 7/6. Super Model in Oxy-brass body with window, 10/-.

Bulb photo cells, R.C.A., 25/-, B.T.P., 15/-. Relays for above from 7/6.

**ELECTRADIX DYNAMOS AND MOTORS.** Charging dynamos, 12 to 16 volts, 10-12 amps., 25/-; or with full automatic switchboard, 47/6; Double current generators, 600 volts, 100 m.a., 8 volts 3 amps., 40/-; Engine dynamo sets, 1/2 kw., £15.

**Motors:** fractional H.P. and large sizes in stock. Television and small machine motors; 1-40h.p., 220 volts A.C., 15/-; 1-50h.p. motor double ended shaft, 250 volts, with resistance, A.C. or D.C., 22/6; 220-volt gramo.-motor, with turntable, 50/-; Collaro double spring gramo. motor, with 12in. turntable, 15/-.

**SEND FOR XMAS BARGAIN LIST "N."**

**ELECTRADIX RADIOS,** 218, UPPER THAMES ST., LONDON, E.C.4

*High Tension for your Radio from the Mains at 1/- PER YEAR*

Model AC/TC, 150 volts at 30 milliamps, or 130 volts at 15 milliamps, with 5.6. and Detector Tappings, 2 volt 1 amp. Trickle Charger Price 47/6.

Send for full particulars.

**M.P.R. LTD ROMFORD, ESSEX**

**PATENTS AND TRADEMARKS.** KING'S PATENT AGENCY (Director: B. T. King, C.I.M.E., Regd. Patent Agent G.B., U.S.A. and Canada). Advice, Handbook and Consultations free. 49 years' refs.—146a, Queen Victoria Street, E.C.4. Phone: City 6161.

(Continued from foot of column one)

**SPECIAL OFFER.** Kolster-Brandes (shop-soiled) Receivers, 2-valve Battery Pup, with self-contained Speaker, Valves and Batteries, 27/6. 3-valve Kobra with self-contained Speaker, Valves and Batteries, 39/6. 3-valve type 106 (Det., 2 L.F.), set only, 15/-.

3-valve S.G.3, Battery set only 19/6. A.C. Receiver, Detector, Pentode Rectifier, set only with valves, 35/-.

Type 169 A.C. S.G. Detector, Pentode, Rectifier, set only with valves, 49/6. Type 320 A.C. 100/250, 2 S.G., Det., Pentode, Rectifier, with valves and self-contained M.C. Speaker, £6/6/0.

Kolstar 6-valve A.C., 100/250 Superhet 20/2,000 metres, Consol type, with valves and self-contained M.C. Speaker, £7/10/0.

**ORMOND** Condensers, 0.0005 2-gang semi-shielded, 2/6; brass vanes with trimmers, 3/6.

**MAGNAVOX** D.C. 152, 2,500 ohms, 17/6; D.C. 144, 2,500 ohms, 12/6; D.C. 152 magna., 2,500 ohms, 37/6, all complete with humbucking coils; please state whether power or pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M., 7in. cone, 10/6.

**RELIABLE** Canned Coils with Circuit accurately matched, dual range, iron cored, 2/11.

**RELIABLE** Intervalve Transformers, 2/-; multi-ratio output transformers, 2/6. Microphone transformers, 50-1 and 100-1, 2/6. 1-1 or 2-1 Output Transformers, 2/6.

**UTILITY** 3-gang Condensers, 0.0005, fully screened, with trimmers, ball bearing straight or superhet, 6/9, complete; with disc drive, 7/11; the best 3-gang available.

**T.C.C.** Condensers, 250v. working, 1 mf., 1/3; 2 mf., 1/9; 4 mf., 3/-; 4 mf., 450v. working, 4/-; 4 mf., 750v. working, 6/-; 2 mf., 750v. working, 3/-.

**VARLEY** Constant Square Peak Coils, band-pass type B.P.7 brand new, in maker's cartons, with instructions, and diagram, 2/4.

**VARLEY** H.P. Intervalve Coils, B.P.S. band-pass, complete with instructions, in original cartons, 2/6.

**SCREENED** H.F. Chokes, by one of the largest manufacturers in the country, 1/6.

**PREMIER** British-made Meters, moving iron, flush mounting, accurate, 0-10, 0-15, 0-50 m.a., 0-100, 0-250 m.a., 0-1, 0-5 amps.; all at 6/-.

**WESTERN** Electric Condensers, 250v. working, 1 mf., 6d.; 2 mf., 1/-; 4 mf., 2/-; 400v. working, 1 mf., 1/-; 2 mf., 1/6.

**WIRE-WOUND** Potentiometers, 1,000, 2,500, 5,000, 20,000, 50,000, 90,000, 120,000, 200,000, 500,000, 2/- each; 1,000 ohm, semi-variable, carry 150 m.a., 2/-.

**COSMOCORD** Pick-ups, complete with arm and volume control, 10/6. Plessey Pick-up with arm 15/-.

**A LARGE** Selection of Pedestal, table and radio-gram cabinets, by best manufacturers at a fraction of original cost, for callers.

**THE** following Lines 6d. each, or 5/- per dozen.—Chassis valve holders 5-, 6-, or 7-pin, screened screen-grid leads, any value 1-watt wire resistances, wire end condensers 0.0001 to 0.1, 3 amp. main switches, Cyldon capacitors, double trimmers.

**SUPER-MOVING** Coil Speakers, handle 10 watts, energised directly from A.C. mains, manufactured by world-famous radio and gramophone company, 40/-.

**T.C.C.** Electrolytic condensers, 8 mf. 440v. working, 3/-; 4 mf. 440v. working, 3/-; 15 mf. 50v. working, 1/-; 50 mf. 12v. working, 1/-; 15 mf. 100 v. working, 1/3; 6 mf. 50 v. working, 6d.; 2 mf. 100v. working, 6d.; 8 or 4 mf. 450v. working, 4/-.

**DUBILIER** Dry Electrolytic Condensers, 8 or 4 mf. 450v. working, 3/-; 12 mf. 20 v. working, 6d.; 50 mf. 50v. working, 1/9.

**CONDENSER** Blocks, H.M.V. 400v. working, 4+2+1+1+1+5. 3/9; 2+2+1+1+1+5, 3/-; Dubilier 300 v. working, 4+4+2+1, 3/-; Phillips 6+4+2+1+1, 4/6; 9+3+2, 3/-.

**RADIOPHONE** Logarithmic Wirewound Potentiometer with mains switch, 2/-; S.W. H.F. chokes, 10/200 metres, 9d.

**CLESTION** P.P.M.10 with Multiratio transformer, listed 48/-, at 25/-.

**BRITISH** Radiophone 2-gang Condensers, fully screened with trimmers, and disc drive with Uniknob Trimmer, 5/6.

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**THE** Following Types, 5/6 each: 350v. 120 m.a., full wave rectifier, 500v. 120 m.a., full wave rectifier, 2 1/2 watt indirectly heated pentode.

**THE** Following American Types, 4/6; 250, 112, 171, 210, 245, 226, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 83, 27.

**THE** Following Types, 6/6 each: 42, 77, 73, 25Z5, 36, 38, 83, 39, 44, 53, 6B7, 2A5, 2A6, 2B7, 5Z3, 6C6, 6A4, 6D6, 6E7; 43, 59. Send for Complete Valve list.

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**ORMOND** Balanced Armature Cone Units, large Magnet Type, 3/-, with Pentode Tone Corrector, 4/-.

(Continued at top of column one page 407)

(Continued from foot of column three, page 406)

**SPECIAL Offer American Midget Superhet AC/DC, 100/250v., 25/60 cycles, 4 valves including rectifier, 200/500 metres, £3/9/6. Ditto 200/2,000 metres, £4/7/6.**

**10,000** 12,000, 15,000 ohm wire-wound Potentiometers with mains switch, 1/6.

**LISSEN Mains Receivers A.C. 200/250v. complete with 3 valves and self-contained Speaker, 5/9/6.**

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**PREMIER SUPPLY STORES**

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**SOUTHERN RADIO'S WIRELESS BARGAINS.**

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**VARLEY Constant Square Peak Coils B.P. 5.** complete with all accessories in sealed cartons, 2/3. **BWCOS B.P.F./R, T.B.F./C. O.S.C./126 (Extensor) T.O. S/R,** all at 3/6 each.

**PICK-UPS.**—Marconi Model K. 25 (1935 issue), 21/- (list 32/6).

**CONDENSERS.**—Lotus, 3-gang, 12/6; 2-gang, 8/6; Single Dyblock, 4/6. All capacity 0.0005. Fully screened with trimmers, complete with dials, knobs and escutcheons. Special bargain line. Plessey four-gang condensers, superhet type. Fully screened with trimmers (less dials), standard dial will fit, 10/6 (list 45/-).

**DUBILLER Block Condensers, 4 mfd. (2 x 1 x 1) 1,000-volt, 2/9; 4.5 mfd. (2.25 x 2.25), 3/-; T.C.C. (0.1 x 0.01), 1/3 each.**

**SPEAKERS.**—Rothermel Permanent Magnet Moving-Coil Universal Transformer, 16/- (7in. cone); Blue Spot Permanent Magnet Speakers Universal Transformer, for Power, Super Power, Pentode and Class B, 23/-; Blue Spot 66R Units, brand new and boxed, 10/6 (list 35/-), complete mounted on Blue Spot Chassis, 16/6 (list 45/-).

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