TWENTY-FIVE YEARS OF RADIO PROGRESS

Practical and Amateur Wireless

3D. EVERY WEDNESDAY

Edited by F. J. CAMM

a GEORGE NEWNES *Publication*

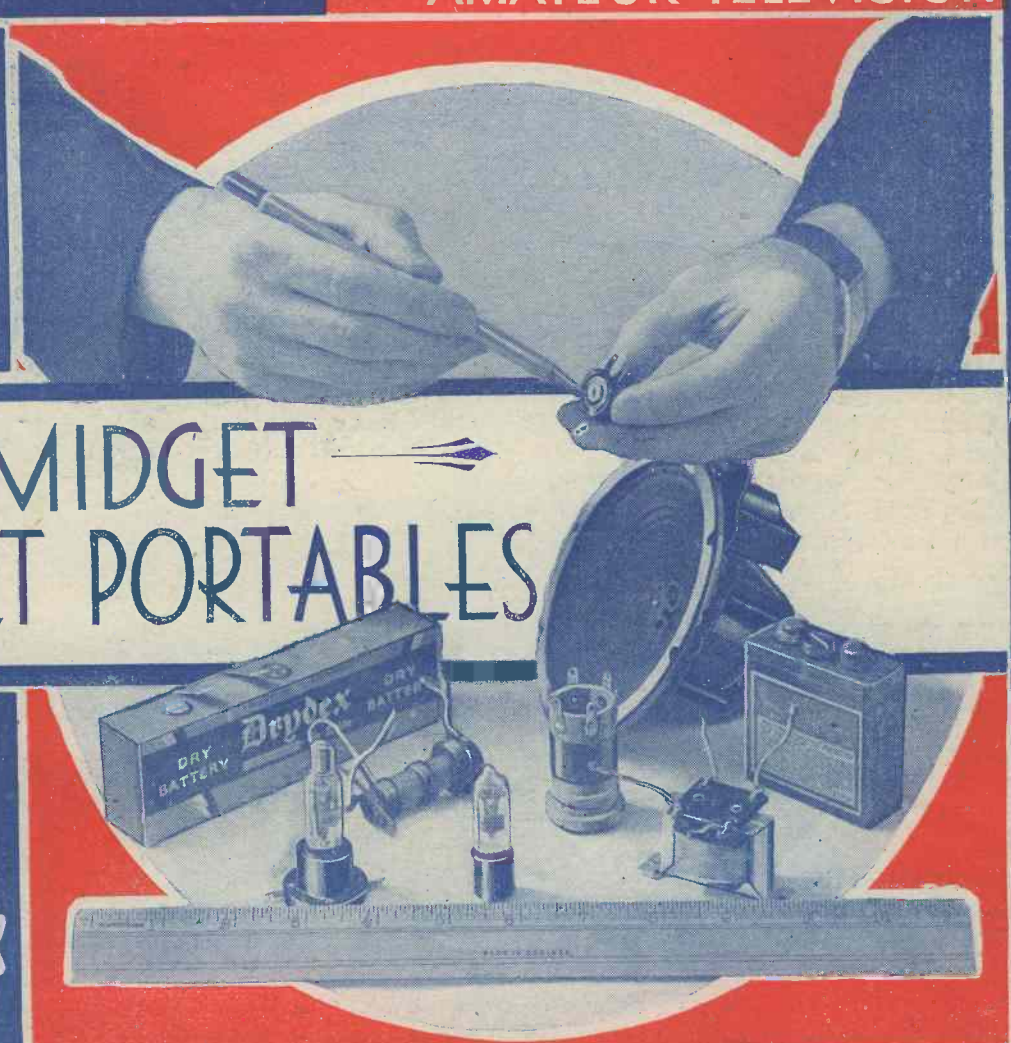
Vol. 6. No. 141.
June 1st, 1935.

AND AMATEUR TELEVISION

Our New Series of

MIDGET POCKET PORTABLES

for all Purposes



OUR NEW MIDGET PORTABLES—THE CAMEO SERIES.

SEE PAGE 324

Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.

VOL. VI. No. 141. June 1st, 1935.

ROUND *the* WORLD *of* WIRELESS

Stand by for Radio Nice

THE new 100-kilowatt transmitter which the French PTT has had under construction at La Brague, near Nice, is now nearing completion, and it is fully expected that tests will be undertaken within the next week or so. Should these prove satisfactory, the station will take over its duties in July. Although, according to a recent report that the Toulouse-Muret 120-kilowatt station is now completely built, experiments with this plant cannot yet be made as the electric cable from the generating station at Toulouse has not been entirely laid. The date of its opening is yet unknown.

Local *versus* Distant Listeners

IT is interesting to note from the result of a plebiscite taken among Austrian radio listeners, that of these the majority tuned in to the local stations for periods up to thirty hours per week. Of these some twenty-five per cent. devoted almost the same quantity of hours to the reception of foreign broadcasts.

No More Records in German Broadcasts

IN view of complaints made by the gramophone industries in Germany, the authorities have decreed that no more records in future are to be broadcast from the stations, and as a substitute more orchestral music is to be given in the programmes.

China Hears European Broadcasts

FROM a report received from West China, it would appear that under favourable conditions the following European transmitters can be fairly well received: Moscow, Prague, Milan, Breslau, West Regional, Stuttgart, and Vienna.

Round the World by Radio

ON April 25th last an interesting experiment was carried out by the American Telegraph and Telephone Company. From his office the President decided to ring up the Chairman of the Company who was sitting in a neighbouring room. The connection was made by cable *via* London, Amsterdam, then by wireless to Java, San Francisco, and finally over his own network to New York. Communication was held for a period of fifteen minutes in a perfectly satisfactory manner.

New Czecho-Slovakian Station

WORK has already been started on the new high-power station at Banska Bystrica, which is to relay the Prague programmes for the Western portion of the country. The power of the station will be 30 kilowatts by day, but this will be reduced by fifty per cent. for the night transmissions. Although most of the programmes will be taken from the capital, it is expected that a certain portion of the entertainments will be provided locally in order to satisfy the Slovak population.

NEXT WEEK!

FULL CONSTRUCTIONAL DETAILS OF THE FIRST OF OUR

CAMEO MIDGET PORTABLES

New Additional Italian Relay

IN order to provide an alternative programme to Bari listeners, a small station is to be erected in this Italian city. As it is only desired to supply local listeners, the power will be limited to 500 watts and the wavelength selected in the neighbourhood of 200 metres. When installed, Bari (2) will take its programmes from alternately Milan, Florence, and Turin.

Time Signals from the Continent

IN addition to the signals given out at stated periods throughout the day by the B.B.C. stations, it is also possible to secure the exact time from some of the Continental transmitters. The six pips have been adopted by Radio-Paris and Brussels; these may be heard from both at B.S.T. 13.00. At other times, such as 08.00 and 20.00, Radio-Paris marks the hour by means of a carillon. Prague puts out a morse signal consisting of one dash and several dots at 21.00 nightly, and Hamburg a somewhat similar signal at 23.00.

Television in Italy

THE first Italian television transmitter has now been installed at Turin. Wavelengths to be used for vision and sound are respectively 5.05 and 8 metres. The receivers which are being placed on the market for the purpose of capturing these transmissions are all equipped with the Zworykin cathode tube.

Listen to Radio Nimes

ALTHOUGH one of the smallest of Europe's broadcasters, it is often possible to pick up Radio Nimes, a 200-watt French station on 201.1 metres (1,492 kc/s). The call, given out by a man on week-days and a woman announcer on Sundays, is *Ici Radio Nimes de la Radiodiffusion Meridionale.* Interval signal: One stroke on a gong between items. Opens and closes with gramophone record of a choir singing an old folk song in local dialect.

French Bagpipes!

RADIO BRETAGNE, or PTT Rennes, on 288.6 metres, of which the broadcasts are so well heard in the United Kingdom, is the one French station which may be stated to possess an original interval signal. Scorning the conventional gong, carillon, or musical box, it has adopted a Breton tune played on the *biniou*, the French conception of Scottish bagpipes. As this instrument is never played alone, the accompaniment is provided by the old *bombarde*, a species of hautbois of very ancient origin. Listeners may find it of interest to tune in this station when it closes down at night.

Range of a 1-Kilowatter

AMONGST the better-known stations of the United States which can still be tuned in after 1 a.m., will be found WIOD, Miami Beach (Fla.) on 230.6 metres (1,300 kc/s). Although the distance (from London) is roughly 4,500 miles, this medium-wave transmitter has been picked up in many parts of the British Isles.

ROUND the WORLD of WIRELESS (Continued)

Scottish Summer Resort Broadcasts

HARRY GORDON and his Beach Pavilion Company will make the Scottish air ring with merriment on May 29th. This is the first of the summer resort entertainments which will be broadcast during the next few months.

Bath and West Show

THIS year's Bath and West Show will be held at Taunton from May 29th to June 1st, and a microphone will be taken to the Show, for the benefit of Western listeners who cannot be present, on May 31st. The Bath and West, or, to give it its full title, the Bath and West and Southern Counties Society, was started in 1777 for the encouragement of agriculture, arts, manufactures, and commerce.

Choral Concert from Bristol

A CONCERT by the Bristol University Choir and Orchestra will be relayed from the Colston Hall, Bristol, for Western listeners on June 1st. The conductors will be R. Vaughan Williams, Reginald Redman, and Arthur Warrell. Vaughan Williams will conduct his own composition of The Hundredth Psalm; Reginald Redman will conduct his own setting of "Sheba's Captain," and Arthur Warrell will conduct his own work for double chorus, "A Lyke-Wake Dirge." The soloist at the concert will be Leslie Bennett (baritone).

Variety from Blackpool

DANCE music by Bertini's and Larry Brennan's Bands precedes on May 30th a relay from the Palace Theatre, Blackpool, when Northern listeners will hear an excerpt from a variety bill which includes Bob and Alf Pearson (in songs at the piano) and Archie's Juvenile Band.

Gounod's "Faust"

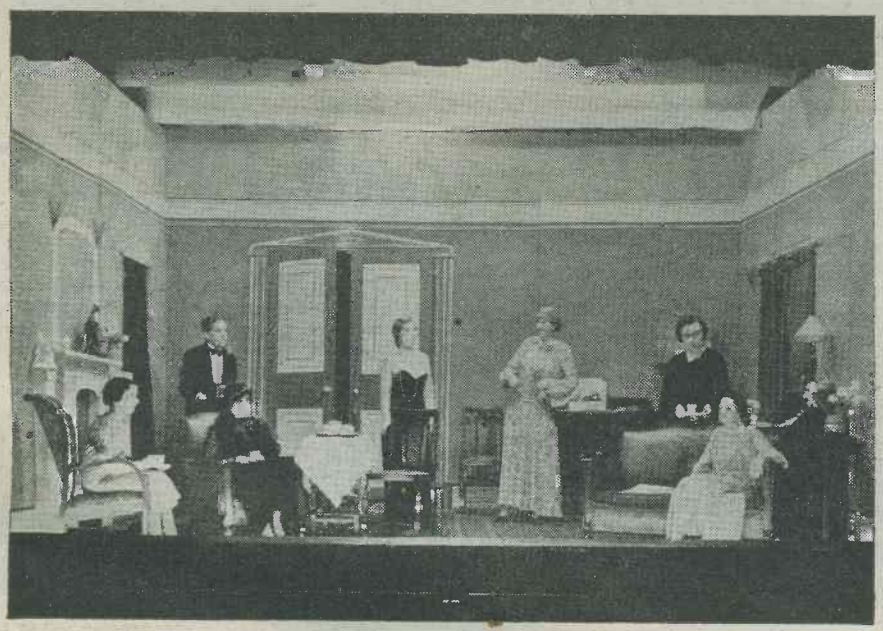
A CONCERT version of Gounod's opera "Faust" will be broadcast to Northern listeners on June 1st, by members of the Stoke-on-Trent Choral Society, supported by the B.B.C. Northern Orchestra.

INTERESTING and TOPICAL PARAGRAPHS

"Music Out of School"

UNDER the general title, "Music out of School," part of the Oswestry, Shropshire, Schools' Musical Festival will be relayed to Northern listeners from the Powis Hall, Oswestry, on May 31st.

FERRANTI'S EMPLOYÉS' DRAMATIC ACTIVITIES



A scene in the play "Fresh Fields," by Ivor Novello, recently produced in the Works Theatre by the Ferranti Amateur Dramatic Society.

Military Band Concert

THE Scottish Military Band will broadcast the Overture, "Rienzi," by Wagner; incidental music to "Henry VIII," by Sullivan; Dramatic Legend, "The Erl King," by Schubert; Spanish Caprice, "Moraima," by Espinosa; and excerpts from "Aida," by Verdi; on May 31st.

The Radio Follies

RICHARD SPENCER presents in the Midland programme a concert party entertainment by the Radio Follies on June 6th. Another light feature will be the variety bill relayed from the Empire Theatre, Peterborough, on June 7th.

B.B.C. Midland Orchestra

NOTABLE musical programmes will be a concert by the B.B.C. Midland Orchestra, conducted by Leslie Heward, on June 3rd; the second of the series of Shakespeare songs in different settings on June 6th, when the three singers will be Mary Pollock, Geoffrey Dams, and Cuthbert Ford; and the fourth of the Midland Chamber Concerts, on Saturday night, June 8th, when the Alfred Cave Quintet and the B.B.C. Midland Singers, conducted by Edgar Morgan, give an Elgar programme.

Broadcast of the Derby

THE great annual racing festival of the Derby will be broadcast on June 5th. Mr. R. C. Lyle will again describe the race from a box on the top tier of the new stand. There is only one commentator in this broadcast. In the National, owing to the usual obscurity, there are two. This year the new B.B.C. recording van will be going to the course to pick up sound records of the crowds, the racing, and the festivities which may give added colour to the news bulletins of the day.

"Bitter Sweet"

THE services of Serge Abranovic have been secured to play opposite Evelyn Laye in "Bitter Sweet." He will sing in the part created by the Rumanian tenor, George Metaxa, in the broadcasts which are taking place on the Regional wavelength on May 31st and the National wavelength on June 1st. Serge Abranovic, who for long deputised for Richard Tauber in the Lehár operettas, sprang to fame in the name part of "The Prince of Schiraz." This operetta was produced in Vienna and Zürich.

Empire Broadcasting Service: New Transmitters

IN view of the success achieved by the Empire Service the B.B.C. has decided to extend the station at Daventry by the addition of two short-wave transmitters, which will be of higher power than the two now in use. There will also be extensions to the aerial system, based on the data collected in the experimental work which has been carried out at Daventry by the B.B.C. during the past two and a half years. When the two new transmitters are in operation the two existing transmitters will be combined to form one transmitter of higher power, making available three transmitters in all. Constructional work on the building to accommodate the additional transmitters will begin shortly.

"Souvenirs"

THE third edition of "Souvenirs," a non-stop medley of song memories compiled by Mai Jones, will be presented by Francis Worsley for Western listeners on June 4. The memories revived will be song hits through the last twenty-five years.

SOLVE THIS!

PROBLEM No. 141.

Harvey obtained some manufacturers' surplus goods, and from them constructed an A.C. mains five-valver. When tested out results were very poor, and he accordingly decided to buy a really good voltmeter in order to make the necessary tests. He checked through each stage and found that all components were in order, of the correct value, and correctly wired. The valves he could not test satisfactorily, and therefore decided that the mains section was faulty. He disconnected the receiver from the mains section and measured the output with his meter. He found it was just 250 volts, and assumed that it was in order. Where was he wrong? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 141 in the bottom left-hand corner and must be posted to reach here not later than the first post Monday, June 3rd, 1935.

Solution to Problem No. 140.

The grid resistance used in Peters' R.C.-coupled stage was faulty, and after being in use for a short time became partially disconnected. Thus the grid of the L.F. valve choked, the condenser charge dissipating when the set was switched off.

The following three readers successfully solved Problem No. 139, and books are accordingly being forwarded to them:—

S. G. Acton, 47, Fairholme Road, Ashford, Middlesex: K. L. Mortlock, Bartle Frere, Haileybury, Herts: J. Coupe, 92, Low Moor Road, East Kirby, Notts.

The Experimenters Explain

Automatic Grid Bias and its Application to Battery Receivers

by The Experimenters

IN explaining other technical refinements and modifications we have prefaced our more practical remarks with a brief discussion of the advantages and disadvantages of the systems in question. If we were to attempt to do this in the present instance, however, we should find a good deal of difficulty in stating the disadvantages of automatic grid bias—in respect of either mains or battery-operated receivers. In fact, so far as mains sets are concerned, automatic grid bias is a practical essential. In the cases of battery-fed receivers, however, the position is somewhat different, and although automatic bias is extremely desirable and certainly worth while, it is not used to anything like the extent to which it should be. Many manufacturers of successful commercial battery receivers have employed this form of bias for a number of seasons, but the average constructor has not, we believe, recognised its many advantages. It is for this reason that automatic bias has not been used more often in PRACTICAL AND AMATEUR WIRELESS receivers which have, generally speaking, been designed on the simplest possible lines at the request of readers. Nevertheless, there are doubtless hundreds of constructors of these sets who would now—after obtaining satisfactory results with the original design—like to add the refinement, especially after realising its advantages. We shall therefore describe the simple modifications in respect of various popular sets after explaining the broad principles.

How the Bias is Provided

First of all, let us see how automatic bias "works" in a battery set. The main idea is that a resistance is included in the negative high-tension lead, so that all of the H.T. current consumed by the set has to pass through it. Fig. 1 shows a skeleton circuit where the simple wiring alterations required in the average type of non-variable-mu receiver are indicated. As current flows through the resistance a voltage-drop occurs, this voltage being proportional to the current flowing and the value of the resistance in ohms. The actual voltage is equal to the current in amps. multiplied by the resistance in ohms, or, more simply for our present purpose, to the current in milliamps multiplied by the resistance in thousands of ohms. The figures indicated in Fig. 1 serve as an example of the simple calculation.

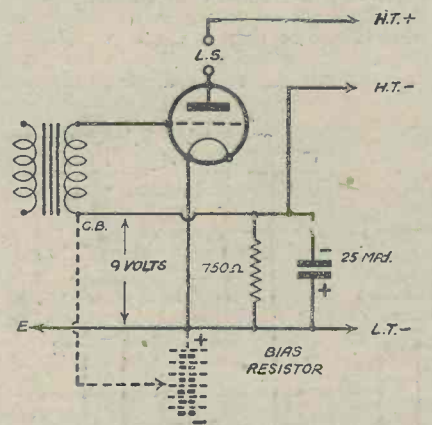


Fig. 1.—This skeleton circuit serves to explain the principal points in connection with automatic bias for a battery set. New connections are shown by heavy lines, and those they replace, by broken lines.

The actual effect of the bias resistance can be seen by comparing the two sets of connections in Fig. 1, and it will be seen that the resistance takes the place of the bias battery, this being more evident when one considers a battery of the combined H.T. and G.B. type. In modifying an existing receiver it is only necessary to connect the G.B.— lead from the secondary of the L.F. transformer to the H.T.— lead, connect one side of the resistance to the earth line, and to transfer the H.T.— lead from its usual terminal to another joined to the second connection of the resistance. In practice, a large-capacity fixed condenser —generally a 25-mfd. electrolytic—is wired in parallel with the resistance to act as a by-pass to the audio-frequency currents. An electrolytic condenser of this type is quite inexpensive, since it need have a working voltage of only 20 or so.

We have found from our correspondence, and from several of the queries addressed

(Continued overleaf)

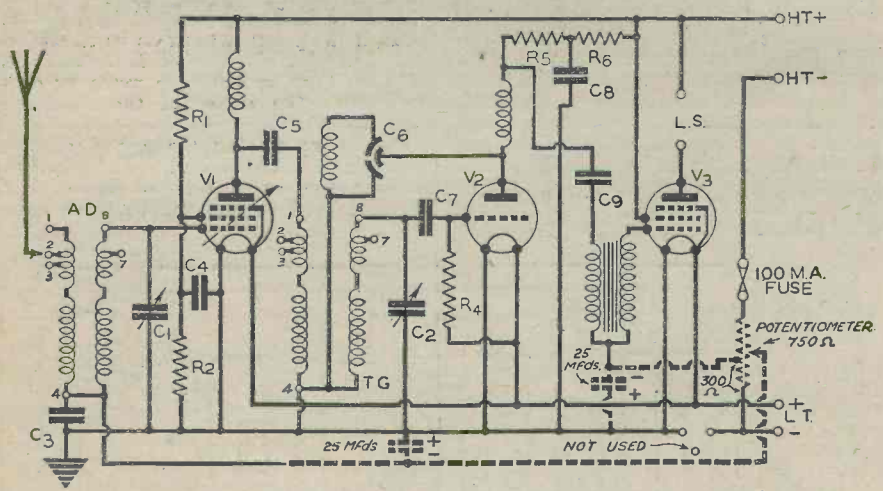


Fig. 3.—Showing how automatic grid bias can be provided in a set with a v.m. valve. The circuit shown is that of the "Summit."

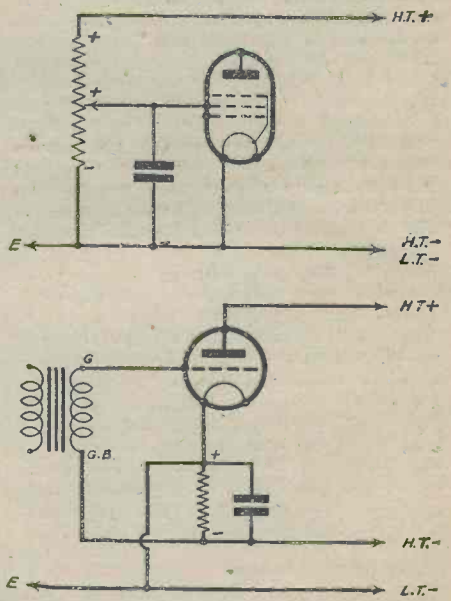


Fig. 2.—A comparison of these two circuits will reveal how one end of the bias resistance (connected to the grid) becomes negative with respect to the other (connected to the filament).

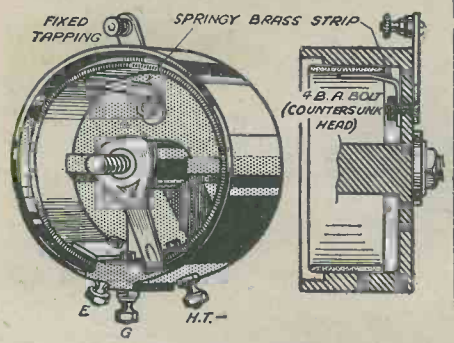


Fig. 4.—Showing how a fixed tapping can generally be arranged on the usual type of wire-wound potentiometer.

(Continued from previous page)

to the Free Advice Bureau, that the main difficulty which readers have in understanding automatic grid bias is that they fail to understand how one end of the resistance can be positive and the other negative; this is best understood by considering the bias resistance as a portion of a potentiometer such as that used to supply the screening grid of an S.G. valve. The second "arm" of the potentiometer is the valve, as will be seen by examining the two skeleton circuits in Fig. 2.

Advantages of Automatic Bias—

Having grasped the general principles of automatic G.B., we are in a better position to appreciate the advantages which it confers. It is obvious that it enables a G.B. battery to be saved, but this alone is of little importance because this component costs only about a shilling and need not be replaced more frequently than twice a year. A more important point, however, is that the resistance regulates the G.B. voltage according to the H.T. voltage; that is, as the H.T. voltage falls off (due to the battery running down, for example) the G.B. voltage is automatically reduced in proportion. This is because the anode current passed by the valves becomes less with a reduction in H.T. voltage, and thus the product of current and resistance—the G.B. voltage, in other words—also becomes less.

The importance of this cannot be overstressed, since we all know that if the G.B. voltage remains constant while the H.T. voltage falls off distortion and overloading inevitably occur. This can be compensated for, to a certain extent, by altering the position of the G.B. tapping, but it is possible to vary the voltage only in stages of 1½ volts by this method, and such a large variation may often be too great. For this reason, it will be appreciated that automatic bias often prolongs the useful life of the high-tension battery and at the same time causes an improvement in the quality of reproduction.

—and a Few Disadvantages

A minor objection to the system is that the value of the bias resistance may have to be changed when replacing a valve in the set by a new one, if this is of different type from the original. This applies, not only to the output valve, but to every valve in the set because, as we have pointed out, the value of the resistance is determined by the total H.T. current passed by all the valves in the receiver. Another minor disadvantage is that the H.T. voltage supplied to the anodes is reduced by the amount used for grid bias and "lost" in the resistance. This is generally of little importance in the case of a receiver of the usual type, although it may attain importance in a set using variable-mu valves of a type which require a large maximum G.B. voltage. Even then, however, the "lost" voltage could be compensated for by increasing the voltage of the H.T. battery by connecting an 18-volt G.B. battery in series with it.

It will also be evident that it may often be rather difficult to provide automatic bias in a receiver having variable-mu valves, due to the fact that the H.T. current varies according to the setting of the variable-bias volume control. In practice, this factor can generally be overlooked when there is only a single variable-mu stage, because the variation in current is so small that, as a percentage of the total current consumption, it is negligible. As an example of this point we may consider a three-valve receiver such as the "Summit" (PRACTICAL WIRELESS, Aug. 18th and 25th, 1934), which uses a combination of Cossor valves comprising the 210V.P., 210H.L., and 220H.P.T. The maximum current passed by these valves (volume control full on) with correct bias and maximum anode voltage, is approximately 3.5, 1.5 and 8 milliamps respectively, giving a total of 13 milliamps. When the full (low-volume) bias is applied to the variable-mu H.F. pentode the current passed by this valve falls to about 1.5 milliamps, although the current passed by the other two remains constant. Thus, the variation in current which would be passed through an automatic bias resistance would be 2 milliamps, which is equivalent to about 16 per cent. Generally, however, the variation in current over the range of volume normally required would be even less than this, so that an automatic bias arrangement would function satisfactorily.

With Variable-Mu

There is a slight practical difficulty in applying automatic bias to a receiver having a variable-mu stage though, due to the fact that there are two different bias voltages required, one of which remains constant whilst the other has to be varied. Nevertheless, this can be done, as shown in Fig. 3, which is the modified circuit of the "Summit," by using a potentiometer with a fixed tapping in addition to the slider. There is no potentiometer of the exactly correct type on the market, but an ordinary wire-wound one can easily be modified as shown in Fig. 4 by making a connection to the winding at the correct point. This can be done by fitting a strip of springy brass and a connection as shown. It is obvious that this exact method cannot be applied to all potentiometers, but in most instances a modification of the idea will suggest itself.

The correct position for the tapping may be found by measuring the resistance between it and the end of the winding or, in the case of a potentiometer which is not of the "graded" type, by taking the resistance in circuit as being proportional to the distance of the tapping from the end of the winding and the total resistance. Thus, if the potentiometer to be employed had a total resistance of 1,000 ohms, a 500-ohm tapping could be made by connecting to the centre of the resistance element.

Details concerning the other circuits shown in this article, and information regarding the application of more than one grid bias voltage will be given next week.

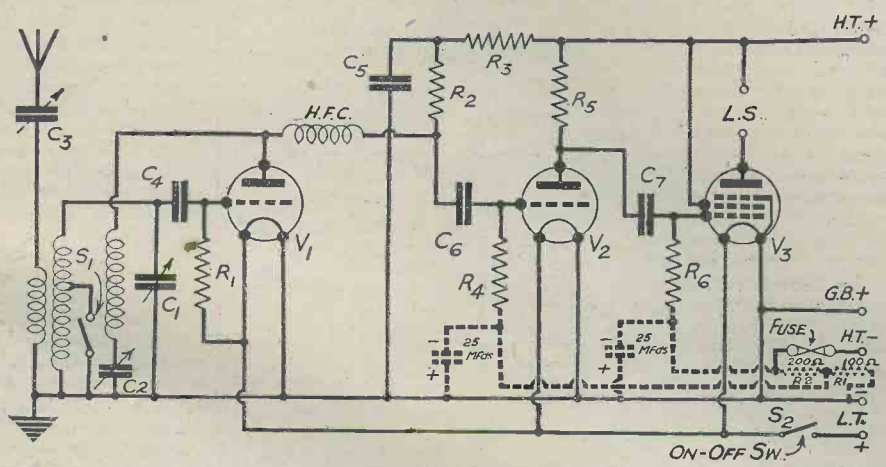


Fig. 5.—Connection for automatic grid bias in the "Hall-Mark Cadet" are here shown in broken lines.

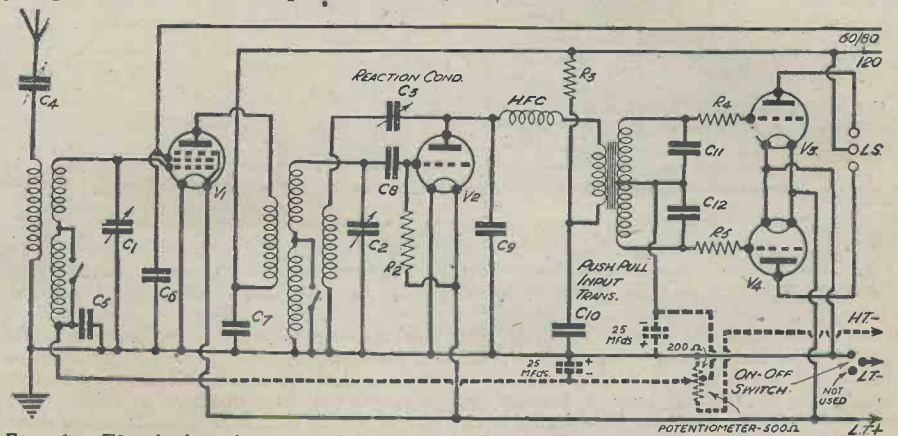


Fig. 6.—The broken lines in this circuit indicate the modifications required when adding automatic bias to the "Battery Hall-Mark Four."

COMPONENTS

Their Action, Principle & Purpose

The Output Circuit Between the Last Valve and the Loud-speaker is Dealt With in this Sixth Article of the Series, and the Easy Calculations Involved are Simply Explained.

WE have now traced through our typical three-valve receiver from the aerial to the output circuit of the pentode low-frequency valve. It now only remains to consider the loud-speaker and the device used to feed it. The latter may take the form of a step-down transformer, an L.F. choke, and a condenser, or a resistance and a condenser. No matter which of these coupling devices is employed it is essential that the impedance of the component, or part of a component, included between the anode of the valve and the H.T.— lead should have an impedance of a fairly definite value. The position is not unlike that which we observed in connection with the output circuit of the detector valve, for the object is to obtain the greatest possible transference of energy from the output valve to the loud-speaker. In the case of the detector valve it was explained that the anode-circuit component should have an average impedance equivalent to twice the impedance of the valve; the same idea applies in the L.S.-feed circuit, except that instead of considering the impedance of the last valve we take into account its *optimum load*. This is generally stated by the makers in ohms, and is usually equal to about twice the impedance in the case of triodes, although there is not always a definite relationship so far as pentodes are concerned.

The Step-down Transformer

In the first place we will assume the use of a step-down transformer for feeding the speech coil of the moving-coil loud-speaker, the connections being as shown

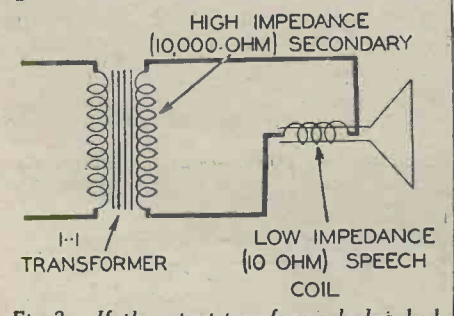


Fig. 2.—If the output transformer had a 1 : 1 ratio there would be very little power transferred to the speech coil. This may more readily be understood by referring to a similar D.C. circuit in Fig. 3.

in Fig. 1. It is hardly necessary to remind readers that the transformer is nearly always fitted to the speaker, and that makers will supply the correct type on being advised of the ratio required or of the make and type of output valve in the receiver. The average battery pentode valve has an optimum load in the region of 10,000 ohms, and so the transformer primary should offer an impedance equal to this figure at average audio frequencies. To ensure good response to the lower notes it is best in this case to work on a frequency of, say, 100 cycles, and the formula is: Z (impedance) $=2\pi fL$, where $\pi=3.14$, f is the frequency, and L is the inductance in henries. For our present purpose this formula might well be re-written: $L=\frac{Z}{2\pi f}$. Using this formula and working on the figures already mentioned, we find that the correct inductance for the primary winding of our transformer is $\frac{10,000}{6.28\times 100}$, which is equal to approximately 16 henries. The primary winding of the transformer must, therefore, be designed

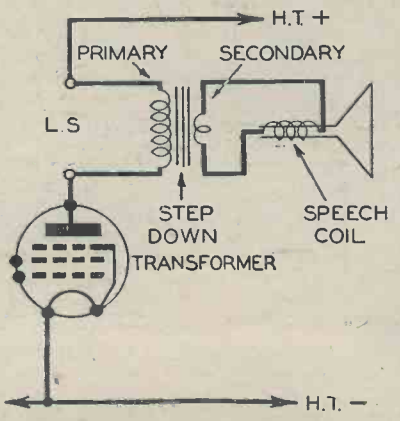


Fig. 1.—Showing the usual method of feeding the moving-coil speaker. A step-down transformer is connected between the anode circuit and the speech coil.

to have an inductance of not less than this value when carrying the full current passed by the last valve. It is important that this latter point should be observed, since there are on the market many transformers rated at 50 henries or so which may possess scarcely any inductance at all when carrying, say, 20 milliamps, because their inductance rating is arrived at without considering the D.C. current passing through them. Better-class manufacturers, however, generally state the inductance at "No. D.C." and at "x milliamps D.C."

Alternative Ratios

When the transformer is supplied as an integral part of the speaker the makers will generally say what is the maximum current-carrying capacity of the primary. It is usual to provide speakers with tapped transformers, the primary windings of these having three tappings which provide alternative inductances to suit the impedances of different types of valve. The lowest tapping is suitable for super-power valves (low value of optimum load); the second matches ordinary power valves (medium optimum load), and the third is for pentodes, which have a comparatively high optimum load. There are, of course, other speakers which are provided with multiple-tapped transformers so that a value of any particular optimum load may be matched accurately; a well-known and popular example is the W.B. "Stentorian."

In addition to the impedance of the transformer primary winding it is necessary to consider the correct ratio between primary and secondary windings. This is because the impedance of the speech coil is generally considerably smaller in ohmic value than the optimum load of the valve, and hence, than the impedance of the primary winding; a fairly average value for the impedance (at, say, 100 cycles) of a speaker speech coil is 10 ohms, and if this were connected in parallel with the secondary winding of a 1 : 1 transformer—in which the secondary and primary impedances are similar—there would be very little power passed on to the speaker. The reason is that, of the total power developed in the secondary circuit (see Fig. 2) only a fraction would be developed across the speech coil. This point might more easily be understood by considering a similar D.C. circuit, such as that shown in Fig. 3. In this case two resistances are shown as being in series, one having a value of 10,000 ohms and the other of 10 ohms. If a current of 10 milliamps were passed through the two resistances the wattage "absorbed" by the 10,000-ohm resistance would be just 1 watt, whilst the 10-ohm resistance would "absorb" only 1/1,000 watt. In the case of the transformer best results can be obtained by making the impedance of the secondary equal to the impedance of the speech coil, and this suggests the method of determining the correct ratio. The ratio is proportional to the optimum load of the valve divided by the impedance of the speech coil, but we cannot find the ratio between the numbers of primary and secondary turns by this simple ratio, because the impedance, or inductance, of a coil is proportional to the *square* of the number of turns. Because of this we have to take the square root of the ratio of optimum load to speech coil impedance, so that we obtain the formula: $\text{ratio}=\sqrt{\frac{\text{optimum load of valve}}{\text{speech coil impedance}}}$

(Continued overleaf)

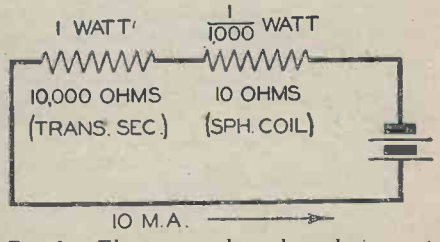


Fig. 3.—This circuit shows how the power is distributed in a circuit consisting of two resistances in series with a battery.

(*Continued from previous page*)

If we apply the figures mentioned above to this formula we find that the ratio in our hypothetical example is $\sqrt{\frac{10,000}{10}}$ which can be simplified to the square root of 1,000, or just about 33:1.

Choke-capacity Feed

In some instances it would be inconvenient to connect the transformer directly in the anode circuit of the output valve as shown in Fig. 1, and we might find it better to feed the speaker through a choke-capacity filter as shown in Fig. 4. This would be the case if the transformer fitted to the speaker were unsuitable for carrying the full anode current required by the output valve, or if the speaker were to be used some distance away from the receiver, especially in the case of a mains set. The position is not greatly changed, however, for the transformer ratio and primary impedance may be as calculated above, whilst the choke should be chosen to have the inductance we found for the transformer primary. With regard to the transformer, however, there is the difference that it has not to carry any D.C. current, the result being that the primary inductance may be determined on this basis. The L.F. choke performs the same function as the feed-resistance considered last week in connection with the parallel-fed L.F. transformer, and the coupling condenser may have a capacity between .5 and 4 mfd. The tone can be varied by altering the capacity of the condenser, and it is sometimes worth while to experiment with different values, although 2 mfd. is a good average.

By employing the circuit shown in Fig. 4 it is possible to use a transformer the ratio of which is actually lower than that found by the calculation above by connecting the coupling condenser to a tapping on the choke. As an example of this it may be explained that the effective ratio of the transformer could be doubled by joining the coupling condenser to a centre tapping on the choke, or quadrupled by using a tapping one-quarter of the way down the choke from the "H.T.+" end. The principle is similar to that dealt with last week in connection with the auto-choke method of L.F. coupling, and the step-down ratio provided by the tapped choke is equivalent to the ratio of the total "length" of the choke to the fractional distance of the tapping employed from the "H.T.+" end.

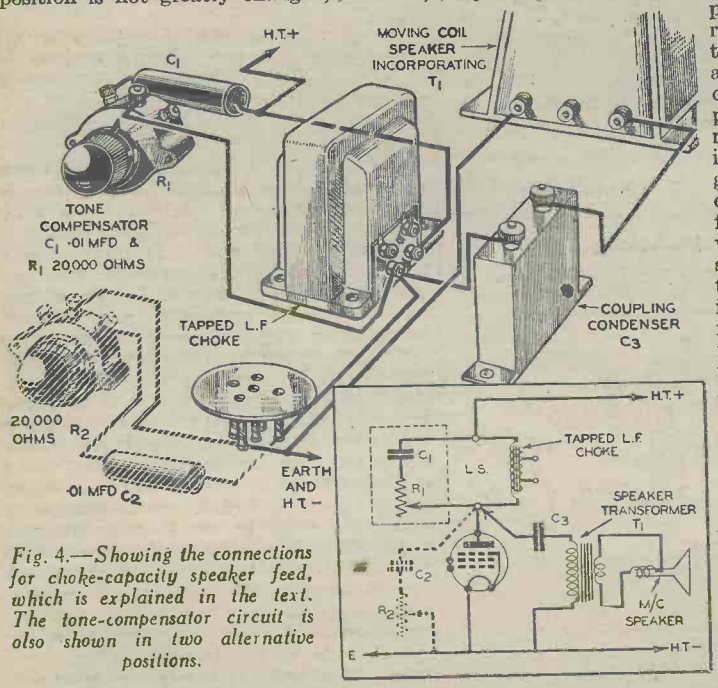


Fig. 4.—Showing the connections for choke-capacity speaker feed, which is explained in the text. The tone-compensator circuit is also shown in two alternative positions.

Resistance-Capacity Output

Yet another arrangement for feeding the speaker is that shown in Fig. 5, where the L.F. choke is replaced by a resistance (non-inductive) having a value in ohms equal to the optimum load of the valve. This arrangement is not often used because the resistance has the effect of reducing the H.T. voltage to a fairly considerable extent. Nevertheless, the scheme is useful when the mains unit supplies a voltage a good deal in excess of that actually required, and where quality of reproduction is an important feature. We do not necessarily say that the resistance-feed method will provide better reproduction than that given when a high-grade choke is employed, but a resistance (which is cheap) is as good as the most expensive transformer. The value of the resistance lies in the fact that its impedance remains constant regardless of the frequency of the audio currents passed through it.

Tone Correction

There is one more point, in connection with the output circuit from the last valve, which we have not considered. It is common knowledge that a pentode—and also a class B valve for that matter—almost invariably gives rather more amplification to the higher audio frequencies, the result being that reproduction is inclined to be rather shrill. It is for this reason that it has become fairly standard practice to include a correction device in the anode circuit of a pentode, the device consisting of a fixed condenser and variable resistance wired in series between the ends of the output transformer, choke or resistance, as shown in Fig. 4; as an alternative these components may be connected between the anode and earth, as indicated by broken lines. Both forms of connection produce the same effect, but the second has the advantage that the variable resistance is at "earth potential," so that there is no danger of receiving a shock if the grub screw on the knob is in contact with the slider, as it usually is.

Of the resistance-condenser combination it is the condenser which is of major importance, and it is the purpose of this component to by-pass a proportion of the higher frequencies. We have seen before that the impedance of a condenser is less to high than to low frequencies, and it is thus evident that it can carry out the desired function.

The Effect of the Condenser

An average value for the condenser is .01 mfd., so let us see just what effect this has. If we consider a frequency of 3,000 cycles we find that the impedance of the 16-henry transformer primary or choke to it is about 300,000 ohms, whilst the impedance of the .01-mfd. condenser is only about 5,500 ohms. It will be clear from this that the condenser would by-pass a large percentage of the output at this frequency, and an even greater percentage at higher frequencies. If we consider the effect of the condenser on low audio frequencies the position is quite different. For example, let us assume now a frequency of 100 cycles, at which the choke has an impedance of about 10,000 ohms, and the condenser an impedance of approximately 165,000 ohms. In this case the condenser would have practically no effect.

The purpose of the variable resistance in series with the condenser is merely to alter the total impedance of the "by-pass" circuit according to requirements; this arrangement is much simpler than using a very large capacity variable condenser, although giving the same effect.

Inductance and Impedance

On page 277 of the issue dated May 18th it was stated that: "The impedance of the transformer primary at, say, 1,000 cycles should then be about 25,000 ohms; this would be provided if the primary had an inductance of 40 henries." The latter figure should have read "4.0 henries," but, due to a slip, the decimal point was omitted. One or two readers who calculated the value by applying the formula given in a previous article of the "Components" series have written to point out the omission of the decimal point.

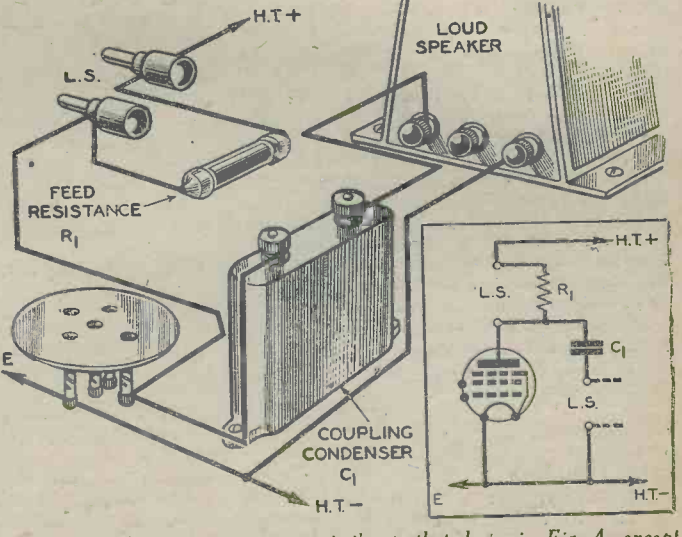


Fig. 5.—A circuit arrangement similar to that shown in Fig. 4, except that a resistance is used in place of the L.F. choke.

Improving the L.F. Amplifier

Some Suggestions are Here Given for Using Old Systems of L.F. Amplification, and for Mixing Such Systems with Modern Arrangements in Order to Obtain Better Results

By W. J. DELANEY

GENERALLY speaking, it may be stated that there are only two forms of L.F. amplification in general use to-day. These are transformer coupling and resistance-capacity coupling. Quality enthusiasts hold that the latter method is the only system worth considering, whilst manufacturers of high-class components can prove that the transformer gives a more even response than the R.C. coupling. Owing to the difficulty which arises in choosing the L.F. coupling, the majority of constructors prefer to adopt the transformer, knowing just what it will do and being aware also that there is a substantial gain in signal strength, with no voltage loss in the anode circuit of the valve with which the transformer is used.

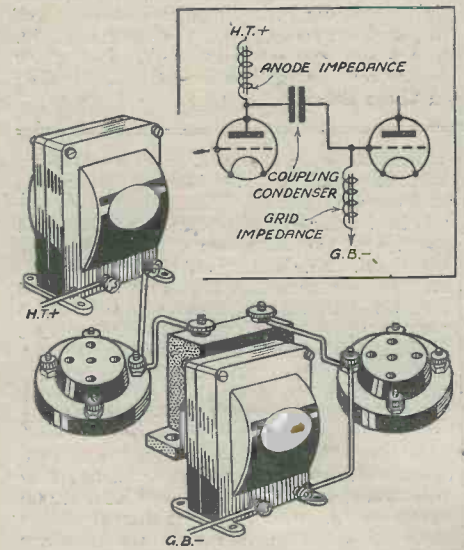


Fig. 2.—A modification of R.C. coupling. The iron-core chokes may be tapped to provide varying effects. This is known as impedance coupling.

In the search for quality in the past many novel forms of coupling have been devised, and such names as Loftin-White, Prince, etc., will no doubt recall memories of some of the ingenious circuits which have been used since broadcasting started. Why have these coupling schemes died out? One reason, of course, is that with the improvement in components, valves, and speakers it has been found that some of the old claims have not been substantiated, but there are certainly many good points in some of these old couplings which may interest the present-day experimenter, and these may be used either in the original form or in combination with more orthodox arrangements.

R.C. Coupling

The system which most people claim is the best from a quality point of view employs two resistances and a condenser, as shown in Fig. 1. It will be seen that the anode of the first valve is joined to the grid of the following through a fixed condenser. The fluctuations of current through the anode resistance cause a varying voltage drop across it, and thus there is a constant change of voltage at the anode. This is the signal which is applied to the following grid, and the condenser is used simply to prevent the application of a positive potential to the grid, whilst the purpose of the grid leak is to prevent the accumulation of grid current and consequent choking of the valve. Thus, the only component which really provides the link between the two valves is the anode resistance, and this is proved in practice by the fact that the size of the resistance governs the amplification. The object is, of course, to get the greatest possible difference in potential between the two ends of the resistance, and it is understood, from previous articles, that the impedance of a resistance is independent of the frequency.

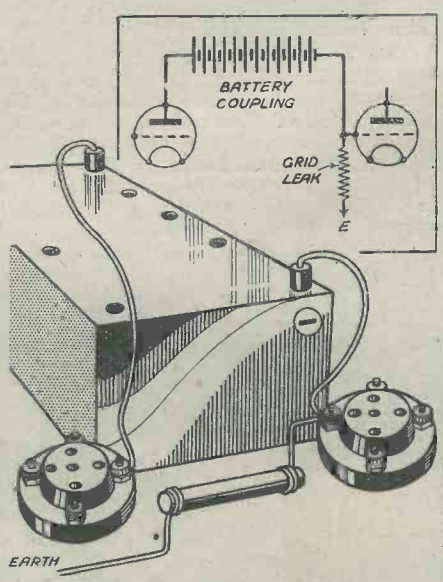


Fig. 3.—Battery coupling, or, as it was often referred to, the "Trigger circuit."

Drawbacks

The drawbacks to this system of amplification are several, but those which principally concern the experimenter are the high voltage loss through the resistance and grid choking. To obtain a satisfactory degree of amplification the resistance must be of high value, preferably four or five times as great as the impedance of the valve with which it is employed. Thus, there may be a drop of 100 or more volts across it, and unless it is possible to obtain a very high source of H.T. supply the valve does not receive sufficient H.T. for efficient working. Grid choking may be caused by the value of the grid leak being too small, or by sudden changes in the character of the received signal, which are so rapid that the leak cannot function sufficiently rapidly, and thus that particular musical effect is lost. Musicians refer to this effect as lack of attack, or rounding off of transients.

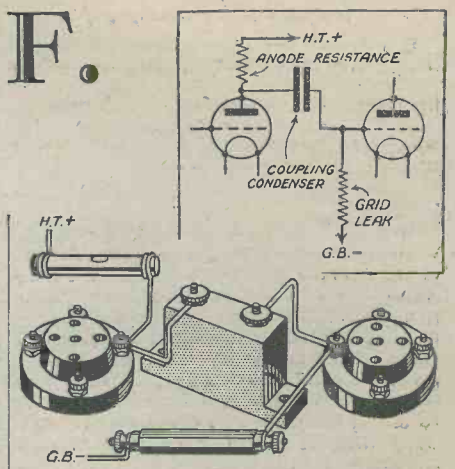


Fig. 1.—Simple resistance-capacity coupling.

Impedance Coupling

One way out of these difficulties, which was popular at one time, was known as impedance coupling. In Fig. 2 will be seen the circuit arrangement where two iron-cored chokes take the place of the resistances previously referred to. Now an inductance provided with an iron core will vary with frequency, and thus a drawback might at first be thought to exist in this method of coupling. Actually, by taking the lowest musical frequency with which we wish to deal, and designing our choke to have a very high impedance at that frequency, this drawback practically disappears. The self-capacity of the choke will, of course, act as in a transformer, and will by-pass high frequencies unless it is of very low value. If large gauge wire is employed, and the above points are attended to, this method of coupling will produce better amplification and handle attack better than ordinary R.C. coupling, and those constructors who would like to try the scheme can employ the primary windings of good high-class transformers for the chokes, ignoring the secondaries. If the impedance is correctly chosen it is possible to obtain 95 per cent. of the

(Continued overleaf)

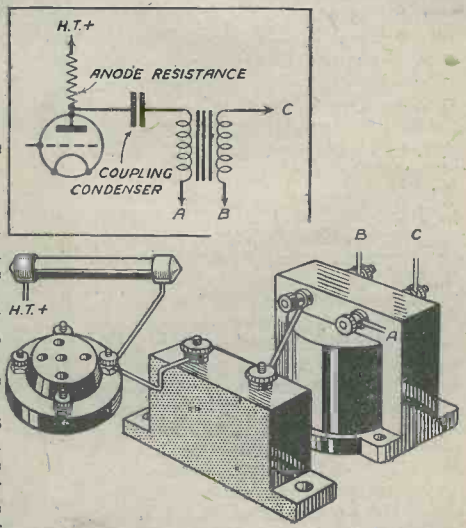


Fig. 4.—A combination of R.C. and transformer coupling. This scheme is familiar to all as the parallel-fed transformer.

(*Continued from previous page*)

amplification factor of the valve, and this is, of course, a very good performance. For general experimental purposes, an inductance between 50 and 80 henrys may be considered satisfactory.

Battery Coupling

In Fig. 3 is shown a form of coupling which was sometimes called a "trigger circuit," and was evolved by Major Prince. The essential feature here is the battery joined between anode and grid, and this, at the time of its development, produced really remarkable results. One of the greatest drawbacks was loss of signal strength due to the capacity of the battery to earth, although this could be overcome by placing the battery on a glass shelf supported on the stand-off insulators used by transmitters. The value of the battery will depend upon the particular valve in use, and the grid leak must also be chosen in conjunction with the remaining circuit characteristics. About 30 or 40 volts will probably be found sufficient for experimental purposes, and it may interest experimenters to try a choke in place of the grid leak.

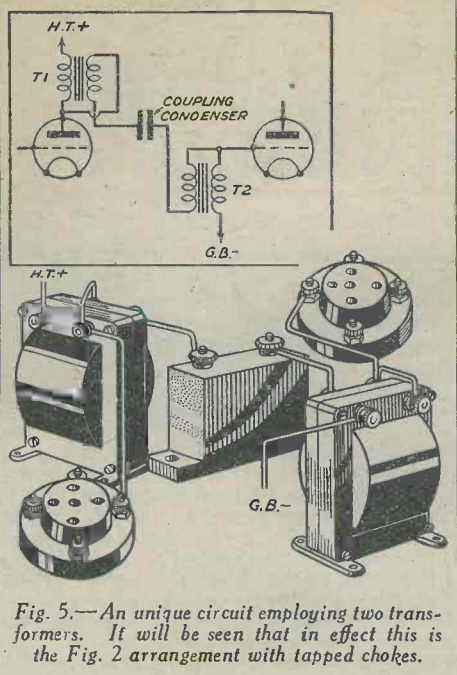


Fig. 5.—An unique circuit employing two transformers. It will be seen that in effect this is the Fig. 2 arrangement with tapped chokes.

Mixing Systems

It is already well known that an L.F. transformer may be resistance fed, placing the transformer in place of the grid leak as shown in Fig. 4. The ends A, B, C may be connected in various ways to provide different degrees of step-up. One terminal is joined to the following grid, and the remaining two may be linked together and then joined to G.B. or earth (according to the type of circuit). An iron-cored choke may be used in place of the anode resistance, thus combining Fig. 2, but it must be borne in mind that the choke and transformer are virtually in parallel, and thus one will affect the other. Similarly, an ordinary L.F. transformer may be used in the anode circuit and another transformer in the grid circuit, thus utilising a system which is shown in Fig. 5. The two transformers must be chosen with care, and the recommendations of the originator are a Ferranti A.F.8 for T1 and an A.F.3 for T2.

A little thought will show that these various systems may be used in combination in a single stage, or in successive stages of an amplifier to level out the characteristic, and those readers who are searching for better quality will no doubt be interested in these details.

THE CLIMAX ALL-WAVE SUPERHETERODYNE

THE Climax receiver under review is an A.C. mains four-valve model, employing a number of novel arrangements. The principal novelty, and one which will no doubt appeal to the majority of listeners, is the fact that the wavebands covered extend down to 10 metres. The second novelty lies in the original visual tuning indicator which is fitted—a Climax invention operating on a rather different principle from that usual in this type of tuning indicator. Dealing with the circuit in detail, we find that the valves employed are of the pentagrid, H.F. pentode, and double-diode triode type, with an ordinary L.F. pentode in the output stage. The double-diode triode is used for detection, A.V.C. (of the delayed type), and first L.F., the triode section being resistance-capacity coupled to the output stage. The aerial input circuit is of the ordinary band-pass type on the broadcast bands, but when the receiver is switched to the short waves an aperiodic arrangement is introduced. In all other respects the circuit is more or less standard.

The Tuning Dial

As may be seen from the illustration, the appearance of the receiver is excellent and out of the ordinary, a plain opening being adopted for the loud-speaker, with the escutcheon arranged almost horizontally on the lower portion of the speaker opening. Such an arrangement greatly simplifies the tuning operations, as the dial may be seen no matter where the receiver is placed. The escutcheon is of rather large dimensions, and the scale, which is very large and is calibrated in wavelengths and marked with station names, is illuminated by two small pilot lamps arranged behind a dark green transparent material. This gives the dial a rather unique appearance, and simplifies the arrangement of the visual tuning indicator which takes the form of a strip of bright light in the centre of the escutcheon.

The Visual Indicator

This indicator consists of a special transformer, the primary of which is connected in the anode circuit of the pentagrid valve. The secondary is arranged with a resistance and lamp in parallel. By arranging the initial brilliancy (with the aid of the resistance) so that a certain value is obtained with no signal, as the anode current of the first valve is lowered by the application of the bias from the A.V.C. circuits, the impedance of the secondary will be increased and thus the lamp will increase in brilliancy. From this it will be seen that the tuning is carried out for maximum brilliancy.

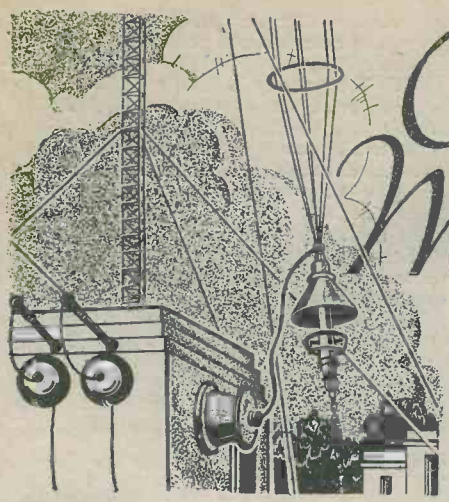
The tuning control is of the two-speed type, a coarse and a fine adjustment being provided. The latter is sufficiently slow to enable very accurate tuning to be carried out on the ultra-short waveband. The remaining controls are for tone, volume (with which is combined the on-off switch), and wave-range. The latter has four ranges, 10 to 30 metres, 28 to 80 metres, 200 to 550 metres, and 900 to 2,000 metres.

Actual Results

On test it was found that the sensitivity was ample for all normal requirements on every waveband, the quality of the reproduction from the normal broadcasting stations being of a high quality on the energised moving-coil speaker which is fitted. Owing to the inclusion of second-channel suppressor circuit arrangements, little difficulty was experienced in obtaining some of the more remote European stations without whistle interference. On the long waves the well-known German stations could be separated (by simple adjustment of the tone and volume controls) from Radio-Paris and Droitwich.

On the short waves many good stations were tuned in in daylight in the centre of London, although the adjustment of the volume control was rather critical on the particular model tested, due to a microphonic valve. As the circuit is of the autodyne type on short waves there are two tuning points for each station, but this did not seem to occasion any difficulty to an inexperienced amateur who was asked to try out the set, and he succeeded in logging many stations at good volume. Unless fading was of the high-speed variety, the A.V.C. functioned admirably and enabled continuity to be obtained on many programmes which would have been lost without the device. The price of the receiver is only sixteen guineas, and provision is made for extension speaker, pick-up, and mains aerial.

The Climax All-wave Superheterodyne. Model 534.



On Your Wavelength

By Thermion

Jazz Music Again

READERS do not like to let sleeping dogs lie. I am not referring to myself, but to that hoary old subject, Jazz Music. I asked readers, you will remember, to settle that much-debated question—which is the best dance band on the air?—by sending me postcards stating their opinions. They are arriving in shoals, some of them couched in vitriolic language about yours truly. Well, it's better to be read and kicked than never to be read at all. One reader, H. M., of Ipswich, who does not wish to be rude, proceeds to be so by sending the following effusion: "Dear Thermion,—With reference to your article in PRACTICAL AND AMATEUR WIRELESS, while not wishing to be rude, you show your utter ignorance of jazz bands when you state that they have to have signature tunes to tell the difference between them. That is a lot of rot because any jazz enthusiast like myself (*note this reader's modesty.*—Thermion) can tell which band it is playing after hearing a few bars. Surely there are few people who take even a very slight interest in jazz who can fail to distinguish such bands as Harry Roy's and Charlie Kunz. Really, Thermion, it's a bit thick to write pages of abuse on something you don't understand as you have been writing lately—you who are usually so impartial. Your articles are very good, but please leave the poor jazz bands alone in future. In my opinion, Jack Payne's is easily the best jazz band."

I like this reference to *poor* jazz bands. Judging from recent accounts, they are anything but that. I will leave my readers to judge as to the relative ignorance of myself and my critic.

Poem!

HEREWITH another effusion recently received:—

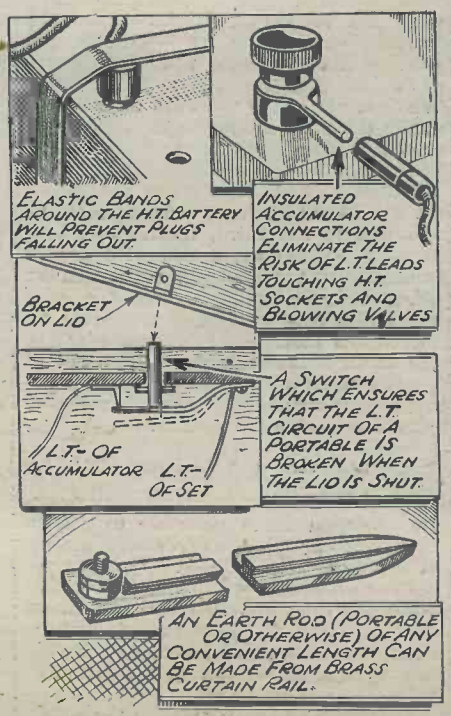
"Dear Mr. Therm,
I am glad to see,
That you will be
At Olympia.
This year.
I long to whisper
Ha-cha-cha-cha
Or boo boo boo
In your ear.
Cheerio,
Croonin' Kid.

"P.S.—Why don't you lay off the crooners?"

Personally, I would rather lay into them. By the way, have readers noticed the very small distance it is from crooner to coroner? Just the transposition of the letter "o" which, in my opinion, expresses the amount of brain which crooners possess, and my ejaculations on their idiotic nigger nonsense. There is another bombshell for the crooning craniacs!

A New Variable Directional Aerial

MR. ALF W. MANN, of 62, Costa Street, Middlesbrough, tells me that he has been granted letters patent for a variable directional aerial system for use in conjunction with all types of radio—short-wave and broadcast receivers and for the reception of all classes of radio signals. With the variable directional adjustment peak signals may be obtained or statics reduced and selectivity improved. Mr.



Mann made tests on many stations, including Java, Manilla, Japanese, American, Australian, and South American short-wave stations. Mr. Mann also tells me that he recently received on an O-V-2 receiver recently described in these pages, operated in conjunction with his new aerial system, understandable signals from the Byrd expedition in daylight. Also American amateurs at 'phone strength at noon and early evening. Mr. Mann is a well-known short-wave experimenter, and I am sure that his claims are well founded.

Loft Aerials

MANY listeners are unable to erect a good outside aerial, and are forced to use an aerial erected somewhere in the house. Now the loft, or space between the roof and the ceiling of the upper rooms, is a very good place in which to place such an aerial, but the actual disposal of the wire is not such an easy matter. A friend asked me to hear his set (built from a design published in these pages) which did not give satisfaction. I heard it and admitted that something was lacking. Firstly, although there seemed dozens of stations all round the dial, they lacked punch. That is to say, they were audible on the speaker but would not give really good volume. I thought at first that the H.F. stage was not functioning correctly, but then I noticed another peculiarity. On tuning through the scale I suddenly noticed a musical item on about 500 metres which I had noticed lower down the scale, and thinking it might be a relay from one of the Continental stations, I turned back to the original position. When the station call was given, however, I was surprised to find that it was the same station and not a relay. This set me thinking, and after two or three adjustments of the controls I found that the apparently large number of stations resolved itself into a dozen or so stations repeating themselves at intervals throughout the scale. I obviously said the ganging was wrong, and endeavoured to right the matter. I took the London National, but could not make any alteration with the trimmers—they were correctly set. Yet the stations were repeating themselves. I must confess I was sadly at sea for some time. Then I thought of the aerial. "Where is the aerial?" I asked. When told it was in the loft, I asked to see it, and there lay the cause of the trouble. The actual space available was rather restricted, and in order to get in a good quantity of wire, it had been taken backwards and forwards across the beams quite a number of times, and then taken down to the receiver. In some manner the adjacent turns were acting upon one another, and completely disorganising the aerial tuning circuit. When a rough wire was slung up to test matters it was found that many more stations were tuned in, and no multiple-tuning points were obtained. As a result, the aerial was taken down, and a single wire taken across the loft and then down to the set. Results were improved tremendously, and the set functioned in a perfectly normal manner.

Short-wave Peculiarities

ON a recent Sunday morning I was tuning round the short waves and was struck with the apparent lack of activity. Only a handful of amateurs

(*Continued overleaf*)

(Continued from previous page)

could be heard, and none of the usual distant stations which are normally tuned in at this time of day could be received. I thought that perhaps the voltage supply was not up to scratch and switched off, deciding to give wireless a rest for a time, and went out into the garden. An hour or so later the weather broke up and I was forced to come indoors, and having very little to do I again turned to the short-wave set. As soon as I switched on I was struck by the great increase in sensitivity, stations rolling in as usual (or perhaps even more so), and the former lack of life having completely disappeared. I naturally thought that my previous assumption that the mains were down was correct, but I suddenly tuned in a Coventry amateur working with a London station and heard him remark on the sudden change in conditions. He told the London man that he was coming through R8, although not many hours previously no signs of London could be obtained. I wonder whether the rain was responsible, or whether some sudden climatic change occurred to render this complete change of conditions possible ?

Radio History

I WONDER how many of my readers can remember their experiences of radio-reception—and perhaps transmission—before broadcasting began. During the time of the Jubilee celebrations I have spent not a little time looking through some of my old log books. One very interesting entry I made was : " Heard faint sounds of telephony—wonder if it is an actual transmission or pick-up from telephone lines." That was before the transmission of telephony was by any means commonplace. Another, and earlier, entry reads : " Cheers—picked up Eiffel Tower time signals after three weeks' experiment with the new crystal set." I think that probably the reception of those few dots and dashes gave me greater pleasure than anything I have since heard " over the wireless."

Another entry in my log book, but this time in 1924 reads : " Marvellous reception conditions to-night ; received KDKA on the loud-speaker at R7 on Det.-2 L.F. set with choke-capacity coupling." Such reception would to-day pass without any note, for it is quite usual for the short-waver.

Hard Work

I WELL remember my first essay into the realms of transmission, and recall the day when I first established two-way communication with a fellow amateur whose station was fifty miles away—my transmitter employed only two B4 power valves in parallel and was fed from a pair of 100-volt H.T. batteries. After that I invested in a small hand generator which had an output of 600 volts at 120 m.a. and increased my range enormously. The difficulty occurred after " keying " with one hand, and turning the handle of the generator with the other ; conditions were not much improved when transmitting telephony, for it is no light task to speak for, say, ten minutes, and at the same time to keep a generator revolving at 3,000 revs.—even though the drive was geared about 50 to 1.

Ministry of Transport and Car Radio

The importance of placing the radio control so as to avoid distraction in driving was strongly emphasised in Philco's original report to the Ministry, and they explain that their sets have been expressly designed so that the control comes effortlessly to the hand of the driver. Any other arrangement has been strongly deprecated by them, and to this factor they attribute the complete immunity of their sets as a cause of accident.

As to the power of the set, Philco state that in discussions with members of the Ministry they have repeatedly expressed their readiness to accept a limit. They are fully aware that power in excess of an undistorted output of 2.5 watts, which they claim is ample for the needs of the private motorist, might tend to become a public nuisance. They have consistently avoided any such possibility.

The Minister's approval of car radio comes at an opportune time for motor manufacturers, who are considering the design of their new season's models.

Notes from the Test Bench

Curing Instability

SOME of the older types of receivers incorporating S.G. H.F. stages utilise unscreened H.F. coils placed quite near each other. Two or three years ago, when the efficiency of H.F. valves was not of a very high order, these coils proved quite satisfactory, and were in many cases more efficient than the modern coil of the screened type. When modern H.F. pentodes are substituted for the original S.G. valves, however, it is generally found that H.F. instability is experienced. Fortunately, there is a fairly simple method of curing this form of instability ; it is only necessary to cover the coils with copper or aluminium screening cans. Care must be taken to keep the screening can at least half an inch from the coil windings, however, and therefore the diameter of the can must be 1in. greater than that of the coil former. It is also necessary to connect the can to a point at earth potential, otherwise the screening will not be effective.

Wave-changing at High Frequency

THE majority of short-wave sets employ low capacity condensers of approximately .00015 mfd. and therefore two coils are necessary to cover the 13 to 50 metre band. Coil changing is not favoured and panel switching also has its disadvantages unless the various components are carefully laid out. A very simple method of wave-changing can be adopted, however, which obviates the necessity for switches and coil bases. Sufficient turns should be wound on the coil former to obtain a maximum wavelength of approximately 50 metres, and very short lengths of 16 or 18 s.w.g. wire should then be soldered to the third, fourth, and fifth turns from the earth end of the grid winding. Wave-changing may then be effected by clipping a crocodile clip, which has been previously connected by means of a short length of flexible lead to the earth terminal of the coil, to one of these tapping points. The reaction winding can be wound on a small former and placed inside the grid former.

S.G. Voltage Adjustment

TO obtain really good quality reproduction it is desirable to use an output valve having an undistorted output of approximately 7 watts. These valves require an anode voltage of 300 to 500 volts, however, and therefore resistances must be connected in the anode circuits of the preceding valves in order to provide the required anode voltage of 200 to 220 volts.

It is very desirable to keep the anode voltage of the S.G. H.F. valve steady, and therefore it is not advisable to control the volume by means of a variable mu bias control, as the total current consumption of the valve drops to a very low level when the control is at minimum setting. The voltage drop across the anode resistance will therefore be very low at this setting.

Short-wave Note

When I mentioned the impossibility of mistaking VQ7LO for an American transmitter, I had in mind W3XAU, of Philadelphia (Pa.), on the same channel, and through which you may receive the WCAU, Columbia programmes in the same city daily from G.M.T. 01.00-04.00. The 49.5-metre wavelength, as you will see, is a very congested one, as it also houses W8XAL, Mason, a 10-kilowatt short-waver, taking the WLW, Cincinnati, radio entertainments, on the air from G.M.T. 10.00-01.00 and again from 04.00-06.00 daily.

Almost immediately above we find GSA, Daventry, on 49.59 metres (6,050 kc/s), and this logging provides us with a good landmark for this particular band of frequencies.

Remember that DIQ, Königs Wusterhausen, Germany, on 29.16 metres (10,290 kc/s), which has been carrying out tests with JVM, Nazaki (Japan), relays from time to time the Zeesen programmes between B.S.T. 22.30–23.30 and from 00.00 to 01.00. On two occasions it has been heard carrying out experimental broadcasts with Pernambuco (Brazil).

Practical Television

I have just been looking through our sister journal, *Practical Television and Short-Wave Review*, and must admit that I was amazed at the diverse subjects which were covered in this interesting monthly. I have not a great deal of interest in television at the moment, and must confess that after looking through this number I shall certainly make up (or borrow) a television receiver. Another feature which greatly interested me was the short-wave superhet. This employs three valves and a pentagrid-frequency-changer, and seems to present many novelties. I shall have to ask the Editor to lend this receiver to me as I have not yet tried out a short-wave superhet employing such a small number of valves. By the way, it might interest readers to know that the usual superhet (if correctly designed) is of little use to those who wish to log amateur transmitters on the short waves, as the majority of these employ continuous-wave transmissions, and this type of receiver will not pick up such transmissions unless the I.F. valve is oscillating. This particular receiver has a manual control and enables this condition to be obtained so that the general use of the equipment is greatly extended, and some really good results should be obtained. There is also an article which will interest those who have ordinary disc apparatus, and are anxious to see the television pictures radiated from France. The article tells you how to get these pictures (60-line) with the ordinary apparatus.

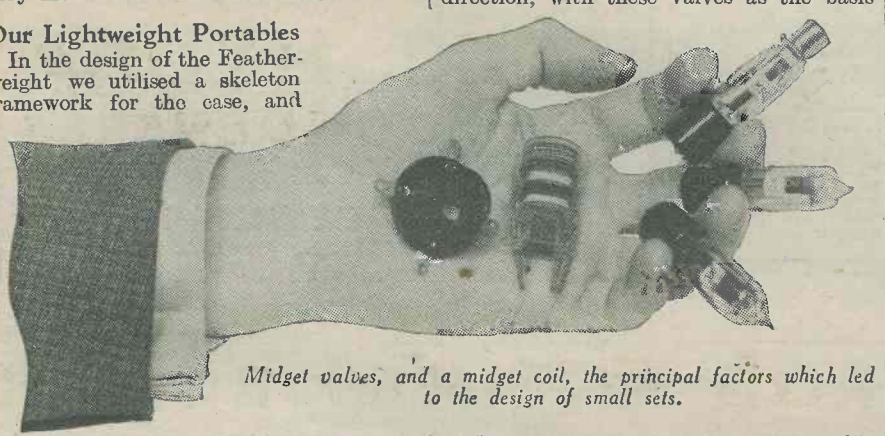
Our Cameo Series of Midget Sets

Preliminary Details of Our New Series of Midget Receivers for Hikers, Cyclists, and Motorists, and Interesting Information Concerning These Tiniest of All Portable and Pocket Receivers. Full Constructional Details Next Week!

FOR some time past we have been giving very intense consideration to the design of small receivers. Readers will remember the original Featherweight receiver which we designed and which was the first real step towards a really portable receiver. In the past the term "portable" has simply meant "capable of being carried," and those who have used some of the older commercial portables will remember that although capable of being carried, their weight prevented them from being taken very far. The term portable when applied to a wireless receiver should mean that it may be conveniently carried, and although the batteries form the greater bulk and weight, there is no need why the total weight should not be very much less than it is to-day.

Our Lightweight Portables

In the design of the Featherweight we utilised a skeleton framework for the case, and this gave a substantial reduction in weight. The remainder of the design also led to a reduction in size and weight, so that together a really neat and convenient receiver was built. In the following year we still further improved upon the design, and introduced the Atom, in which small coils were employed, and other devices were introduced in the interests of lightness and smallness. This receiver represented a real advance in design and received high praise from many quarters. Even so, the hiker or the rambler who wishes to go out into the country during the summer months often feels that the entertainment which is provided by musical items, etc., is well worth while, but a receiver to be taken on such excursions must have many points which cannot to-day be found in a receiver.



Midget valves, and a midget coil, the principal factors which led to the design of small sets.

What Is Needed

Apart from the fact that the total weight must be at an absolute minimum, the overall size must also be such that the receiver may be stowed in the rucksack when not required, or at least carried comfortably in the hand without the necessity of guarding against the corners banging the legs or protruding knobs, etc., which render it necessary to place the body at an angle so as to enable the receiver to hang clear. Travellers in other directions, too, often wish that a receiver was at hand to wile away the time. In the train, in a car, on a cycle, or in many other directions there is a real need for small apparatus, and it may be of the type designed to fit into an overcoat pocket, or built to the dimensions of an ordinary box camera. There were, however, many difficulties in the way of the production of such apparatus. First and foremost is the battery supply. Until recently the standard apparatus was much too large and weighty to enable ordinary supplies to be utilised. The size of components, too, precluded ordinary apparatus from being used in midget. Our experiments have led to the design of a receiver which eclipsed even the Atom and yet we were not satisfied.

Midget Valves

Then came the announcement from the High Vacuum Valve Company that they had succeeded in producing really midget valves, and these have already been mentioned in these pages. Previous ideas were not discarded, and we struck out in a new direction, with these valves as the basis of design. It was obviously impracticable to use ordinary coils and condensers with such small valves, and, therefore, we got into touch with the various manufacturers with a view to the production of suitable components, and we have now succeeded in obtaining some really interesting apparatus as a result of which real midgets are now possible. Obviously, it is not intended that receivers of this nature shall give loud-speaker signals sufficient to fill a small hall. What is intended is that the output shall be sufficient for the needs of the user only. Thus, one model which we have constructed will operate headphones only, and will be admirable for the hiker who desires music whilst he rests for lunch or has a break from his walk. Another model is designed for the cyclist, who cannot wear headphones, but will be content with a moderate loud-speaker output, sufficient to relieve any tedium of the journey but not sufficient to prevent his hearing sounds from overtaking traffic, etc. Another model will suit the car user who wishes to hear the signals on a loud-speaker above the engine and other incidental noises, but does not wish to distract the driver. No doubt there are many other types of receiver which will be required by our readers, and in order that we may cater for all classes we should be glad if readers would write to us and let us know their requirements.

What Circuit?

It must be remembered that there are limitations to the amount of high tension which it is practicable to accommodate. Therefore, it is of no use asking for seven- or eight-valve superhets. Circuits which are economical in low and high tension must be employed, and thus there is a certain restriction upon the type of apparatus which can be built. To many, a one-valve receiver with reaction and an efficient coil will give sufficiently loud signals on a good pair of headphones to offer adequate entertainment under normal conditions, with a throw-out aerial.

Cabinets

One of the most difficult points concerns the type of cabinet in which to house these midget sets, as it is obviously necessary to maintain the smallness of size of the receiver portion without bringing the entire assembly up to the dimensions of the Atom, for instance. In the case of the hiker's receiver a small cabinet would be sufficient, but in the case of a receiver designed for the car it is obviously desirable to arrange the receiver to fit into some convenient part of the car, and the glove-box lends itself admirably for this purpose. A small wooden panel may be shaped to fit the opening of the box, and the receiver itself will go very conveniently into the space behind. Other particular requirements may similarly be fulfilled, and no doubt readers will let us know their ideas and requirements when writing to us concerning the type of circuit which they will find most useful.

Here is an H.T. battery and a small accumulator, the actual sizes of which may be seen from the hand in which they are held.

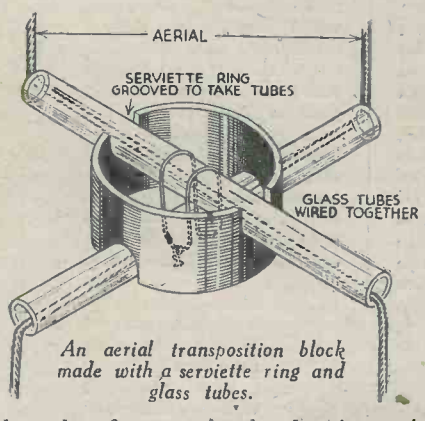
A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

Easily-made Transposition Blocks

IT is well known that a great deal of the local interference caused by car ignition, trams, electric signs, etc., can be cut out by the use of transposition blocks. These are particularly useful when listening to weak signals on the short waves.

The blocks are fixed in the two down leads, one being from the aerial wire and

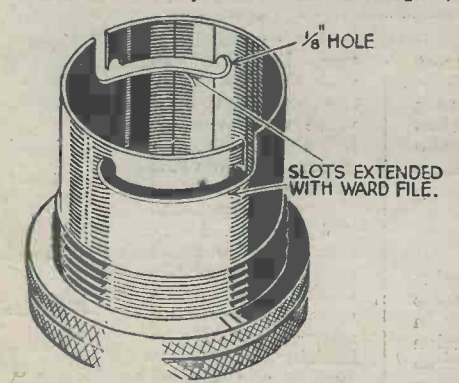


An aerial transposition block made with a serviette ring and glass tubes.

the other from an insulated point. As shown in the accompanying sketch, glass tubes are used which are wired together on to a serviette ring, which has been grooved out to take the tubes to prevent them moving. The rings can be obtained at a local stores and the tubes from a chemist. The sketch shows one the transposition blocks assembled, and they should be arranged at a distance of two feet from each other. —G. LINDSAY (Hitchin).

A Novel Switch Plug

BY the simple modification, shown in the accompanying sketch, a batten holder, when used in conjunction with an adaptor,



Adapting a batten holder to form a switch plug.

forms a handy switch-plug. In the normal closed-circuit position, the contacts of holder and adaptor coincide. The extended slots permit the adaptor to be rotated through an angle of 90 degrees, when the contacts of the holder will rest on the insulation of the adaptor. The device is best suited for use with extension speakers.

THAT DODGE OF YOURS!

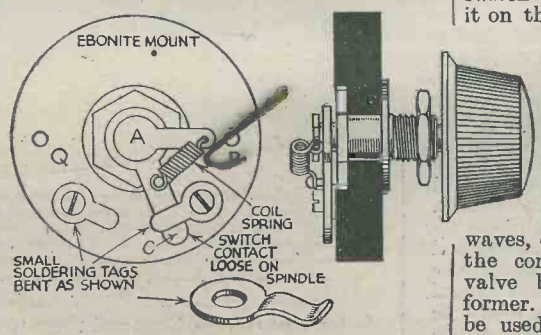
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be *original*. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

It should be pointed out that the device should not be used with high-voltage mains, as this would be against I.E.E. regulations.—STEENSON RAINEY (Wishaw).

An Easily-made Snap Switch

THE switch shown in the accompanying sketches is of the rotary two-way snap type suitable for radiogram change-over switching. The common contact is taken to the fixing bush and spindle, which are from an old push-pull switch or rheostat. The knife contacts are made from soldering tags fixed by 8 B.A. bolts to which the other contacts are taken.

The large tag "A" is soldered flush with the end of the spindle. Under this tag is placed the snap contact, which pivots



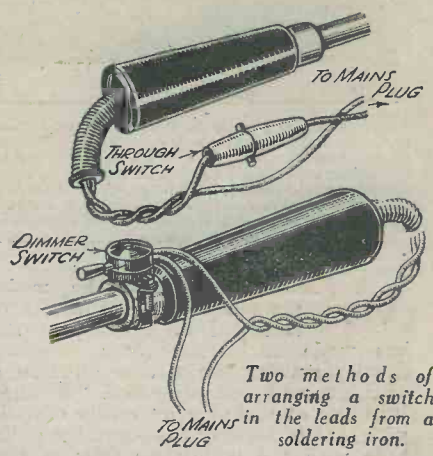
A method of making an efficient snap switch.

easily on the spindle. This contact can easily be made from a brass strip from a flash-lamp battery. To each of these tags is soldered a pin over which the tension spring is fixed.

When the spindle is rotated anti-clockwise, that is over from P to Q, the tag "A" puts a tension on the spring. When the tag "A" is rotated so that the centre line of the spring is to the left of the spindle, the contact "C" will snap over to the left-hand contact. This cycle is repeated when the spindle is rotated in the reverse direction. A compression spring may be placed between the bush and the knob to cause the contact "C" to be pressed against the mount, so making the switch work smoothly.—C. S. HARRISON (Long Eaton).

A Soldering-iron Switch

WHEN using an electric soldering iron, it is very annoying to have frequently to get up to switch it off in order to economise in current consumption. The follow-

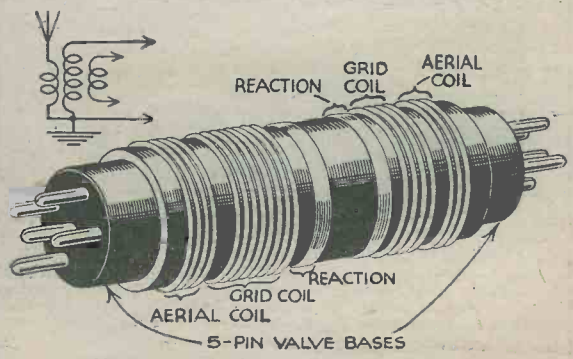


Two methods of arranging a switch in the leads from a soldering iron.

ing dodge eliminates the trouble. Break one side of the flex, near the handle of the iron, and insert a "Bulgin" through switch. Another idea is to obtain a dimmer switch of the pattern illustrated, and fix it on the ferrule of the iron, breaking the lead in the same way as before.—R. LANDELLS (Hendon).

Two Sets of Coils on One Former

BY using the method illustrated in the accompanying sketch, two sets of coils, *viz*, short waves (40–80 m.), long and medium waves, etc., can be wound on one former, the connections being taken to 5-pin valve bases fixed in the ends of the former. This arrangement, which can also be used for Hartley and other circuits, permits of quick wave-change.—S. HAWES (Dunedin, New Zealand).



Using a single former for two sets of coils.

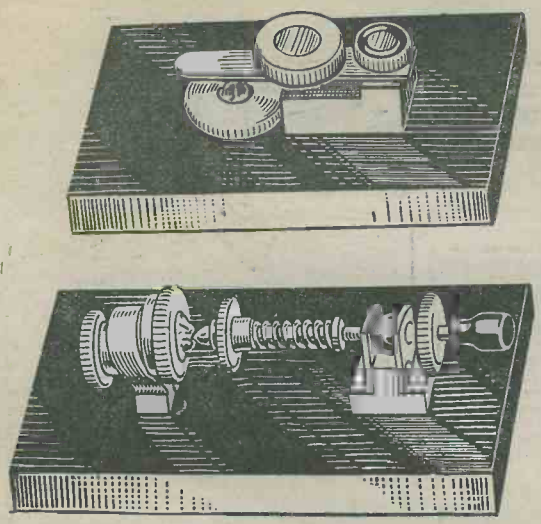


Fig. 1.—Two very early detectors. The upper illustration shows the carborundum detector, in which a flat piece of steel was pressed against a crystal of carborundum. This type of detector was generally employed in conjunction with a small potential, a potentiometer being used in order to vary the applied voltage. The lower picture shows the combination type of detector in which copper pyrites is employed in conjunction with a piece of galena. The pressure applied was a critical factor and thus the small milled adjusting knob was provided on one holder.

TWENTY-FIV RADIO P

At the time of the King's Silver Jubilee it is Int During his Reign. Some Interesting Details are he

WHEN one reviews the modern marvels of the age, surely one is forced to admit that none has made such tremendous strides in development as the science of radio, or, as it is more commonly called, "wireless." When we compare the motor-bus of to-day with that of 1910, or the aeroplane of that time with the luxury air liner of these days we admit that marvellous changes have been brought about in twenty-five years; but if we go back to 1910 and examine the wireless position of that time, what do we find? Broadcasting unheard of and not even envisaged. Marconi, who was in that year on a voyage to Buenos Aires on the S.S. *Princepessa Mafalda*, was able to pick up signals sent from Clifden in Ireland over a distance of 4,000 miles in daylight and 6,735 miles at night. This was, of course, with what might be termed "laboratory apparatus," and the distance created a record and once more revealed the startling effects of the radio signals. By signals is meant the dots and dashes of the morse code, for at this time it had not been found practicable to transmit the human voice, although experiments carried out in secret had shown that it might be possible when more was understood of the nature of the radio-frequency oscillations.

1910

Thus in 1910 we find that wireless telephony (and naturally the transmission of music by wireless) was not an accomplished fact, and that a distance of 4,000 miles for code signals was a record. What was the apparatus like in these days? In general, the crystal detector was in use, although the Fleming valve was being experimented with in complete receivers, and such receivers were being used by the Marconi Company with great success. The magnetic detector was still in existence, and receivers presented a most frightful appearance, with their array of switch studs and arms. Certain ships had been fitted (from an experimental point of view) with wireless apparatus, and it will be remembered that in this year the first real proof of the value of wireless was furnished to the world with the arrest of the notorious murderer Crippen, who was found on a ship going to America, and the captain of the boat sent a wireless message to the authorities which enabled them to take a faster boat to New York and there to arrest Crippen before he landed.

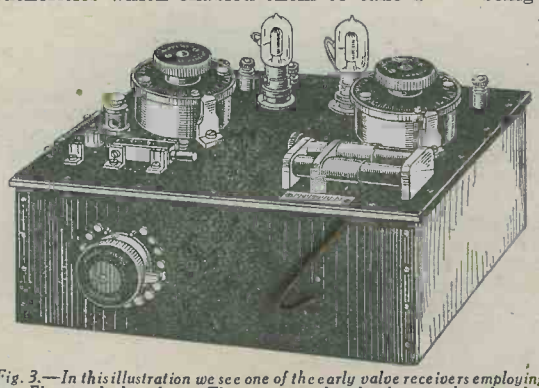


Fig. 3.—In this illustration we see one of the early valve receivers employing two Fleming diode valves. The circuit employed only a single valve, but two were fitted in the interests of reliability, and a switch enabled one or the other to be brought into circuit. Note the massive variable condensers, and compare them with modern components. The dielectric employed in these condensers consisted of plates of thick ebonite, but the components were very efficient.

In this year the first wireless shipping report was published at Lloyds, thus forging another link in the chain which was establishing radio as one of the world's everyday needs.

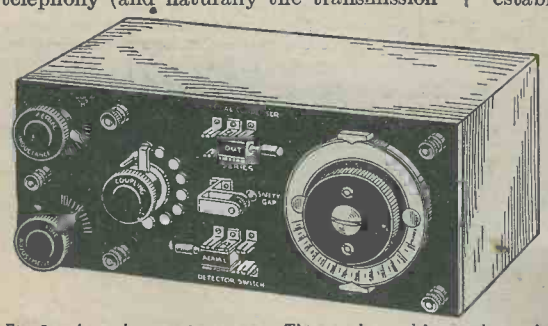


Fig. 2.—An early army-type tuner. This was designed for use during the early days of the Great War, and employed a flat tuning inductance arranged to tune after the manner of a variometer. Switches were provided to enable the detector and phones to be joined across either the "closed" or the "aerial" circuit.

1911

In the following year the Admiralty interest in the possibilities of radio led them to have a station built in Whitehall. The power of this station was 14 k.w., and during the same year an army airship took aloft a transmitter and was able to establish communication up to a distance of thirty miles. In America things were going ahead rather more rapidly, but the world was, in general, taking a much greater interest in the subject, principally owing to the saving of life at sea due to help being received as a result of a wireless call.

1912

This latter use of radio was stressed still more forcibly in 1912, when the *Titanic* struck an iceberg and was able to send for help before finally foundering. In this year a transmitting set designed especially for aircraft was perfected and fitted to military aeroplanes, and in June a seaplane so fitted was able to transmit over a distance of ten miles. Greater distances were being accomplished by land stations, and it was becoming increasingly evident that there was a future for communication between one country and another by means of wireless signals.

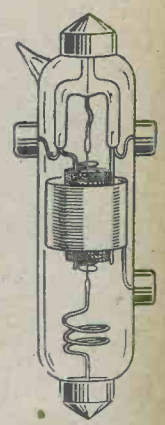


Fig. 7.—Two interesting v the popular V.24, in whic leads are taken to oppos container to reduce capaci clipped into a small hold extremely small, but very e about three inches long by of an inch in diameter. O 4-electrode valve, known were some novel uses sugg 1920, not the least of w struction of a receiver wit supply

1913

In 1913 the Government, seeing the importance of the subject, entered into a contract with the Marconi Company for the erection of a chain of high-powered stations for Imperial communication. Early in the year the first three-electrode gas-filled valve was developed by a Marconi engineer, and from this point receiver design progressed by leaps and bounds. Many amateurs were taking up the study of the hobby, and as a result of the growing interest the Radio Society of Great Britain was formed in this year in the interests of such amateurs.

Fig. 5.—The well-known French "R" valve. This was extremely popular amongst amateurs immediately after the war, but its performance would be extremely poor compared with modern valves. It formed an ideal detector and was used in its thousands.

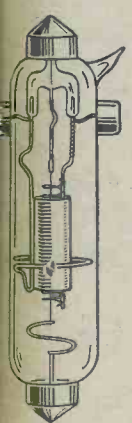
1914

With the arrival of the War, the military development of radio

E YEARS OF ROGRESS

ling to Review the Progress Made by Radio given.

was very marked, and those amateurs who were experimenting at the time will remember that under Government orders the apparatus had to be sealed up and could not be used, in case of communication with the enemy ! Fig. 2 shows the Mark II Long-wave Tuner of these times, and Fig. 3 is the first valve receiver. In the front may be seen a peculiar form of tuning condenser (known as the Bili), whilst the tapping switch for the tuning coil is visible in the front. Direction-finding stations were erected in France, and, although not to be compared with modern D.F. apparatus, it was found possible to trace enemy ships.



...es. On the left is the grid and anode ends of the glass effects. This valve and was not only ficient. It measured about three-quarters the right is the first the F.E.1. There ed for this valve in cu was in the con-ut any high-tension

1915

Owing to the necessity of communication between the various arms of the Service, great strides were now being made in the design and efficiency of apparatus. Communication between aeroplanes and gunners was necessary, and by the end of 1915 600 aeroplanes were fitted for the job, and there was a complete wireless telegraph arm attached to the Royal Engineers. The three-electrode valve was still further improved, and the first "reflex" circuit was evolved during this year, in which the valve was employed. Records also show that night-fading was first discovered in this year. A patent was taken out for the push-pull method of L.F. coupling.

Fig. 9.—One of the earliest, and at the same time one of the most popular, loud-speakers —the Magnavox. This employed an energised magnet (requiring an applied voltage between 6 and 10) and the diaphragm was of the conical type. This was operated by a moving coil and was used on many occasions for public-address demonstrations.

1916-1919

The entire War period may be said to show rapid stages of development. Telephony was adopted in field service sets, the beam method of transmitting was developed from the laboratory to the practical stage, and hard valves were being manufactured. In 1919 the first transmission in this country of speech and music for public reception was carried out from Chelmsford. Unfortunately, this station was closed down by order of the Postmaster-General as it was stated to be interfering with "legitimate services." It was found in 1919 that the self-capacity of a valve was a drawback to good functioning, and as a result the well-known V.24 valve was introduced (Fig. 7). As will be seen from the illustration, the leads were brought out at various points of the glass container.

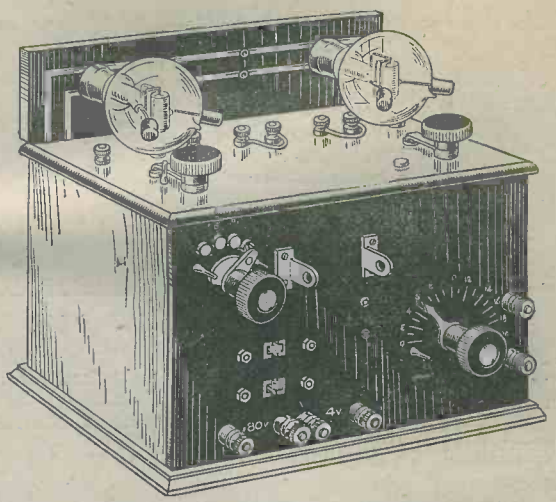


Fig. 6.—Here you see a 1918 short-waver. Again anti-capacity valves are being used, and these are of the French "Horn" type, with the grid and anode leads brought out to separate contact points. The term "Short wave" only applied, of course, to wavelengths down to 200 metres.

1920

This year saw broadcast entertainment introduced as a reliable feature, the Chelmsford station again being the source of the transmission. The wavelength used was 2,800 metres, and in June of this year Dame Nellie Melba gave her famous broadcast, using an ordinary carbon hand-microphone with a small wood and paper trumpet round the mike to improve matters. She had to hold it whilst she sang ! The transmission was picked up by a ship at sea over 1,000 miles away. A well-known London daily newspaper had a receiver installed in order to pick up items of news transmitted from Chelmsford and a number of important transmissions of this nature were made during the year.

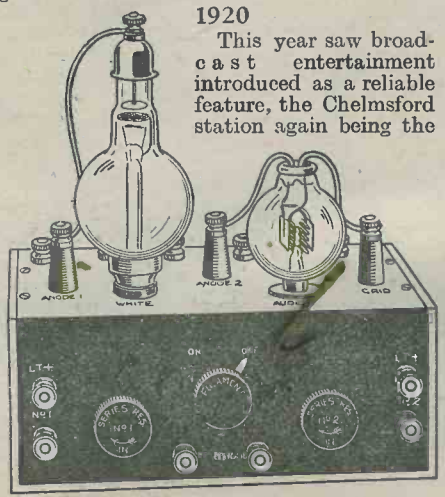


Fig. 4.—An amplifier of 1917. This employed two "soft" valves in an H.F. and detector circuit, but did not incorporate any tuning arrangements. It was intended for use in conjunction with the Mark III Tuner. The leads coming out from the valve should be noticed, together with the large terminal points for them. It was customary even during recent years to de-cap ordinary standard valves and use them in a similar manner for short-wave work in order to reduce inter-valve capacities.

1921

The P.M.G. authorised a limited broadcasting service from Writtle with a power not exceeding 200 watts in 1921, and some interesting receivers began to come into existence to pick up these transmissions.

1922

The now historic 2LO came into existence in 1922, and the British Broadcasting Company was formed. Crystal receivers appeared on the market, and one of these is shown in Fig. 8. This was the Apollo and cost £4 10s. with one pair of 'phones. Notice the two crystal detectors which were fitted in the interests of reliability, and the large tuning coil with the sliding primary winding. Towards the end of the year valve receivers were obtainable, the popular Marconi V2, which employed two valves only, but in a reflex circuit, costing £20.

1923

Now that broadcasting had arrived, the strides were really rapid, and it is only possible to indicate some of the interesting developments of the past decade. Looking through old catalogues I find a 5-valve receiver was on sale in 1923 at a price of £83 7s. 6d. This was fitted with a frame aerial in the interests of selectivity !

(To be continued next week)

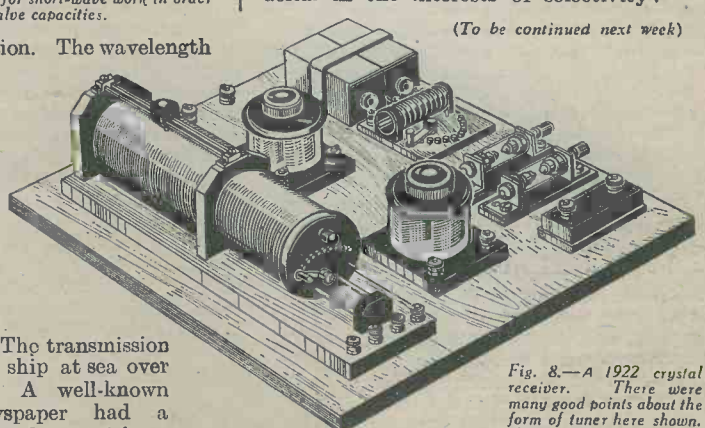


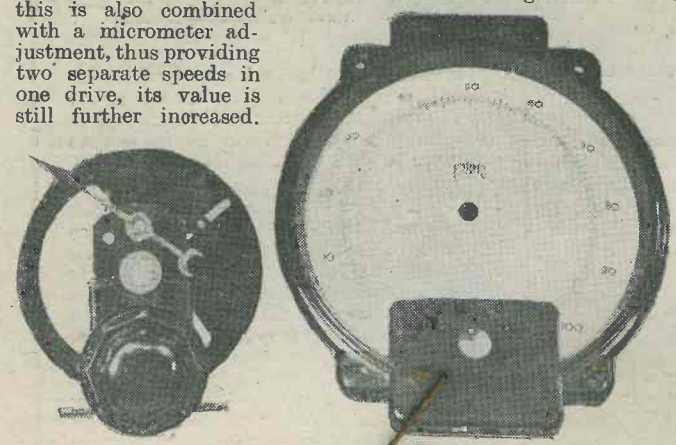
Fig. 8.—A 1922 crystal receiver. There were many good points about the form of tuner here shown. A primary and secondary winding were employed, the primary being tapped at a number of places whilst the secondary was provided with a sliding contact. The adjustment of wavelength could be made by the variable contacts, and the degree of coupling between primary and secondary could be varied by sliding the primary in or out of the secondary.

Facts & Figures

COMPONENTS TESTED IN OUR LABORATORY

A New Formo Drive

THE use of a modern receiver demands also that the actual tuning unit shall be operated through a drive which will enable full advantage to be taken of the modern circuit design. The ordinary old-fashioned direct drive is of little use to-day and a slow-motion drive is essential. When this is also combined with a micrometer adjustment, thus providing two separate speeds in one drive, its value is still further increased.



The Formo snail drive and dial.

The Formo drive shown above is of the latter type, having two separate speeds each controlled by a separate knob, the two being arranged concentrically on a common spindle. The normal speed obtained with the larger knob is approximately 8 to 1, whilst when the smaller front knob is manipulated the gear reduction is brought to 60 to 1. The actual drive is more or less on orthodox lines, except that the pointer which is fitted is of the same pattern as a modern clock hand and is a sliding fit on the spindle—after clock practice. To enable full advantage to be taken of the drive a large diameter (4½in.) matt celluloid dial is provided, and a neat bakelite escutcheon into which it fits. The dial is domed and the pointer is suitably curved to provide a really neat and novel tuning unit. The price is 3s. for the snail drive, and 3s. 6d. for the escutcheon—a total of 6s. 6d. for the complete unit.

A Dual-wave Station Suppressor

LISTENERS who experience difficulty in cutting out local stations should make a point of trying the Whiteley unit which is expressly designed for this purpose. It connects in a simple manner between the aerial of your set and the aerial terminal, and the simple adjustment of a knob on the unit enables any station to be suppressed. A wave-change switch is provided on the unit so that it may be operated on either the medium or long wavebands. The price, complete with easy-to-follow instructions, is 10s. 6d., and further details may be obtained from Messrs. Whiteley Electrical Radio Co., Ltd., of Radio Works, Victoria Street, Mansfield, Notts.

A Useful Bulgin Accessory

USERS of short-wave converters sometimes find that, owing to the particular arrangement of the aerial coil in the standard broadcast receiver with which the converter is employed, some loss in signal strength is noticed. The usual anode wiring scheme of a converter consists of two chokes in series, one a short-wave choke and the other a normal broadcast choke. The little device introduced by Messrs. Bulgin, and illustrated on this page, consists of a specially-wound choke which is intended to replace the ordinary choke in the converter, and owing to the winding which is used on this component it provides a much better transfer of energy and will prove of great value in those cases where the signal transfer from converter to receiver is poor. The price is 2s. 6d.

Mercury Vapour Rectifying Valves

THERE are many advantages to be gained by employing the so-called "gas-filled" rectifiers (*i.e.*, mercury vapour rectifying valves of the hot-cathode type) for high-tension supply to high-power output valves, such as those used for talkie and public-address amplifiers, relay systems, and the like, and for valves of corresponding consumption in transmitting circuits.

Of these advantages, one of the most valuable is that high rectification efficiency is obtained, even at low working voltages, due to the fact that, owing to the low internal resistances of this type of valve the internal voltage drop is very low. For the same reason, the voltage regulation of the supply unit is remarkably good.

The Mullard Wireless Service Co., Ltd., has developed a range of gas-filled rectifiers, and four types are available, having the following outputs:—

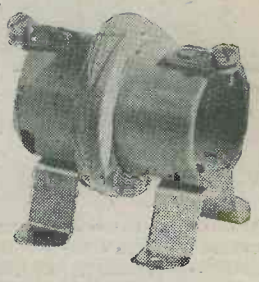
Type.	*Max. Rectified Output.*	
	Volts.	*m/Amps.*
RG1-125	1,200	125
RG2-500	2,000	500
RG5-500	5,000	500
RG5-1,500	5,000	1,500

Of these, Type RG2-500 is an entirely new valve, details of which have only just been released. Its operating data are as hereunder:—

Filament Voltage	5.0 V.
Filament Current	10.0 A.
Max. Anode Voltage	2,000 V. R.M.S.
Max. Peak Inverse Voltage	5,000 V.
Max. Rectified Output Current	500 mA.
Max. Peak Anode Current	2,500 mA.

As in the case of other valves in the range, the internal voltage drop is only some 15 to 20 V.

The RG2-500 is particularly suitable for use in rectifier circuits fed from single-phase or three-phase A.C. supplies where relatively heavy output currents at voltages up to 2,000 V. D.C. are required, and in voltage doubling circuits giving an output voltage of approximately 4,000 V. D.C. at full load.



A useful accessory from the Bulgin range, referred to on this page.

In connection with the smoothing arrangements for a rectifier circuit employing gas-filled tubes, it should be emphasised that the filter circuit should be so arranged that a choke is connected in series with the rectifier *before* the first smoothing condenser.

Two New Marconi Valves, X31 and X41

MARCONIPHONE announce the introduction to their range of two new valves, which will be known as the Marconi X41 and the Marconi X31.

These are triode hexode valves, specially designed to perform as frequency changers in superheterodyne receivers. They offer certain important advantages over previous valves made for the purpose, particularly when used on the ultra-short wavebands, for which they are eminently suitable by reason of the efficient oscillator section and the great reduction of "pulling."

The new Marconi triode hexode valve, type X31 and X41.

The X41 is for A.C. operation and has the following characteristics.

Filament volts	4.0 volts
Filament current	1.2 amps.
Anode voltage	250 volts
Screen voltage	70 volts
Osc. anode voltage	100 volts
Control grid voltage	−1.5 volts
Conversion conductance	550 microamps/V.
Conversion impedance	2 megohms.

The Marconi X31 is an A.C./D.C. valve with a filament voltage of 13, whereas the X41 is an A.C. valve only, with a filament voltage of 4.

The price of either type is 20s.

LEAVES FROM A SHORT-WAVE LOG

By J. G. ABRAHAMS

THE King's Silver Jubilee, and in particular the preparations made by the B.B.C. for the relay of greetings from Colonies and Dominions overseas, afforded many opportunities to short-wave fans of hearing transmissions of commercial stations clearly, on channels which as a rule are confined to scrambled telephony.

World-wide Broadcasts

It was a matter of considerable interest in the course of the celebrations on May 6th, during both day and evening, to pick up echoes of the original broadcasts on various short waves, emanating from not only the Daventry Empire stations, but also from North and South American sources.

In addition to a relay carried out by a number of European countries, and by the Colonies and Dominions, rebroadcasts of portions of the different ceremonies in connection with the Jubilee through the medium of the Daventry Empire transmitters and British Post Office radio telephony systems, were rebroadcast by Alexandria, Cairo, Buenos Aires, and throughout the C.B.S. and N.B.C. North American Networks. Such a world-wide rediffusion must assuredly constitute a record in the annals of radio broadcasting.

Suva (Fiji)

VPD, Suva, of which reception was made recently by a reader, is a station owned by the Amalgamated Wireless of Australia Limited (Sydney), and situated in the Fiji Islands. It works on 22.94 metres (13,075 kc/s) daily except Sundays, between B.S.T. 06.30–07.30, and VLZ2, Sydney, which has been picked up frequently during the past fortnight, is the Pennant Hills short-wave transmitter on 30.74 metres (9,760 kc/s), which is mainly used for communication with New Zealand, but is also devoted to experimental transmissions destined to Europe.

In this waveband also tests have been picked up prior to the opening of the Rome-Tripoli radio telephony service. In addition to traffic with ships, IAC, Coltano, is used as the channel for communication with the Italian North African colony. The wavelength of the Coltano 54 kilowatt transmitter is 35.23 metres (8,515 kc/s), ICK, Tripoli, using mostly 31.71 metres (9,460 kc/s) and occasionally 51.5 metres (5,825 kc/s). The times to search for these stations are between B.S.T. 11.00–13.00 and 18.00–20.00. It is probably through IAC, Coltano, that the Rome programme will be relayed from time to time for rebroadcast in Tripoli.

New South American Transmitters

Two new stations which have been traced and for which it might be worth while to make a search, are HJ2ABD, Bucaramanga (Colombia) on 50.34 metres (5,960 kc/s) and TI6OW, Puerto Limon (Costa Rica) on 42.43 metres (7,070 kc/s). The latter calls itself Ondas del Caribe (the Waves of the Caribbean).

Whilst reference is made to South American transmitters, it is well to note that HCJB, Quito (Ecuador), which was working on 73 metres, now appears to have definitely settled on 36.59 metres (8,200 kc/s). Transmissions take place daily (Tuesdays excepted) from B.S.T. 02.15–04.00.

In addition to the better known Riobamba broadcasting station, Ecuador also possesses two active transmitters in the short-wave band, namely, HC2RL, Guayaquil, on 45.05 metres (6,659 kc/s) and HC2ET, in the same location, on 65,22 metres (4,600 kc/s). Of these the former has been heard more frequently; the call, in Spanish, reads phonetically: Ah-kee es-ta-see-yon atcha say dos air ell, and the schedule at present is: B.S.T. 23.45–02.00 (Sundays) and 03.15–05.45 (Tuesdays). In the course of transmissions you may hear the announcer say: "Hallo America," following which he gives a talk in English and frequently reads out reports of reception which have reached him from oversea listeners.

In recent notes I mentioned a harmonic of P.T.T. Rennes found on 48.1 metres. When searching around 46 metres a few nights ago, I picked up a strong harmonic—apparently the sixth—of Bordeaux P.T.T. on 46.4 metres, namely, immediately below HJ1ABB, Barranquilla, on 46.53 metres. There is no doubt about the harmonic as the call was distinctly heard.

British Commercial Transmitters

No doubt when twirling the dials you must have come across some British commercial transmitters, possibly at the time when operators on this side were talking to their opposite numbers. These, as a rule, will have probably emanated from Rugby, and good landmarks can be registered by noting the following three channels: GBW, 20.78 metres (14,440 kc/s); GBU, 24.41 metres (12,290 kc/s), and GBS, 24.69 metres (12,150 kc/s), all work with New York.

It is not often that transmissions from the West Indies are logged in the British Isles, but I have seen a report from a listener which confirms his reception of ZFD, Bermuda, on 29.03 metres (10,335 kc/s).

SHORT WAVE SECTION

At the Short-waver's Bench—5

Band-spread Tuning, Mains Sets, and Hum-free Reception are Amongst the Subjects Dealt With in this Article

The Ultraudion Circuit

THE present generation of experimenters is probably unaware of the "ultraudion" circuit which used to be very popular in the early days of radio. It was an excellent design for a one-valver, and a somewhat modernised version is given in Fig. 1. Those enthusiasts who are always anxious to be trying out some new form of short-wave circuit may find this old friend of many of us a fruitful source of experiment. Simplicity is the main feature of the circuit; the filament rheostat shown is used to supplement the variable resistance as a reaction control.

You will notice in this circuit that this latter is the main reaction control, and illustrates a method which is very popular in the United States of America. The value of 50,000 ohms is found best for general use, and should always be by-passed, as shown, with a condenser of at least one microfarad. The advantages of this form of control are that it has no effect upon tuning, and that it is a very simple arrangement,

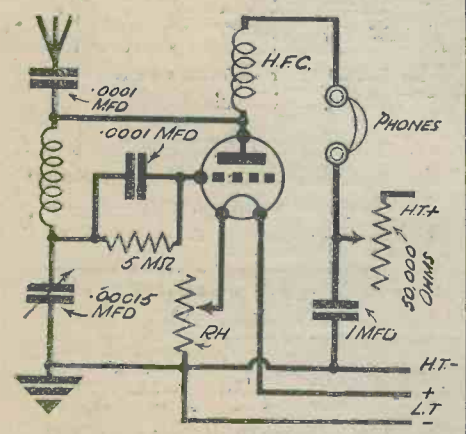


Fig. 1. — A modernised version of the "ultraudion" single-valve circuit.

giving smooth reaction. Care must be taken that a reliable component is used for the variable resistance, as otherwise crackles and noises will arise every time it is touched.

Adding "Band-spread Tuning"

"Band-spread tuning" can easily be added to any short-waver, a fact which few amateurs appear to realise, as otherwise, its advantages being so many, most sets would use it. The additional components required are a .00004 short-wave variable condenser and a good slow-motion dial. These should be mounted on the panel as near as possible to the main tuning condenser; the additional variable condenser being connected in parallel with the main variable condenser—that is to say, the moving plates on each are connected together with a short length of wire, as also are the fixed plates of each. Now the main tuning condenser is the "tank" condenser, and the smaller one is used for most of the tuning. The method of operation is as follows: Tune on the larger condenser until an interesting section of the

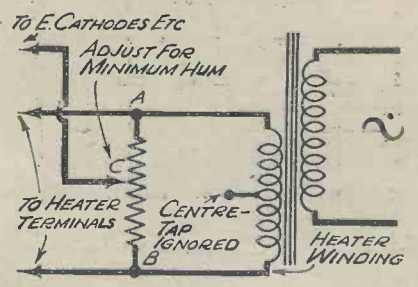


Fig. 2.—Using a potentiometer across the heater windings of the transformer for reducing hum.

band is found. This condenser is then left set and tuning continued on the smaller condenser, which will be found to spread the stations out as simply and easily as though tuning on the broadcast waveband.

Mains Short-wavers: A Source of Hum

My standard receiver for short-wave work is the all-A.C. three-valver which was recently described in the Short-wave Section. This set was originally built using indirectly-heated valves throughout, but just recently I have been trying out a directly-heated power valve. The general hum level has not risen, but a somewhat curious effect has occurred. A loud morse signal, an atmospheric or man-made static "crash," or a sudden spill-over into oscillation causes a loud hum to burst forth and last a few seconds, then gradually dying away. No alterations to the circuit will get rid of this effect, and I can only explain it by assuming that the sudden loud noise causes a slight vibration of the power-valve filament and thus the hum. The filament, or cathode, of an indirectly-heated valve cannot vibrate and so the trouble is not experienced when one is used. The hint is passed on in case other readers come across a similar difficulty. By the way, apart from this, I have found that for hum-free reception the finding of the exact electrical centre of the filament winding is essential. It is preferable, therefore, to use a potentiometer across the winding rather than to take the cathode return leads to the centre-tapping. Fig. 2 shows how this is done, whilst Fig. 3 shows how a filament rheostat may be modified to serve the purpose.

The Care of Headphones

As practically the only place nowadays where we find a pair of 'phones is beside the short-wave set, perhaps a few notes on their care will not be out of place here. The first point to note is that 'phones should not be dropped, as, besides impairing the efficiency of the magnets, this may fracture the very fine wire connections from the bobbins to the leads. If they have been in use for several years they may have lost much of their magnetism, however well you have treated them. Re-magnetising would be carried out very cheaply by many of the firms advertising in PRACTICAL AND AMATEUR WIRELESS and would make a great improvement in the sensitivity of the 'phones. Next, gently unscrew the caps and *slide* off the diaphragms, taking great care not to dent or bend them in any way. Clean them up, removing all traces of rust, and to prevent this in future, a very slight smear of vaseline may be put on each side. When the diaphragms are replaced, not forgetting the large washer under each, make sure they are quite free and not stuck down on the magnets. Finally, new leads may well replace the old ones, which, if worn, are liable to cause a variety of unpleasant noises.

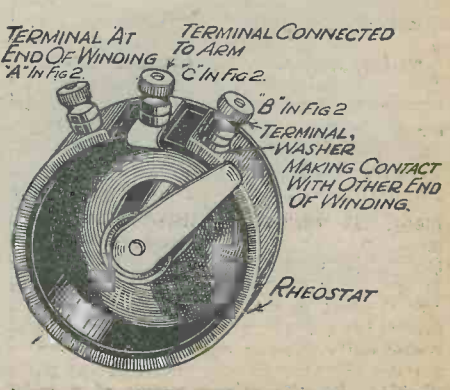


Fig. 3.—A modified form of filament rheostat for use as a potentiometer.

UNUSUAL SHORT-WAVE CIRCUITS

This Article Deals with Three Interesting Circuits of the Cathode-Impedance Type.

THERE has been developed recently a series of short-wave circuits for which are claimed the following advantages: (a) Reduction of background noise; (b) more stable oscillations; (c) smoother regeneration, and (d) tuning largely independent of supply voltages and regeneration control. For reasons which

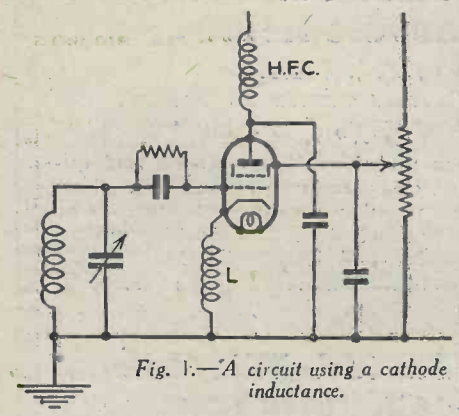


Fig. 1.—A circuit using a cathode inductance.

will be seen later, these circuits are known as the "cathode-impedance" type.

Indirectly-heated Pentode

The first of these circuits is shown in Fig. 1, and makes use of an indirectly-heated screen-grid or pentode valve. In the cathode lead of the valve is connected an inductance, the value of which is chosen so that its impedance to the speech frequency is small, and so does not in any way affect the rectification properties of the valve. As both the grid and anode currents of the valve flow through the cathode circuit, this inductance is common to both circuits. Voltages set up across this inductance by the high-frequency component of the anode current are transferred back to the grid circuit, so producing oscillations.

For the short-wave band this inductance can consist of about 200 to 300 turns of 36 S.W.G. wire, wound in slots on a ½-in. diameter former, or, if desired, a short-wave choke can be used.

Using a Tapped Coil

A modification of this circuit is shown in Fig. 2. Here it has been possible to dispense with the cathode inductance by connecting the cathode of the valve to a tap on the tuning coil.

A portion of this coil is now common to both grid and anode currents, and, as before, oscillations are generated.

This circuit is particularly useful when it is desired to cover a large range of wave-bands, using several coils in the receiver, as the amount of feed-back is not dependent on the characteristics of the inductance, which is more effective at one wavelength than another.

These two circuits can be combined to give that shown in Fig. 3, which has the great advantage that it can be used with directly-heated battery valves.

In this circuit the whole of the filament of the valve is raised above earth potential with respect to the high-frequency currents.

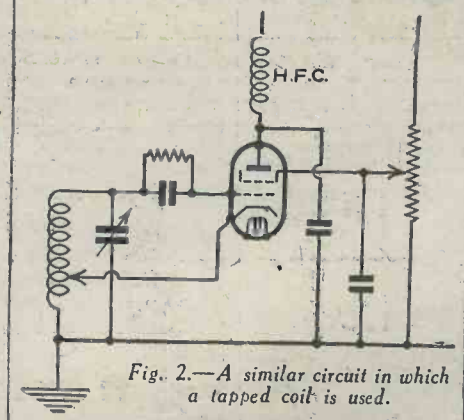


Fig. 2.—A similar circuit in which a tapped coil is used.

This is accomplished by connecting one leg of the filament to a tapping on the tuned circuit, whilst the other leg is connected to low tension through an inductance; a small fixed condenser is connected across the filament terminals of the valve to maintain the whole of the filament at earth potential. It will probably be found that it is necessary to apply rather more than the rated voltage to the valve owing to the voltage drop across the inductance.

A variable resistance is fitted in the filament circuit, and this should be adjusted until the rated voltage is shown on a reliable voltmeter across the filament terminals of the valveholder with the valve in position.

The remarks previously made about the cathode inductance apply also to this circuit, but it is essential that the resistance of this inductance is not excessive, and it should be capable of carrying the rated current of the valve.

Smooth Control of Feed-back

In the three circuits just described it is essential that the anode of the valve shall in each case be short-circuited to earth, with respect to the high-frequency currents, by the high-frequency choke and fixed condenser, as shown.

To vary the amount of feed-back a variable potentiometer is used to vary the voltage applied to the screening-grid of the valve. Alternatively, a variable resistance shunted by a large condenser should be connected in series with the high-tension supply to the anode of the valve.

Either of these methods will give a smooth control of feed-back.

These circuits prove particularly useful for use on the ultra-short waves, where normally it is difficult to obtain a sufficiently tight magnetic coupling between the grid and anode circuits to produce oscillations.

On these waves the value of the cathode inductance to obtain the necessary coupling is small, and can consist of a spiral of wire wound around a pencil and then slipped off.

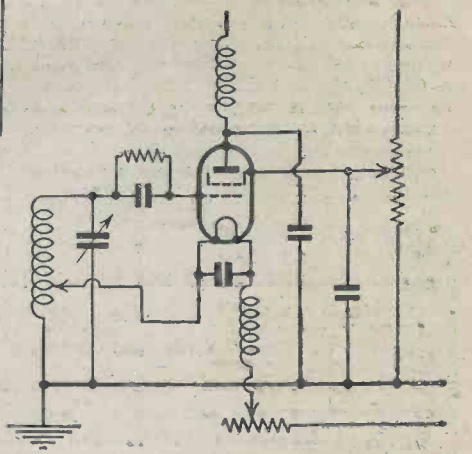
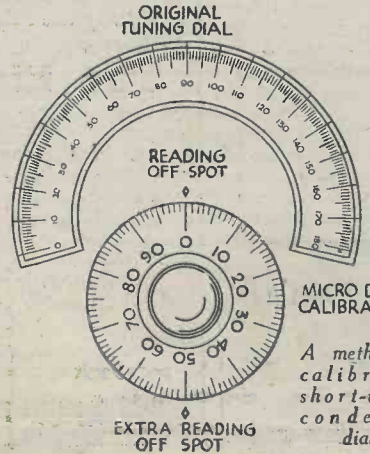


Fig. 3.—A circuit using a combination of tapped coil and cathode inductance with a battery-operated valve.

Micro Degree Calibration for Short-wave Condenser Dials

THE following idea will enable the user of a full-vision condenser scale to calibrate his short-wave receiver much more efficiently than with the usual arrangement. It consists in substituting for the usual control knob a condenser dial, of the panel mounting variety. This should be marked in degrees the whole way round, but if there is any difficulty in obtaining one of these dials, one marked half the way round will suffice, in which case two reading points will have to be marked on the panel in case the dial should arrive at a point where there were no markings. The main



A method of calibrating short-wave condenser dials.

tuning dial is read off in the usual manner, and the additional dial reading is taken and entered into the log, so that when one may wish to return to that particular station at a later time, the receiver will be exactly in tune. The knob should be screwed on to the spindle very tightly, and the slow-motion knob screwed on top of that.

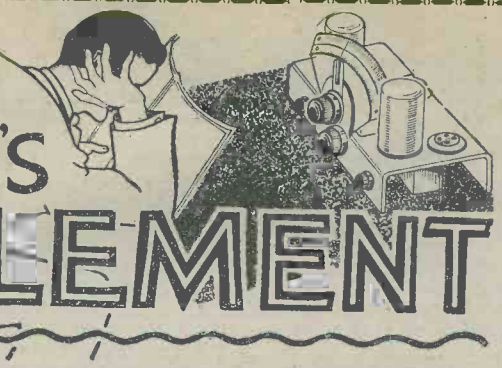
An Important Point

This idea should prove very helpful, since there are so many short-wave stations so near together, but once found they can easily be picked up afterwards with this arrangement. When employing a dial marked only half-way round for the micro-dial, the user will have to enter which of the two spots on the panel is being referred to.

—T. CROOK (Hoghton).

Points About Resistances

BEGINNER'S SUPPLEMENT



In this Article the Author Discusses the Functions of the Various Resistances Used in Receiving Circuits and Gives Helpful Hints as to the Choice of Suitable Types and Sizes.

THE space beneath the chassis of a modern receiver is usually crowded with resistances, and it is sometimes a matter of wonder to the amateur what they are all for, and whether all of them are necessary. It is safe to say that if a designer puts a resistance anywhere in a circuit, that resistance is either essential or at any rate desirable, and to justify this it is wise to discuss the functions of the various resistances used in receiving circuits, and to give some helpful hints as to the choice of suitable types and sizes.

Listeners with even the most elementary knowledge of Ohm's Law know that, with a given voltage, the value of the current in a circuit is governed by the resistance in the circuit. It might, therefore, be imagined that the primary function of resistances in radio sets is to limit the value of the current. This, however, is far from being the case, and in comparatively few instances are resistances employed for this purpose. The chief examples are the filament resistances which were necessary in the old days before the accurate manufacture of valves was fully developed, and the line resistances which are to-day necessary in the heater circuits of D.C. and universal receivers in order to maintain the heater current at its proper rated value.

Voltage Dropping

A simple inversion of Ohm's Law tells us, however, that when a current passes through a piece of apparatus possessing resistance, there is a drop of voltage across the ends of the resistance, equal to the strength of the current in amperes multiplied by the resistance in ohms. It is in order to obtain suitable voltage drops that resistances are principally employed in radio sets.

A typical example of this is in a receiver where only one H.T. positive terminal is fitted. The anodes and screens of the various valves all require different voltages, and these are obtained by passing the anode current or screen current, as the case may be, through a resistance of appropriate value so that the voltage developed across the resistance reduces the applied voltage to the figure required.

In the accompanying illustration, which shows the theoretical diagram of a typical universal receiver, the resistance R_1 is a true current-limiting resistance, while R_2 is employed for reducing the anode voltage to the detector valve to an appropriate value.

The resistance shown at R_3 also produces a voltage drop, but in this instance it is not employed to obtain a correct applied voltage. It forms the "load" in the anode circuit of the detector, and across this load is developed not only a D.C. voltage drop due to the mean value of the anode current, but also an audio-frequency A.C. voltage drop which is applied, viâ the coupling condenser, to the grid of the next valve.

Other Applications

These are typical examples of the three principal ways in which resistances are used in radio circuits, and for the sake of completeness a few other examples may be mentioned. R_4 in the same diagram, is a grid-bias resistance. Its function is to produce a voltage drop due to the passage of the anode current between the high-tension negative terminal and the cathode of the valve. As a result, the cathode is at a higher potential than the H.T. negative lead, and as the grid circuit of the valve is connected to H.T. negative, the cathode is at a higher voltage than the grid or, what amounts to the same thing, the grid is at a negative potential with respect to the cathode—is, in other words, given a negative grid bias.

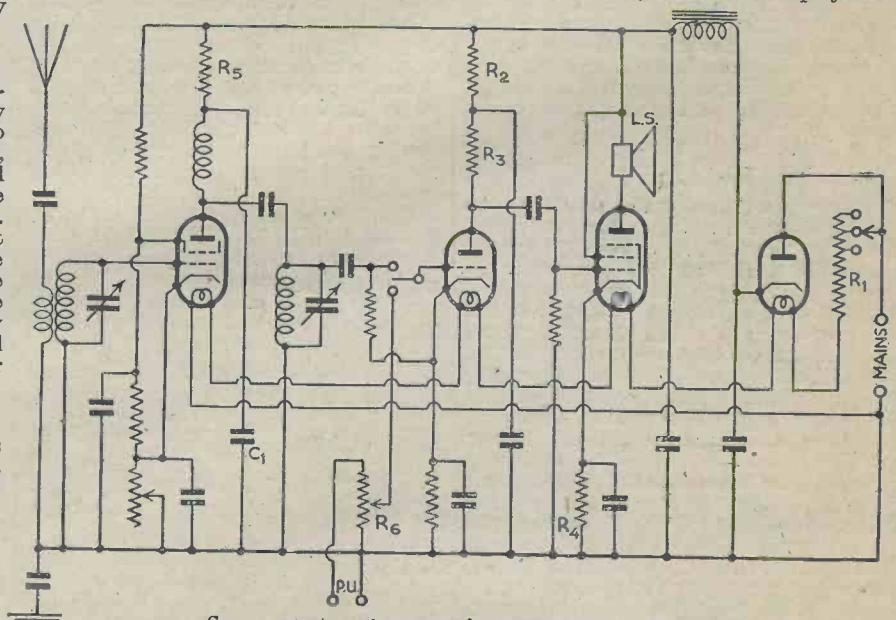
It will be noticed that the resistance R_5, in the anode circuit of the high-frequency valve, is by-passed to earth by a condenser, C_1. This resistance is not primarily intended to produce a drop in the H.T. voltage applied to the anode of the valve, but it *is* intended to produce an A.C. voltage drop. Actually the resistance is called a "decoupling resistance," and its duty is to filter out any alternating voltages due to the fact that the currents to all the valves are derived from one common supply, so that fluctuations due to any one valve, say the output valve, can also find their way through the high-tension wiring to the anode circuits of other valves. If the various anode and grid circuits were not decoupled properly, these back-coupled signals would be re-amplified over and over again, and would then give rise to general instability, of which howling, "motor boating" and distortion are the chief symptoms.

By including a resistance in each of these circuits, and a by-pass condenser to earth, the back-coupled signal produces an A.C. drop across the resistance which is shunted to earth through the condenser. It will be observed that the resistance R_2, which has already been described as the voltage-dropping resistance in the detector anode circuit, is also by-passed to earth so that in this case it also acts as a decoupling resistance.

Types of Resistances

In most cases, resistances employed in receiving circuits can be of fixed value. An experienced designer can work out beforehand the best values for the different resistances, and it will be shown later that the task is not really difficult for the amateur who wishes to design his own set.

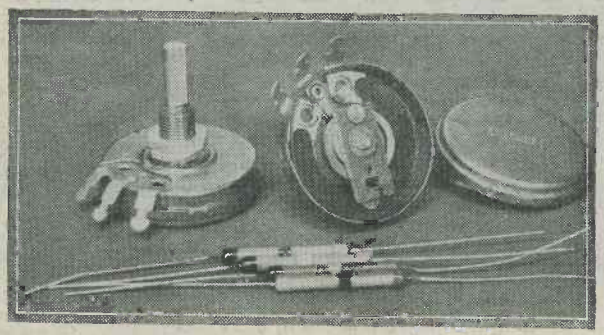
There are, however, some positions in which a resistance of adjustable value should be employed. A line resistance in the heating circuit of universal valves should be adjustable, so that different mains voltages can be catered for. Similarly, the bias resistance, at any rate for the output stage, might well be of adjustable type in order to take care of variations between different valves of the same type, or to permit valves of other types being used if required. In the case of bias resistances, adjustment should be made with a milliammeter



Some typical applications of resistances in a radio circuit.

connected in the anode circuit, and the resistance varied until the anode current is equal to the maker's rated figure. The bias resistance for a mains variable-mu valve must again be adjustable, because it is used to control the volume of sound. But whereas the adjustment of line resistors and the bias resistance of the output valve is made once and for all, that of the variable-mu bias is constantly being altered, so that a type is required which has a sliding contact and knob.

A few positions in a receiver may call for a resistance of fixed value, with a provision for taking a tapping at any desired point, thus making it possible to lead away the whole or any desired part of the voltage drop across the whole resistance. A device of this nature is termed a potentiometer or potential divider. In the theoretical diagram R_6 represents such a potentiometer, which in this case is connected across the gramophone pick-up. The pick-up develops an A.C. voltage due to its needle vibrating in the grooves of the record, and by adjusting the slider of the potentiometer any desired portion of this voltage can be tapped off for application to the low-frequency amplifier of the set, thus acting as a gramophone volume control.



A typical potentiometer and some composition resistances.

Choice of Resistances

There are three main points to be studied when choosing resistances. First the general suitability of the type for the work in hand, secondly the resistance value, and thirdly the current-carrying capacity. All three are intimately bound up with each other, but it will be more convenient to deal with them in the order given.

In the first place, the value of the resistance must be constant under all working conditions. From the nature of their operation, resistances dissipate a certain amount of electrical energy, and this is wasted in the form of heat, so that the temperature of the resistance will rise in service. Most materials sustain an alteration of their resistance when heated, and there are very few whose resistance is absolutely constant under all temperature conditions. The resistance materials employed by reputable makers, however, are so selected that, provided they are not *overheated* by the passage of excessive current, their resistance will not vary seriously under working conditions.

Next, if the resistance is to be used in a radio-frequency circuit, it is advisable that it should be non-inductive, and in this respect the popular composition resistors are entirely suitable, and, moreover, their high-frequency resistance is practically the same as their D.C. resistance.

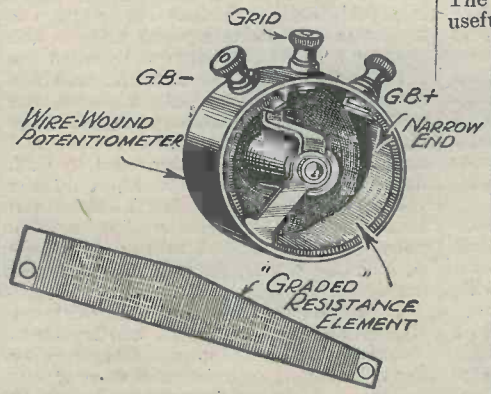
When it comes to variable resistances and potentiometers, the important point is to see that the sliding arm makes good contact with the fixed surface, and that the contact surfaces will not rapidly deteriorate due to wear. Unless the sliding contact is good, and smooth-acting, noise will certainly develop while adjustments are being made, and often will persist. It is sometimes desirable that a variable resistance or potentiometer be so designed that the variation of resistance for a given movement of the arm at one end of the scale is much greater than at the other end, and for this purpose a "graded" resistance should be used. These are often desirable for volume controls, because in most cases all the "control" takes place during a limited portion of the resistance range.

Coming to the discussion of the correct value of each resistance in the case of voltage-dropping resistances, the current to be passed will be known beforehand, as will also the number of volts to be dropped. The correct resistance will therefore be found by dividing the volts to be dropped by the current in amperes or, putting it another way, by multiplying the volts to be dropped by 1,000 and dividing by the current in milliamps. A very simple rule to remember is that a resistance of 1,000 ohms will give a voltage drop of 1 volt for every milliamp passing.

Simpler still is the following table which shows the correct resistance for a drop of 10 volts at various currents between 1 and 10 milliamps. For 20 volts drop multiply the resistance by 2, for 50 volts drop by 5, and so on.

RESISTANCE FOR 10 VOLTS DROP.

Current in mA.	*Resistance in Ohms.*
1	10,000
2	5,000
3	3,333
4	2,500
5	2,000
6	1,666
7	1,430
8	1,250
9	1,111
10	1,000



Showing the construction of a graded potentiometer.

Of course, you will not be able to obtain exact values for such resistances as 1,666 ohms, and must make do with the nearest standard size. They are usually obtainable in steps of 50 ohms between 100 and 500 ohms, in 500-ohm steps between 500 and 5,000 ohms, in 1,000-ohm steps up to 10,000 ohms, then in 2,500-ohm steps to 20,000 and afterwards in steps of 5,000 or 10,000.

In selecting decoupling resistances, make them as large as you can, providing the voltage drop, as calculated above, is not excessive. Load resistances for resistance-capacity coupled L.F. valves should in general be three times the value of the valve impedance, while the grid leak in the same coupling circuit may generally be about twelve times the value of the anode impedance of the previous valve.

Finally, we must consider the current-carrying capacity of the resistance. It has been explained that the power wasted in a resistance takes the form of heat, which causes the temperature of the resistor to rise. For the sake of standardisation, resistances are now rated to dissipate a given number of watts; half-watt, one-watt, two-watt, and three-watt being the usual ratings for composition resistances, with still larger dissipations for wire-wound types.

Now the actual power absorbed by any circuit or portion of a circuit due to resistance can be expressed in watts by multiplying the resistance by the square of the current in amps. Thus, a resistance of 10,000 ohms passing 3 milliamps would dissipate 10,000 x .003 x .003 watts, or .09 watt, or if it passed 10 milliamps it would dissipate 10,000 x .01 x .01 = 1 watt. Knowing the resistance and the current, therefore, it is a simple matter to decide what wattage rating to employ. The above table will, however, be useful.

MAXIMUM PERMISSIBLE CURRENTS FOR ONE-WATT RESISTANCES.

Resistance.	*Milliamps.*
100	100
250	60
500	40
1,000	30
1,500	25
2,500	20
4,000	15
10,000	10
15,000	8
20,000	7
25,000	6
40,000	5
50,000	4
100,000	3
250,000	2

IMPRESSIONS ON THE WAX

By T. Onearm

THIS month there is an impressive "cavalcade" of Jubilee Memories on "His Master's Voice" records. In the "Cavalcade of Famous Artists," *H.M.V. DB*2454-*DB*2455, such famous names as Paderewski, McCormack, Melba, Caruso, Kreisler, Cortot and Elgar make their appearance. This is a record well worth hearing. "Jubilee Music Hall Parade," *H.M.V. C*2739 and *C*2740, and "Jubilee Dance Memories," *H.M.V.* C2738, show how tastes have changed in the music-hall and ballroom. These records contain such favourites as "I do like to be beside the Seaside," "Pack up your troubles," "Ours is a nice 'ouse, ours is," "A wee Deoch and Doris" (sung by Sir Harry Lauder) and "Sally" (sung by Gracie Fields). Dance tunes include "Charmaine," "Broadway Melody," "Stormy Weather," and "Let's have a Jubilee."

The Light Symphony Orchestra play "Homage March," a fine new composition by Haydn Wood, which ends with the National Anthem, on *H.M.V. C*2734 and, finally, there is a most impressive record of Elgar's "Coronation March," composed for the Coronation of His Majesty the King, and German's "Coronation March and Hymn," which was performed in Westminster Abbey during the Coronation Service. These two records are exceedingly well played by the London Philharmonic Orchestra, conducted by Sir Landon Ronald, their numbers being *H.M.V. DB*2437 and *DB*2438 respectively.

Rubinstein's Superb Performance

THIS is perhaps one of the best records issued by H.M.V. in this month's list. It is a revelation of the truly grand style of pianoforte playing. Since Busoni first astonished musicians with his masterly pianoforte arrangements of Bach's Organ Toccatas, Preludes and Fugues, most programmes by the greatest performers contain one of these monumental works. Rubinstein obtains a sonority from his instrument which is almost unbelievable and, in spite of tremendous difficulties which it contains, preserves a complete control which is truly great. Everyone should possess this "Toccata in C Major" (Bach-Busoni) on *H.M.V. DB*2421-2.

Following on the issue of the Mozart and Schumann Sonatas, played by Yehudi and his fourteen-year-old sister, Hephzibah Menuhin, H.M.V. have done well in issuing Beethoven's greatest violin and piano sonata "The Kreutzer," played in a most musicianly manner by this perfect partnership on *H.M.V. DB*2409-12.

Columbia Records

THOSE inimitable cads, the Western Brothers, have done it again! This time they can be heard in their new "Old School Tie" songs, "We're Frightfully B.B.C." and "Keeping up the old Traditions," on *Columbia DX*685. This record is a clever example of humour and daring allusion to celebrities so prevalent in their other records, and there is no question that it will be very popular.

Hardly a week goes by without some of Percy Fletcher's music being heard in the radio programmes. His tunes, and his reputation as a theatrical conductor, are household words. Of the wealth of music which he wrote before his death in 1933, the "Vanity Fair" is perhaps the most popular. Its light-hearted strains could have had no finer interpreters than the famous B.B.C. Military Band which plays its merry tunes on a Columbia record, just issued.

In playing "For Love Alone" for his new Columbia disc, Albert Sandler pays a handsome tribute to Lance Fairfax, the singer who made it famous, and whose record of it was issued just recently. "Portrait of a Toy Soldier" is the coupling and the number of the record is *Columbia DB*1532.

An Outstanding Record

SUBTERRANEAN sounds of supernatural voices; appearance of the spirits of darkness, followed by that of Satan himself—Glorification of Satan and celebration of the Black Mass—the Sabbath revels—at the height of the orgies the bell of the village church sounding in the distance disperses the spirits of darkness—Daybreak. These words preface Moussorgsky's original composition. With so weird a programme for inspiration a brilliant composition must inevitably result. Rimsky-Korsakov, who completed this work, carried out the composer's intentions. The symphonic character of the work leaves little to the imagination. The isolation of the rugged mountain with the wind beating against the rocks is pictured by the violins, the woodwind adding a gruesome howling. Gruff voices from the interior of caves (performed by the brass) intermingle with the external atmospheric sounds. The chanting of a pagan hymn with responses of raucous character is terrifying in its eeriness. The composition is a sound picture of an engrossing subject which leaves no loopholes for the slightest misunderstanding. This record, the number of which is *Columbia LX*384, is played by the Colonne Symphony Orchestra of Paris, and the exceptional quality of the orchestral recording emphasises the magnificent interpretation. It is one of the finest examples of descriptive music in the recorded repertoire of the concert hall. I can specially recommend this outstanding record.

Decca-Polydor Records

I ANTICIPATE that the most popular Polydor issues in this month's list, from a general standpoint, will be Schlusnus and Sittard records. In the first place, Schlusnus is singing, in outstanding form, two famous Hugo Wolf songs, and, secondly, organ records are becoming increasingly popular—at least, organ records of such quality. Schlusnus, on *Decca-Polydor DE*7032 sings "The Drummer" and "Biterolf," and Alfred Sittard, on the organ, plays Bach's "Dorian Toccata" on *Decca-Polydor PO*5118. Two really great performances.

Another interesting Decca-Polydor publication is by The Lamoureux Orchestra of Paris—three records, *Decca-Polydor CA*8199-8201—"Roussel's Symphony in G Minor." This symphony needs getting used to. It is an example of the new music of our own time.

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

Quee-Quee (Johannesburg). We cannot give you the information from the details you supply. We would suggest you communicate with the makers of the instrument, giving them some indication as to the particular model as they have made several different types.

R. E. (Harpenden). We would suggest that you build the Progressive Experimenter Series. This commenced in PRACTICAL WIRELESS dated October 21st, 1933, and will fill your requirements exactly.

A. J. D. (Hereford). There is no particular receiver incorporated in the device you mention. Any one-valve set may be built in the form indicated in the article.

D. T. (Milverton). The reference was probably a Readers' Wrinkle, and was published in our issue dated August 19th, 1933.

A. V. R. (Handsworth). So far as we are aware it is not possible to obtain spare parts for metal rectifiers. We would recommend you to communicate with the Westinghouse Company direct.

A. H. (Longside). In view of your remarks we can only assume that one component is defective. The only method of tracing this is to obtain a good meter and take accurate measurements in each stage.

E. H. (Brierley Hill). The address of the firm in question is Bennett Television Co., Redhill.

S. G. B. (Ballintra). We have published no recent portables of the "suit-case" type. Our last portable utilised a very small wooden cabinet and was known as the Atom—Blue print No. PW 36 published in our issue dated June 2nd, 1934.

C. G. L. (East Acton Lane). The S.G. H.F. unit, described in our issue dated February 4th, 1933, will no doubt be found most suitable for your purpose.

J. M. (W.1). Are you using the suppressor with a "mains aerial" device? This would account for the loss of signal strength. Failing this, the resistance of the chokes is higher than you anticipate and is reducing the voltage on the valves.

W. M. (Paisley). We would not recommend the use of the coil you mention in the Lucerne receiver. If you are not getting good results with this receiver we would recommend the addition of an H.F. stage, or the rebuilding of the entire apparatus to include such a stage.

G. F. M. (Sutton Coldfield). We regret that we have no blue prints of receivers which would fit into the box in question.

H. S. (Brighton). We would suggest a resistance in series with the grid lead of the L.F. valve. It would appear from your remarks that the valve has become soft. Alternatively, the grid-bias battery may have developed a very high resistance or even become partially disconnected and thus the grid is becoming isolated from the earth line.

G. E. S. (Hull). The lack of noise when aerial and earth are removed rather points to a faulty H.F. circuit, either the coils being faulty, or one of the associated leads broken.

F. D. (Romford). An eliminator will not deliver the required current. A larger accumulator with a separate full-rate (not trickle) charger would seem to be the best solution.

C. W. (Nelson). It is not practicable to carry out the construction of the device you refer to. The oxidation is not complete on your sample.

P. L. (Willesden Green). The circuit must be wrong in some respect. A faulty component or valve, or wrong wiring may be the cause, but it is impossible to state without further details. Instructions for fitting a pick-up were given in our issue dated Nov. 17th, 1934.

C. S. J. (Soham). The reaction circuit may be ignored and the reaction winding left unconnected. The loss of this feature will be noticed very seriously when trying to receive distant stations, but on locals with an S.G. stage it should not matter at all. For your purpose we would suggest S.G. pentode, diode, and two L.F.s with a push-pull output stage.

R. C. R. (Urmston). We do not advise the modification of commercial receivers. It should not be difficult, however, to fit bandpass tuning or other up-to-date devices, but we cannot give constructional details.

W. W. (N.W.8). We would suggest that you write to Messrs. Heayberd for details of a suitable unit for your purpose.

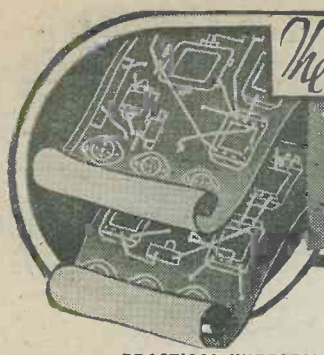
H. R. C. (Middlesbrough). We regret that we cannot trace the firm you mention. Any good repair service should be able to tackle the job.

H. C. (Finchley). If you cannot get a sound of any description it is obvious that there is something seriously wrong. Have you checked each stage with a meter? If you can let us have some further details we might be able to assist you.

L. J. R. (Swansea). We regret we have no blue print for the set in question. Your difficulty may be due to insufficient H.T. on the valve and you would therefore have to test your eliminator in case this is failing to deliver sufficient output.

S. P. (Pontyberem). What type of adaptor do you refer to? A short-wave adaptor could be used and would be joined to the aerial terminal in the usual way. It does not matter which pin is positive or which negative when testing a valve.

A. N. C. (Manchester). The Long-Range Express Three, P.W.2, employed commercial dual-range coils, but a more recent circuit is the Hall-Mark Cadet, P.W. 48. This employed an ordinary unscreened dual-range coil



The PRACTICAL AND AMATEUR WIRELESS Blueprint Service

These blueprints are full-size. Copies of appropriate issues of "Practical Wireless," "Amateur Wireless" and of "Wireless Magazine" containing descriptions of these sets can in most cases be obtained at 4d. and 1s. 3d. each, respectively, post paid. Index letters "P.W." refer to "Practical Wireless" sets, "A.W." refer to "Amateur Wireless" sets, and "W.M." to "Wireless Magazine" sets. Send, preferably, a postal order (stamps over sixpence unacceptable) to "Practical and Amateur Wireless" Blueprint Dept., Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS.

Blueprints, 1s. each.

Long-Range Express Three	24.9.32	PW2
Mains Express Three	8.10.32	PW3
Sonotone Four	15.10.32	PW4
Bijou Three	29.10.32	PW5
Argus Three	12.11.32	PW6
Empire Short-Wave Three	3.12.32	PW7
Solo Knob Three	10.12.32	PW8
Midget Two	17.12.32	PW9
Selectone Battery Three	14.1.33	PW10
Fury Four	—	PW11
Featherweight Portable Four	6.5.33	PW12
Q.P.P. Three-Four	4.3.33	PW13
Alpha Q.P.P. Three	25.3.33	PW14
Ferrocart Q.P.P. Hi-Mag. Three	25.3.33 and 1.4.33	PW15
Supersonic Six	8.4.33	PW16
Beta Universal Four	15.4.33	PW17
A.C. Twin	22.4.33	PW18
Selectone A.C. Radiogram Two	29.4.33	PW19
A.C. Fury Four	25.2.33	PW20
Radiopax Class B Four	27.5.33	PW21
Three-Valve Push-Pull Detector Set	4.3.33	PW22
Double-Diode Triode Three	10.6.33	PW23
Three-Star Nicore	24.6.33	PW24
D.C. Ace	15.7.33	PW25
Superset	19.8.33	PW26
Auto-B Three	19.8.33	PW27
All-Wave Two	19.8.33	PW28
A.C. Three	16.9.33	PW29
Premier Super	23.9.33	PW30
Experimenter's Short-Wave Three	23.9.33	PW30A
A.C.-D.C. Two	7.10.33	PW31
All-Wave Unipen	14.10.33	PW31A
F.J.C. 3-valve A.V.C. (Transfer Print)	4.11.33	PW32
Luxus A.C. Superhet	14.10.33	PW33
A.C. Quadpak	2.12.33	PW34
Sixty-shilling Three	2.12.33	PW34A
Nucleon Class B. Four	6.1.34	PW34B
Fury Four Super	27.1.34	PW34C
A.C. Fury Four Super	10.2.34	PW34D
Leader Three	10.3.34	PW35
D.C. Premier	31.3.34	PW35B
A.C. Leader	7.4.34	PW35C
Atom Lightweight Portable	2.6.34	PW36
Ubique	28.7.34	PW36A
Four-Range Super-Mag. Two	11.8.34	PW36B
Summit Three	18.8.34	PW37
Armada Mains Three	18.8.34	PW38
Midget Short-Wave Two	15.9.34	PW38A
All-Pentode Three	22.9.34	PW39
£5 Superhet Three	27.10.34	PW40
A.C. £5 Superhet Three	24.11.34	PW43
D.C. £5 Superhet Three	1.12.34	PW42
Hall-Mark Three	8.12.34	PW41
F. J. Camm's Universal £5 Superhet	15.12.34	PW44
A.C. Hall-Mark	26.1.35	PW45
Battery Hall-Mark 4	2.2.35	PW46
Universal Hall-Mark	9.2.35	PW47
Hall-Mark Cadet	23.3.35	PW48
Short-Wave Converter-Adapter	23.2.35	PW48A
F. J. Camm's Silver Souvenir (All-Wave Three)	13.4.35	PW49
F. J. Camm's A.C. All-Wave Silver Souvenir Three	—	PW50
Genet Midget Three	—	PM1

AMATEUR WIRELESS AND WIRELESS MAGAZINE.

CRYSTAL SETS.

Blueprints, 6d. each.

Four-station Crystal Set	—	AW427
1934 Crystal Set	4.8.34	AW444
150-mile Crystal Set	—	AW450

STRAIGHT SETS. Battery Operated.

One-valvers: Blueprints, 1s. each.

B.B.C. One-valver	—	AW344
B.B.C. Special One-valver	—	AW387
Twenty-station Loud-speaker One-valver (Class B)	—	AW449

Two-valvers: Blueprints, 1s. each.

Melody Ranger Two (D, Trans.)	—	AW388
Full-volume Two (SG.-Det. Pen.)	17.6.33	AW392
Iron-core Two (D, Trans.)	—	AW395
Iron-core Two (D, QPP)	12.8.33	AW396
B.B.C. National Two with Lucerne Coil (D, Trans.)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG., Trans.)	—	AW338A
Lucerne Minor (D, Pen.)	—	AW426
Family Two (D, Trans.)	—	WM278

Three-valvers: Blueprints, 1s. each.

£8 Radiogram (D, RC, Trans.)	—	AW343
New Regional Three (D, RC, Trans)	25.6.32	AW349
Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans., Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	14.10.33	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher, Chassis Model (SG, D, Pen)	3.2.34	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
P.W.H. Mascot with Lucerne Coils (D, RC, Trans)	17.3.34	AW337A
Mullard Master Three with Lucerne Coils	—	AW424
Pentaquester (HF Pen, D., Pen)	14.4.34	AW431
£5 5s. Three: De-luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All Britain Three (HFPen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.1.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
Multi-Mag Three (D, 2 Trans)	—	WM288
Percy Harris Radiogram (HF, D, Trans)	*Aug.* '32	WM294
£6 6s. Radiogram (D, RC, Trans)	*Apr.* '33	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Tyers Iron-core Three (SG, D, Pen)	*July* '33	WM330
C.-B Three (D, LF, Class B)	—	WM333
Economy-pentode Three (SG, D, Pen)	*Oct.* '33	WM337
All-wave Three (D, 2LF)	*Jan.* '34	WM348
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans.)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	*Oct.* '34	WM371
Graduating to a Low-frequency Stage (D, 2LF)	*Jan.* '35	WM378

Four-valvers: Blueprints, 1s. 6d. each.

65/-Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 H.F., D, QP21)	18.8.34	AW445
(Pentode and Class-B Outputs for above: blueprints 6d. each)	25.8.34	AW445A
Quadradyne (2SG, D, Pen)	—	WM273
Calibrator (SG, D, RC, Trans)	*Oct.* '32	WM300
Table Quad (SG, D, RC, Traus)	—	WM303
Calibrator de Luxe (SG, D, RC, Trans)	*Apr.* '33	WM316
Self-contained Four (SG, D, LF, Class-B)	*Aug.* '33	WM331
Lucerne-Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (H.F., D, 2LF)	*Feb.* '35	WM381
Standard Four-valve Short-waver	*Mar.* '35	WM383
The H.K. Four	*Mar.* '35	WM384

Five-valvers: Blueprints, 1s. 6d. each.

Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
New Class-B Five (SG, D, LF, Class-B)	*Nov.* '33	WM340
Class-B Quadradyne (2 SG, D, LF, Class-B)	*Dec.* '33	WM344
1935 Super Five (Battery Superhet)	*Jan.* '35	WM379

Mains Operated

Two-valvers: Blueprints, 1s. each.

Consoelectric Two (D. Pen) A.C.	23.9.33	AW408
Economy A.C. Two (D. Trans) A.C.	—	WM286

Three-valvers: Blueprints, 1s. each.

Home-lover's New All-electric Three (SG, D, Trans) A.C.	25.3.33	AW383
S.G. Three (SG, D, Pen) A.C.	3.6.33	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	23.6.34	AW439
D.C. Calibrator (SG, D, Push-pull Pen) D.C.	*July* '33	WM328
Simplicity A.C. Radiogram (SG, D, Pen) A.C.	*Oct.* '33	WM338
Six-guinea A.C./D.C. Three (HF Pen, D, Trans) A.C./D.C.	*July* '34	WM364
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	*Nov.* '34	WM374

Four-valvers: Blueprints, 1s. 6d. each.

A.C. Melody Ranger (SG, DC, RC Trans) A.C.	—	AW380
A.C./D.C. Straight A.V.C. 4 (2 HF, D, Pen) A.C./D.C.	8.9.34	AW446
A.C. Quadradyne (2SG, D, Trans) A.C.	—	WM279
All Metal Four (2SG, D, Pen)	*July* '33	WM329
"W.M." A.C./D.C. Super Four	*Feb.* '35	WM382
Harris Jubilee Radiogram	*May* '35	WM386

SUPERHETS.

Battery Sets: Blueprints, 1s. 6d. each.

1934 Century Super	9.12.33	AW413
Super Senior	—	WM256
1932 Super 60	—	WM269
Q.P.P. Super 60	*Apr.* '33	WM319
"W.M." Stenode	*Oct.* '34	WM373
Modern Super Senior	*Nov.* '34	WM375

Mains Sets: Blueprints, 1s. 6d. each.

1934 A.C. Century Super, A.C.	10.3.34	AW425
1932 A.C. Super 60, A.C.	—	WM272
Seventy-seven Super, A.C.	—	WM305
"W.M." D.C. Super, D.C.	*May* '33	WM321
Merrymaker Super, A.C.	*Dec.* '33	WM345
Heptode Super Three, A.C.	*May* '34	WM359
"W.M." Radiogram Super, A.C.	*July* '34	WM366
"W.M." Stenode, A.C.	*Sep.* '34	WM370
1935 A.C. Stenode	*Apr.* '35	WM385

PORTABLES.

Four-valvers: Blueprints, 1s. 6d. each.

General-purpose Portable (SG, D, RC., Trans)	—	AW351
Midget Class-B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Town and Country Four (SG, D, RC, Trans)	*May* '32	WM282
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)	*Aug.* '34	WM367

SHORT-WAVERS. Battery Operated.

One-valvers: Blueprints, 1s. each.

S.W. One-valve	—	AW329
S.W. One-valve for America	—	AW429
Roma Short-waver	10.11.34	AW452

Two-valvers: Blueprints, 1s. each.

Home-made Coil Two (D, Pen)	14.7.34	AW440

Three-valvers: Blueprints, 1s. each.

World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regea)	30.6.34	AW438
Experimenter's Short-waver	*Jan.* 19, '35	AW463
Short-wave Adapter	*Dec.* 1, '34	AW456
Superhet, Converter	*Dec.* 1, '34	AW457

Four-valvers: Blueprints, 1s. 6d. each.

"A.W." Short-wave World Beater (HF Pen, D, RC, Trans)	2.6.34	AW436
Empire Short-waver (SG, D, RC, Trans)	*Mar.* '33	WM318

Mains Operated.

Two-valvers: Blueprints, 1s. each.

Two-valve Mains Short-waver (D, Pen) A.C.	10.11.34	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	*Aug.* '34	WM368
"W.M." Long-wave Converter	*Jan.* '35	WM380

Three-valvers: Blueprints, 1s. each.

Emigrator (SG, D, Pen), A.C.	—	WM352

Four-valvers: Blueprints, 1s. 6d. each.

Gold Coaster (SG, D, RC, Trans) A.C.	*Aug.* '32	WM292
Trickle Charger	*Jan.* 5 '35	AW462

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).

A "Quality" Two-Valver

SIR,—I notice you are receiving requests for various four or five stage receivers. May I make a request for a humble two-valve set to include certain points. There must be a large number of listeners living within a certain radius of broadcasting stations who receive ample volume on a two-valve set, and being content with programmes broadcast by the B.B.C., do not wish to "tour" the continent. Being one of those listeners, I should like a *quality* set to include,

(1) A form of Plus-1 unit as described in PRACTICAL AND AMATEUR WIRELESS, April 13, page 102.

(2) A wave-trap for cutting out either the Regional or National, the control knob to be on the panel, in place of the wave-change switch, which could be at the back of the set, and

(3) A plug for gramophone pick-up.

The on-off switch could be at side of the cabinet, so that the panel has only three knobs, *viz.*, wave-trap, tuning, and reaction.—C. KEARLEY (London, N.).

The Sixty-Shilling Three

SIR,—Just a note of appreciation of your very practical paper. I have had it for over a year now, and intend to continue taking it. I have a list of over a hundred broadcast stations received on the "Sixty-shilling Three," most of them, including KFI Los Angeles, on a 5-in. cone speaker. Many of the English components can be had out here now, but there is a surprising dearth of English valves, which makes some sets described in your paper hard to build, as the valve circuit of the American equivalent is difficult to find out. Components which I am sure would sell well out here are metal rectifiers, as there appears to be a big demand for these. Wishing your paper the best of success.—S. HAWES (Dunedin, New Zealand).

[*Manufacturers please note.*—ED.]

An Interesting S.W. Log

SIR,—I have been a reader of PRACTICAL AND AMATEUR WIRELESS for about one year and I do not think there is another wireless periodical to compare with it as regards the price, and of course the excellent material it contains. There is one suggestion I would like to make—I think the short-wave section could be extended a little further. For instance, one or two S.W. logs could be included. I would very much like to see a few more logs published to see where I stand in comparison with other S.W. enthusiasts, especially at this time of the year. I enclose a short log of S.W. stations recently received on a three-valve short-wave receiver (H.F.P.3). They came in at audible loud-speaker strength.

SHORT-WAVE LOG

RNE, Moscow. 12.45 p.m. 25 m.
CT1AA, Radio Lisbon (Portugal). 10.50 p.m. 31.25 m.
VK2ME, Sydney (Australia). 4.30 p.m. 31.28 m.
DJN, Zeesen (Germany). 1.10 p.m. 31.38 m.
WBZ, WBZA, Boston and Springfield (Mass.). 2.0 a.m. 31.35 m.
HJ4ABB, Colombia (Manizales), S. America 6.0 a.m. 41.9 m.
W8XK, KDKA, Pittsburgh (U.S.A.). 2.15 a.m. 48.86 m.
W3XAU, Philadelphia (U.S.A.). 2.30 a.m. 49.5 m.
W9XF, Chicago (Ill.). 7.0 a.m. 49.18 m.
DJZ, Zeesen (Germany). 11.15 p.m. 49.83 m.
COC, Cuba, Havana. 5.45 a.m. 49.92 m.

—G. E. ROBINSON (Penge).

A Super A.C. Set Wanted

SIR,—I have read with much interest the letters from Mr. West and other correspondents *re* "baseboard and panel" *versus* "chassis" type of receivers, and gladly give my vote for the former type.

A close study of the various wireless journals reveals the fact that the receivers described are of the chassis type and, with a few exceptions, for not more than three, or at most four, valves. No doubt there are others who, like myself, desire to build more powerful sets, but have not sufficient technical knowledge to design one for themselves, and would welcome the design for a receiver of the baseboard and panel type for five or more valves.

Most of the receivers given in present-day wireless journals are arranged with few valves, and are low-priced; but I am sure there must be many who, like other readers here and myself, would be only too glad to have a design for a super A.C. set that will bring in medium stations about 200-550 metres and the usual long-wave stations satisfactorily; and if easily arranged to receive the short-wave stations, so much the better, though this need not be a *sine qua non*. — HY. FITZGERALD REYNOLDS (Cardiff).

CUT THIS OUT EACH WEEK.

Do you know

—THAT modern short-wave superheterodynes utilise an intermediate-frequency of 465 kc/s (approximately 645 metres).
—THAT the intermediate-frequency generally used in broadcast superheterodynes is 110 kc/s (approximately 2,700 metres).
—THAT the frequency chosen in this stage has a great influence on the production of whistles.
—THAT the inductance, and not the D.C. resistance, of the primary of an L.F. transformer is the most important figure.
—THAT ordinary rocksalt or sal-ammoniac may be used to improve an earth connection in the dry weather.
—THAT loss of volume on long-distance stations at this time of the year may often be traced to dryness of the earth connection.
—THAT twin earth leads should not be employed in view of risk of setting up erratic effects.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL AND AMATEUR 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 AND AMATEUR 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.

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.

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

MISS CAROL BUSH, organiser of the Ladies' Section of the Anglo-American Radio and Television Society, has appointed Miss Hilda Radish, of 330, Manchester Road, Cubitt Town, Poplar, E.14, as Central and East London Representative of the Ladies' Section.

Persons in that area who desire to join should send their names and addresses to Miss Radish, enclosing a stamp if they desire a reply.

Lady enthusiasts in other parts of Great Britain should send to Miss Eileen G. Harris, of "Frampton," Victoria Avenue, Porthcawl, Glam. (the British Rep. of the Ladies' Section).

The West Middlesex and East Buckinghamshire Branch is holding a picnic on June 2nd, commencing at 3 p.m. There will be no charges, and any reader of this paper who would like to attend may do so. Full particulars may be obtained from Mr. Leslie W. Orton, at "Kingsthorpe," Willowbank, Uxbridge.

INTERNATIONAL SHORT-WAVE CLUB (LONDON)

A VERY interesting evening was afforded members of the London Chapter of this organisation when Mr. H. G. Menage described the application of the Rochelle salt crystals to high-fidelity reproduction. Among the various applications were the Piezo-electric microphones, loud-speakers, pick-ups and earphones, all of which were demonstrated, and it was agreed that they were as near perfect as one could wish for. The meeting closed with some recordings of short-wave stations as received at the New York Chapter of the I.S.W.C., which included a very good one of GSA, and a personal message from the President of this chapter.—A. E. BEAR, secretary, 10, St. Mary's Place, Rotherhithe, London, S.E.16.

THE RADIO PHYSICAL AND TELEVISION SOCIETY

ON Friday, May 17th, a lecture was given at the above society's headquarters, on Optical Instruments, by Dr. C. G. Lemon. Dr. Lemon explained the theory of light and the laws of reflection and refraction. Several interesting pieces of apparatus were shown, among then being an instrument for measuring from a distance the amount of space between two points. Two very fine specimens of Iceland Spar were the subject of members' interest. After the lecture Dr. Lemon demonstrated his transmitting station (G2GL), which was operated on 40 m. and with a power of 60 watts. Although several calls were given, members taking it in turn to give calls, it was impossible to make any contacts owing to the very bad interference on the 40 m. band.

On Friday, May 31st, a lecture on 5-metre work will be given, with demonstrations of transmitters and receivers. Readers of PRACTICAL AND AMATEUR WIRELESS are cordially invited to our next meeting which will be held at 72a, North End Road, West Kensington.—M. E. ARNOLD, 12, Nassau Road, Barnes, S.W.13.

CATALOGUES RECEIVED

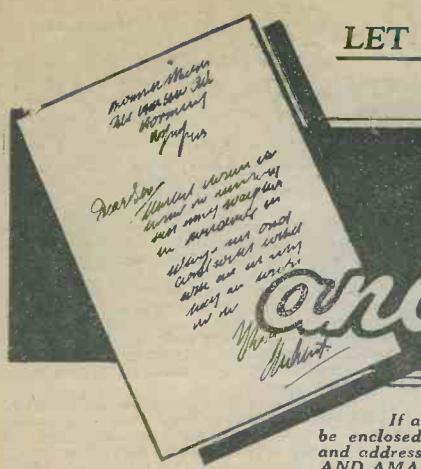
To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL AND AMATEUR WIRELESS, *Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2.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

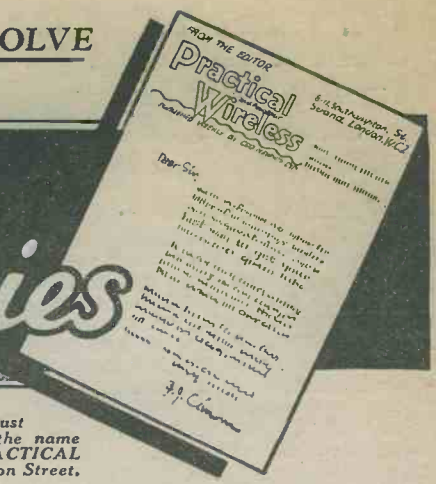
FERRANTI NEWS

WITH the opening of the new Radio Works at Moston, Messrs. Ferranti have issued an interesting brochure entitled "Masters of Power." Unlike many similar publications, this is an enormous affair, consisting of twenty-four pages measuring each 16ins. by 12ins. It is most attractively printed in several colours and gives some interesting details of the new Moston works, together with illustrations and notes of the original Ferranti productions dating back to 1882, when the company was founded by the late S. Z. de Ferranti, D.Sc., F.R.S. Facts concerning the new Moston factory are tabulated, and large photographs of various sections of the works, in black and white and in various self-tones, make up a most interesting souvenir, as well as provide some indication of the work which is involved in the manufacture of modern radio parts. The 1935 receivers are well illustrated, and notes on the various sections of the Ferranti business are given by the heads of those sections.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

Queries and Enquiries





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 AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

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.
(5) Grant interviews to querists.

Please note also, that queries must be limited to two per reader, and all sketches and drawings which are sent to us should bear the name and address of the sender.

Loud-speaker Problems

"Do all M.C. speakers require D.C. current to excite the field? Approximately what is the consumption of the average speaker?"—W. J. F. W. (Wembley).

The term moving-coil speaker can apply to permanent-magnet models as well as to energised models, and it is only in the magnet system that the differences occur; the actual movement of the cone is carried out by the movement of a small coil—hence the name. A direct current is essential for magnetising those of the energised type, but A.C. speakers are obtainable in which the necessary transformer and rectifier is included in the cabinet or on the actual chassis. The consumption varies according to the type. Between 4 and 10 watts is the usual rating, the sensitivity naturally being the greater with the higher rating. The transformer feeding the speech coil must be chosen to match output valves and speech coil, and the makers' instructions should be followed in this respect.

Amplifier Output

"With regard to the Q.P.P. amplifier described on Blueprint A.W. 376, I should be glad to know the output of which this amplifier is capable."—F. W. (India).

The actual output will, of course, depend upon the valves which are used, and whether or not they are fully loaded. With the majority of the valves specified in the constructional article, the rated output is in the neighbourhood of 1 watt. If larger types of valve are used the output may be increased up to 2 watts.

Amateur Call Signs

"Can you please tell me if such a thing as a complete list of amateur short-wave stations, together with names and addresses, is obtainable? If so, where from and at what price?"—H. E. J. (Birmingham).

The Radio Amateurs' Call Book will no doubt prove of greatest use to you. This is obtainable from F. L. Postlethwaite, 41, Kinfauns Road, Goodmayes, Ilford, Essex, and the price is 6s. post free.

Poor Long-wave Results

"I recently built a 4-valve S.G. receiver which functions perfectly on the medium waveband, bringing in 30-40 stations. But I am unable to get any more than 1 station (Droitwich) on the long waveband and even this is weak. I would be very pleased if you could tell me how to rectify this."—D. W. (York).

As the receiver functions well on medium waves it would appear that the circuit as such is in order. The only change when going over to long waves is in the tuning coils, and we would therefore suspect the wavechange switch or switches, or the loading coil sections on each tuning unit. Examine these points carefully. If you are using ganged tuning circuits there is a possibility that the ganging does not hold over both ranges and thus some external trimmer may be necessary for use on long waves.

Using an Extra Speaker

"I have an all-electric broadcast receiver with a socket for extra speaker. I want to know if I can plug the output of a short-wave receiver into these extra speaker sockets so as to be able to utilise the speaker of my broadcast receiver for stations that are too strong for 'phones on my short waver."—P. F. P. (Paignton).

You cannot adopt the procedure you mention. Firstly, the extra speaker sockets are joined to the output of your broadcast receiver and thus the speaker may be in series with the extra sockets or in parallel—according to the particular circuit which is employed. We would not recommend an alteration of the broadcast circuit so as to enable you to carry out your scheme, but would suggest that you obtain a separate speaker.

Insulator Troubles

"I have a short-wave three on which I get good reception of Daventry, Germany, and Paris up to about 9 p.m. (our time), but then it goes off. A very heavy dew falls here nightly when the air is still and I have formed the theory that the weakening of the signals is caused by the insulators outside getting wet. Can I cure this? I should also like to cure noisy reaction—it starts with a plop and is not smooth."—J. M. G. (S. Rhodesia).

The weakening of signals may be due to natural phenomena and not to the wetting of the insulators. However, you could check this by utilising good quality insulators—preferably of the glass or steatite type with long leakage surface, and in addition smearing them with some grease or other moisture-resisting medium. This would enable you to ascertain whether or not the insulators were responsible. The reaction effects may probably be cured by using a potentiometer across the L.T. supply and returning the grid leak to the arm of the control so that the best working point may be found. Care is also necessary regarding the choice of the detector valve, H.T., choke, etc.

Medium-wave Breakthrough

"I have recently built two straight three receivers employing different coils with different layout, but on testing same I was surprised to hear the Midland Regional in the background on long waves. I checked the coils time after time, also shifting the wiring about to no effect. Would you be so kind as to inform me what is wrong?"—H. T. T. (Wolverhampton).

There is nothing actually wrong with your circuits, but the trouble is due to what is known as breakthrough, and is due to your proximity to the Midland transmitter. You can overcome the trouble quite easily by fitting a special choke in the aerial circuit, or by fitting a commercially-made Droitwich suppressor designed for the purpose. Your aerial and earth leads, with the primary of the coils in circuit, are being influenced by the powerful signal from the local transmitter, and thus the tuning has little effect, even when on long waves, but the fitting of the wave-trap or suppressor, or the alteration of the value of the aerial circuit by the special choke, will prevent the aerial circuit from responding unless the secondary is in tune.

The coupon on page 340 must be attached to every query.

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 and Amateur Wireless," 8, Southampton Street, Strand, London.

PREMIER SUPPLY STORES

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

OFFER the Following Manufacturer's New Surplus 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. Send 1½d. stamp for NEW ILLUSTRATED CATALOGUE.

PREMIER SUPPLY STORES Announce the Purchase of the Complete Stock of a World-Famous Continental Valve Manufacturer, all the following standard mains types, fully guaranteed, 4/6 each. HL, L, Power. High, Medium and Low Magnification Screen Grid. Variable-mu Screen Grid; 1, 3 and 4 watt A.C. output, directly heated Pentodes; 250-volt 60 m.a. Full Wave Rectifiers; A.C./D.C. types, 20 volts .18 amp. Filaments; Screen Grid; Variable-mu Screen Grid.; H, HL, Power and Pentodes.

THE following types 5/6 each; 350v., 120 m.a. full-wave Rectifiers; 500v., 120 m.a. full-wave Rectifiers, 2½-watt indirectly-heated Pentodes.

2-VOLT Valves, detector, H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screened grid, variable-mu screened grid 5- or 4-pin Pentodes, 5/-.

THE Following American Types, 4/6; 250, 210, 245, 226, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5.

THE Following Types, 6/6 each: 42, 25Z5, 36, 38, 83, 39, 44, 53, 6B7, 2A6, 2B7, 5Z3, 6C6, 6A4, 6D6, 6F7, 43, 59, 1A6, 1C6, 1V, 12AS, 12Z3, 19, 30, 31, 32, 33, 34, 41, 49, 56, 57, 75, 76, 79, 82, 84, 6Z4, 85, 89.

LISSEN 3-gang Superhet Coils, with switching; listed 30/-, with circuit, 6/-.

12 TO 2,000 metres. Huge Purchase of All-Band 2 gang Coils from prominent British manufacturer. Fully Screened with switching for S.G. Det. type receivers, 4 Separate Bands, 12 to 2,000 metres. 12/6 with circuit.

SPECIAL Offer B.T.H. Moving Coil Speakers, matched pairs, specially manufactured for McMichael Supervox; 8in. diameter, 1,500 ohms-7,500 ohms (1,500 speaker as choke, 7,500 ohms speaker in parallel with H.T. supply); complete with special dual output transformer for pentode, 15/6 per pair; A.C. kit for above pair, 12/6.

MAGNAVOX D.C. 152, 2,500 ohms, 17/6; D.C.154, 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, 16/6; 9in. cone, 22/6.

A LARGE Selection of Pedestal table and radio-gram cabinets by best manufacturers at a fraction of original cost; send for list.

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

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

PREMIER L.T. Charger Kits, consisting of Premier transformers and Westinghouse rectifier, input 200-250v. A.C. output 8v. ½ amp., 14/6; 8v. 1 amp., 17/6; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6; 2v. ½ amp., 11/-.

B.T.H. Truspeed Induction Type A.C. only, Electric Gramophone Motors, 100-250v., 30/- complete; ditto, D.C., 42/6.

COLLARO Gramophone 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 100,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

WHITELEY Boneham Energised M/c Speakers, 2,000 or 2,500 ohms, 8 inch diameter, 9/11. Please state which type transformer required.

COSSOR Permanent Magnet M/c speakers, large Darwin Cobalt Steel Magnet, 8 inch diameter, please state transformer required, 13/6.

(Continued at top of column three)

This Triode-Hexode is a new frequency-changer of very considerable possibilities. We have two types available, the X41 for A.C. Mains and the X31 for A.C. or D.C. Both are of real interest to every experimenter, and especially to Short Wave and Television enthusiasts, for reasons which we have described in some useful notes on the subject.

WRITE TO THE VALVE DEPARTMENT, MARCONIPHONE COMPANY LIMITED, 210 TOTTENHAM COURT RD., LONDON, W.1, MENTIONING THIS PAPER.

MARCONI VALVES

THE CHOICE OF THE EXPERTS

(Continued from foot of column one)

LISSEN 2-Gang Condensers, Uniknob Trimmer, Disc Drive, .0005 each section, 5/6.

SPECIAL Offer Western Electric Mains Transformers, input 200-250 volts, output 350-0-350 volts, 120 milliamps, screened primary, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-5 amps., 9/6; input 100-250 volts, 300-0-300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 6/6; input 200-250 volts, screened primary, output 500-0-500 volts 150 milliamps, 4 volts 3-5 amps., 4 volts 2-3 amps., 4 volts 2-3 amps, 4 volts 1 amp., 4 volts 1 amp., 19/6.

SPECIAL Offer.—0.00015 brass short wave tuning condensers, with slow motion and complete dial, 3/9; short-wave chokes, 10-200 metres, 9d.

DUBILIER Electrolytic Condensers, 12 microfarads, 20 volts, 6d.; 8 plus 4 microfarads, 500 volts, 4/-; 50 mf., 50 v., 1/9; 8 mf., 500 v., 3/-.

RELIABLE Intervalve Transformers, 2/-; M.C. Multi-ratio output transformers, 2/6; 2-1 or 1-1 output transformers, 2/6; microphone transformers, 50 and 100-1, 2/6; 3 henry chokes, 2/6. 100 henry chokes, 2/6.

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

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

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, 0-250m.a., 0-1, 0-5amps.; all at 6/-; read A.C. and D.C.

POTENTIOMETERS by Best Manufacturers, 200, 350, 500, 1,000, 2,500, 5,000, 8,000, 10,000, 15,000, 25,000, 50,000, 100,000, 250,000, 500,000, 1 meg. 2/-; 5,000, 10,000, 15,000, 100,000, 250,000, with mains switch, 2/-.

U.S.A. Electrolytic Condensers. 550v. peak working, standard tubular metal condenser, 4 mf., 8 mf., 12 mf., a real bargain, 1/9.

1,000 OHM 150 Milliamp, semi-variable resistance, 2/-; 1,000 ohm 250 milliamp., tapped, for any number .18 valves, 3/6; 800 ohms 350 m.a., tapped, 2/-.

RELIABLE Smoothing Condensers, 250v., working, 1mf., 6d.; 2 mf., 1/-; 4 mf., 2/-; 350v. working, 1 mf., 1/-; 2 mf., 1/6; 4 mf., 3/-.

ALL Premier Mains Transformers have Engraved Panels, terminal connections, all low tension, windings centre-tapped, tapped and screened primaries, 200-250 volts.

PREMIER 250-0-250 60 milliamps, 4 volts, 1-2 amps., 4 volts 2-3 amps., 4 volts 3-4 amps., 10/-.

PREMIER 350-0-350 150 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-4 amps., 12/6.

PREMIER Combined H.T.8 and H.T.9 Transformer, rectified output 250 or 300 volts 60 milliamps, 4 volts, 1-2 amps., 4 volts 3-5 amps., 10/-; or with Westinghouse rectifier, either type, 18/6.

PREMIER H.T.10 Transformer, rectified output 200 volts 100 milliamps, 4 volts 1 2 amps., 4 volts 3-5 amps., 10/-; or with Westinghouse rectifier, 19/6.

THE Following Lines 6d. Each, or 5/- per dozen; 4- or 5-pin baseboard or 4-, 5-, 6- or 7-pin chassis mounting valve holders, American valve holders, 1 watt resistances, wire end, every value; tubular wire end condensers, 1,500 volt, every value up to 0.5, 0.3 amp., 2- or 3-point switches. Cyldon double trimmers, 6yds. Systoflex, 1, 1.5, 2 or 2.5 mm., 1yd. 7-way cable, 9ft. resincored solder, 6yds. push-back connecting wire.

PREMIER SUPPLY STORES

(Dept. G.N.), 20-22, High St., Clapham, S.W.4. 'Phone: Macaulay 2188. Nearest Station: Clapham North Underground.

CLARION VALVES.—All brand new; battery types, 2-volt, HF.2, LF.2, LP.2, 1/9. Super power, PP.2, 2/6; screens and pentodes, 3/9; A.C. Mains, 4-volt, 1 amp., general purpose, 3/3; power, 4/-; screens and pentodes, 4/6; full wave rectifiers, 3/6; postage paid, cash with order, or C.O.D. over 10/-. Clarion Valves, Dept. 2, 885, Tyburn Road, Erdington, Birmingham.

MAINS transformers, 200-250 input, 4v-4amp, 4v-2amp, 350-0-350, 70 milliamps, limited quantity, 5/11, Telsen best quality heavy duty 4v-6amp, 350-0-350, 100 milliamps 7/6. Telsen mansbridge condensers, 250v. working, .01, .02, .05, .1, 3d. each, 2/- dozen; 1mfd., 4½d.; 2 mfd., 6d. Post, C.O.D. extra.—Economic Radio, 321, Argyle Street, Glasgow.

PEARL & PEARL,

190, Bishopsgate, London, E.C.2. All the following Bargains guaranteed new goods. Cash or C.O.D. Carriage Paid in British Isles.

SPECIAL OFFER. Burgoyne Receivers. 3-Valve Class B Models. Complete with Mullard valves; Exide H.T. and L.T. batteries. M/c speaker. Artistic cabinet of highly polished walnut. Chromium fittings. Brand new in original cartons; 1935 Model. List £6/10/0. Cash £3/18/6, or 14/- down and 10 monthly payments of 7/-.

ATLAS ELIMINATORS. Guaranteed 12 months. Model C.A.25 for A.C. mains. 5 tappings. Westinghouse rectifier. List 59/6. Yours for 7/- down; balance in 10 monthly payments of 5/3.

FREE. Our June bargain list "N"

All Mail Orders direct to

PEARL & PEARL,

190, Bishopsgate, London, E.C.2.

Telephone: Bishopsgate 1212.

HULBERT.

HULBERT for Quality Surplus Speakers.

ALL Speakers Listed Below are Brand New and Made by one of the Best Known British Makers of High Grade Moving Coil Speakers. Repeat orders coming in daily.

10/6 Only, original price, 30/-.—Energised, 8in. cone, 6,500 ohms field, for direct use on 200-240 volts D.C. mains; also 1,800, 2,000, 2,200 or 2,500 ohms field; price includes power, pentode, or universal transformer as required.

14/- Only, usual price 45/-.—As above, but with 10in. cone, a very powerful quality speaker capable of handling large outputs.

15/6 Only, usual price 35/-.—Permanent magnet model with cobalt steel magnet of high efficiency, 8in. cone, power, pentode, or universal transformer.

18/6 Only, usual price 39/6.—As above, but with 10in. cone, powerful quality speaker giving large output with given input.

19/6 Only, usual price 41/-.—Permanent magnet model with the new Alni magnet, high flux density and wide frequency response, 8in. cone, power, pentode or universal transformer.

24/- Only, usual price 70/-.—As above but with 10in. cone, ideal for use with quality receivers.

2/9 Only.—Brand new cabinets, suitable for any of above.

SECURE One of These Bargains Now. Repeat orders coming in Daily.

CASH With Order or C.o.d.—Hulbert, 6, Conduit St., W.1.

HULBERT for Surplus Speaker Bargains.

WOBURN Radio offer following Goods:—

ELECTRIC SOLDERING IRONS: 200/250v., copper bit, complete with flex and adaptor, 1/11, post 6d. Immediate delivery.

SHORT-WAVE CONDENSERS: Air-spaced, 0001, 00015, 00016, 0002, 00025, 2/-, with slow-motion dial, 3/-. Popular iron-cored canned coils, dual range, boxed with instructions, 2/6. Dubilier and Erie resistances, all values, 6d. Truwind wire-wound colour coded all values to 50,000 ohms, 3½d. Western Electric Microphones, 2/3. Transformer for same ratio, 100/1, 2/3. Rothermel Speakers, 7" cone, power and pentode transformer, new and boxed, listed 39/6, 17/6.

TRADE LIST NOW READY. Send stamp and trade letter heading.

WOBURN RADIO CO., 9, Sandland Street, W.C.1. Holborn 7289.

RADIO CLEARANCE, 280, High Holborn, W.C.1. Telephone: Holborn 4631.

RADIO CLEARANCE announce the issue of their Grand Jubilee Illustrated Bargain List containing hundreds of special Bargains. Release date, May 30th. Send 3d. to cover cost and postage.

RADIO CLEARANCE announce the purchase of a limited quantity of Dorchester 5 Valve Superhet Sets A.C. 200/250 Volts, Fluid Light Tuning A.V.C., employing Mullard F.C.4, S.P.4, S.P.4, PEN4VA and I.W.4, complete in beautiful Walnut Cabinet.

£7/19/6.

RADIO CLEARANCE announce a further purchase of Plessey 7 Valve A.C. Superhet Chassis, Mullard Valves, delayed A.V.C., suitable for use with Energised Moving Coil Speaker 2,500 ohms. Chassis complete with Valves less Speaker.

£7/10/0.

RADIO CLEARANCE. Palliard A.C. Gramophone Motors 200/250 volts, complete with Unit Plate, 12in. Turntable.

27/6.

RADIO CLEARANCE. Utility 3-Gang Midget Type Superhet Condenser with 110 k/c Section. Also 3-Gang Straight. Brand new, boxed.

Without Dial, 5/11. With Dial, 7/6.

RADIO CLEARANCE. H.T.8 Mains Transformers, fully shrouded, output 250 volts, 60 m.a. 4 volt 4 amp centre tapped.

6/- With Westinghouse Metal Rectifier, 14/6.

RADIO CLEARANCE.—280, High Holborn, W.C.1. Telephone: Holborn 4631.

ALL goods advertised in last week's issue, still available.

WARD, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

SILVER SOUVENIR.—Complete Specified Kit. No alternatives. 79/6 cash. Host of other bargains. Kits, Accessories, etc. Lowest prices always.—Write now for free lists, Melfo-Rad, Queen's Place, Hove. (Trade Supplied.)

BIRMINGHAM RADIOMART,

SPECIALISTS IN SHORT-WAVE AND QUALITY COMPONENTS AT LOWEST PRICES.

Our stock is much too large to itemise here: From a soldering tag to a superhet we can supply everything, and what is more you won't be "Caught"! Send 1½d. stamp for our latest **CATALOGUE**. No firm has larger stocks or is cheaper than

THE SQUARE DEALERS,

BIRMINGHAM RADIOMART,

19, John Bright Street, Birmingham.

EASY TERMS

Everything Radio supplied on the lowest terms. Send list of requirements for quotation by return of post. Prompt delivery. Car. Paid.

Revitalise your set with the new W.B. P.M. STENTORIAN SPEAKER

Senior P.M. Speaker. Cash Price £2.2.0 or 2/6 with order and 11 monthly payments of 4/-.

Standard P.M. Speaker. Cash Price £1.12.6 or 2/6 with order and 11 monthly payments of 3/-.

5/- Secures delivery. Atlas T 10/30 H.T. Eliminator and Trickle Charger combined. Cash price £3.9.6 or 5/- with order and 12 monthly payments of 5/11.

Estd. 1925 THE 'PHONE: NATIONAL 1977

LONDON RADIO SUPPLY COMPANY

11, OAT LANE · NOBLE STREET · LONDON, E.C.2

EASY PAYMENTS

"There's no place like HOLMES"

W.B. SPEAKERS.

This year's finest value.	Deposit.	Monthly Payment.
STENTORIAN SENIOR	42/-	9 of 4/7
STENTORIAN STANDARD ..	32/6	7 of 4/5
STENTORIAN BABY	22/6	5 of 4/1

KIT SETS

We strongly recommend.

LISSEN SKYSCRAPER 3	60/-	5/6	11 of 5/6
LISSEN SKYSCRAPER 4	112/6	10/-	11 of 10/3
COSSOR MELODY MAKER 352 ..	119/-	10/10	11 of 10/10
COSSOR ALL ELECTRIC 357 ..	159/-]	14/7	11 of 14/7

COMPLETE SETS

Unbeatable Value.

COSSOR 3-VALVE 350	112/6	10/- 11 of 10/4
MARCONI 3-VALVE 234	£7.19.6	14/7 11 of 14/7
G.E.C. BATTERY COMPACT 3 ..	117/6	10/9 11 of 10/9
FERRANTI LANCASTRIA.. ..	£12.12	23/- 11 of 23/-

ACCESSORIES

of merit and fine value.

EXIDE H.T. ACC. 120v.	60/-	5/- 9 of 5/8
ATLAS ELIMINATOR T. 10/30 ..	69/6	6/- 11 of 6/4
AVOMINOR METER	40/-	5/6 7 of 5/6
B.T.H. LATEST PICK-UP.. ..	40/-	4/5 9 of 4/5

Parts for any set. Any make of speaker.

New goods obtained for every order.

Send us a list of parts or valves you require or any speaker or set you may select and we will forward you a definite quotation. Ten years' advertiser in the Wireless Press. Thousands of satisfied customers.

H. W. HOLMES,

NEW ADDRESS:

333, EUSTON ROAD, LONDON, N.W.1.

'Phone: Museum 1414.

ENGINEERS!

ARE YOU EARNING LESS THAN £10 PER WEEK?

If so, you cannot afford to carry on without reading our 256-page Handbook. The book explains clearly and definitely many ways of carving out a successful career. Among other things, it explains the Services of our unique Appointments Department, outlines Home-study Courses in all branches of Civil, Mechanical, Electrical, Motor, Aero, Wireless, "Talkie," Eng., Building, etc., and gives details of B.Sc., A.M.I.C.E., I.E.E., A.M.I.Mech.E., A.M.I.A.E., G.P.O., MATRIC, and all Exams. We alone Guarantee—"NO PASS—NO FEE." Whether you be an old hand or a budding apprentice, get this book to-day—FREE and POST FREE.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY.

409, Shakespeare House, 29/31, Oxford St., London, W.1.

---

362 VALVES

GUARANTEED FOR A LONGER PERIOD THAN ANY OTHER VALVE

Latest List from: **THE 362 RADIO VALVE CO. LTD. STONEHAM ROAD, LONDON, E.5.** Cliss. 1294.

PATENTS AND TRADEMARKS.

KINGS 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.

SOUTHERN RADIO'S WIRELESS BARGAINS. Every Article Guaranteed New, Perfect and Sent Post Paid.

RECEIVERS. TELSEN RADIOGRAMS. Model 3550/R.G.A. Latest 1935 6 Valves, Superhet, A.C. This receiver embodies the very latest in Radio. Complete with 6 Valves, Mains Energised Speaker, contained in exquisite cabinet with GARRARD ELECTRIC RECORD CHANGER. In Original Sealed Cases, £18/10/0. (List 32 Guineas.)

TELSEN THREE-VALVE BATTERY SETS. Model S93. Complete with 3 Mazda Valves, in attractive bakelite cabinet, 30/-. (List, 75/-.)

TELSEN "AIRMARSHAL 3."—Three-valve Battery Sets. Complete with 3 Mazda Valves, Speaker. In attractive Walnut cabinet, 47/6. (List, 98/6.)

BURGOYNE CLASS "B" THREE-VALVE SETS. —Complete with 3 Mullard Valves, Exide Batteries, and Accumulator. Magnavox Moving Coil Speaker. In magnificent cabinet, finished in chromium, £3/9/6.

SPEAKERS. BLUE SPOT PERMANENT MAGNET SPEAKERS, WITH UNIVERSAL TRANSFORMERS TO SUIT ANY CIRCUIT.—1935 Series, 99 P.M., 24/6. 45 P.M., 20/-. Celestion P.P.M.W., 16/6. Celestion Soundex, 11/-. All in sealed Cartons.

ELIMINATORS. REGENTONE 1935 Series New and Boxed for A.C. Mains 200/250 Volts, TYPE W.5a Complete with Trickle Charger, 39/6. Type WIa (less Trickle Charger), to carry 30 Milliamps, 33/-. WIC (less Trickle Charger), 30/-.

CONDENSERS. PLESSY 4-Gang Superhet Condensers, .0005 Fully Screened, with Trimmers, 7/3. LOTUS 0.0005 Condensers, Fully Screened, with Trimmers. Complete with Escutcheons, Dials, Knobs. 3-Gang, 11/-. 2-Gang, 7/3.

COILS.—Igranic Superhet 4-Coil set (1 osc. 2 I.F. with pig tails and 1 L.F. plain), 9/- per set (List 50/-). Varley Constant Square Peak Coils B.P.5, with all accessories, 2/3. Telsen Twin-matched Coils: Type W.287, screened, with switch, 7/9 (List 17/-). Triple-matched Screened Type W.288, with switch, 10/9. Telsen Twin Coil Unit, Type W.478, 12/6. Type W.476, 17/6. All Brand New and Boxed.

MISCELLANEOUS.—Bifo Static Cut-outs, definitely eliminate all interference, 2/-. Lewcos Spaghetti Resistances, all capacities, new and boxed, 1/6 per dozen assorted. Telsen Binocular H.F. Chokes, 2/-. Telsen ACE L.F. Transformers, 3-1 and 5-1, 2/9.

STOCKTAKING BARGAIN PARCELS.—After our Recent Stocktaking, we gathered at our Head Office a large number of odd lines from our Various Branches. We are offering these in parcel lots as UNDER:—

5/- PARCEL Contains Components to the value of at least 20/-. Including Condensers, Coils, wire, resistances, etc.; 10 different Telsen Radio Circuits included with each Parcel.

10/- PARCEL contains Components to the value of at least 45/-. Includes Transformers, Variable Condensers, etc., etc. Also Circuits as above.

20/- PARCEL. This is the "Small Traders" Parcel and contains a marvellous selection of components valued at 85/-. We have supplied this parcel to hundreds of dealers for re-sale at a profit. Every article contained in these parcels is up to date, new and boxed.

THOUSANDS OF BARGAINS AT OUR VARIOUS BRANCHES.—All Goods guaranteed and sent post paid. Branches at 46, Lisle Street, W.C.2; 271-275, High Road, Willesden Green, N.W.10. All Mail Orders to: 323, Euston Road, London, N.W.1.

SOUTHERN RADIO, 323, EUSTON ROAD, LONDON, N.W.1. Near Warren Street Tube. 'Phone: Museum 6324.

OLYMPIC Combined H.T. (S.G., Det., L. F., Power) and ½a. charger: Special price,

30/- UNIQUE spangled finish, humfree, year's guarantee. Frost Radio, 21, Red Lion Street, E.C.1.

HOMECONSTRUCTOR SERVICE.—Sets modernised, repaired. Diagrams, H.F. units, converters. Radio Service Bureau, 9a, Shepherd's Bush Road, London, W.6.

LISSEN Battery valve bargains. L.2 power detector, 2/10. P.T.225, 5-pin pentode 5/9. Service Radio, 72, Bruce Grove, Tottenham.

BANKRUPT Bargains. List free. 3v kits 15/-. Transformers 1/6, Dual coils 1/6. Telsen 0005 mica 1/3, airspaced 1/9. Screened coils 3/6. Binoc HFC 1/8. Lotus PM. MC speakers 12/6. Celestion Soundex 10/6. Regentone 30 m.a. eliminators A.C. 30/-, with Trickle charger 20ma. 37/6. Telsen 28ma. A.C. 25/-. Lampex A.C. 4v. mains sets £4/10/0. Large stock receivers and components. Quotes. Butlin, 143b, Preston Road, Brighton.

SPEAKER REPAIRS.—New Cones/coils fitted popular makes, 5/-. Mains Transformers, chokes, etc., rewound or made to order.—WEEDON P.L.R. Co., Dept. C., 80, Lonsdale Avenue, London, E.6. Maryland 1782.

FREE ADVICE BUREAU

COUPON

This coupon is available until June 8, 1935, and must be attached to all letters containing queries.

PRACTICAL AND AMATEUR WIRELESS, 1/6/35.

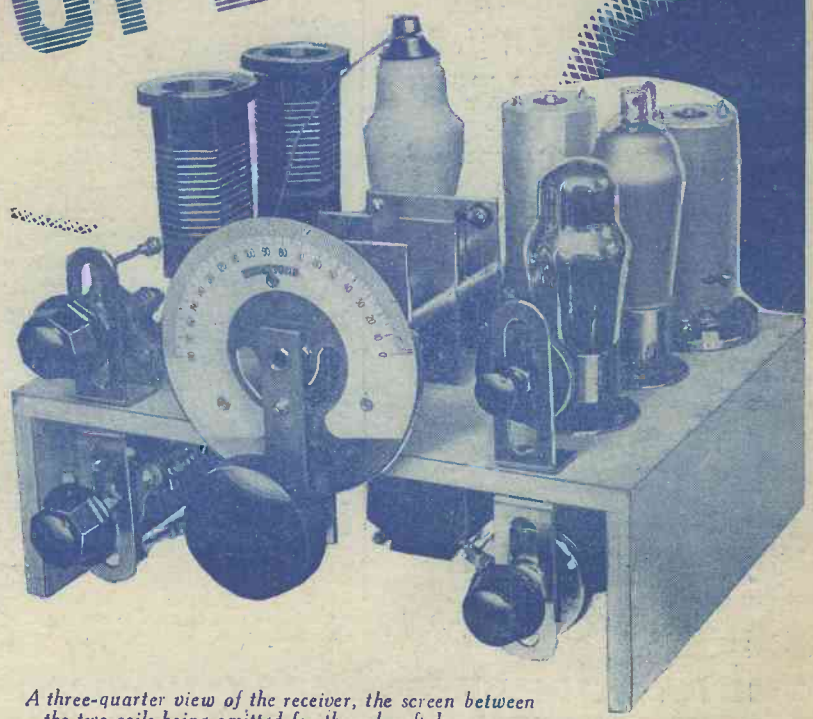
ADVERTISEMENT INDEX

AMERICA
AUSTRALIA
INDIA

F. J. CAMM'S 3 VALVE SHORT-WAVE SUPERHET

THOUSANDS of listeners in this country are obtaining hours of enjoyment from short-wave reception with receivers employing a simple detector stage. Reports received from all parts of the country show that it is possible with a carefully-arranged detector circuit to pick up stations in lands as far away as America, Australia and India, and it is really surprising with what strength these transmissions are heard.

Now comes F. J. CAMM'S latest Short-wave Superhet—the last word in short-wave receivers. Simple to construct, easy to operate, this highly-efficient receiver is fully described for you, with photographs and diagrams, in this month's PRACTICAL TELEVISION and Short-wave Review.



A three-quarter view of the receiver, the screen between the two coils being omitted for the sake of clearness.

Other Splendid Contents in this number include :

- Making a Kerr Cell Amplifier
- Band Spread on the Short Waves
- Receiving the 60-line French Television Broadcasts
- Television Made Easy
- The Beginner on Short Waves
- New Short-wave Components, etc., etc.

THE JUNE

PRACTICAL TELEVISION AND SHORT-WAVE REVIEW

OUT NOW

On sale at all Newsagents and Bookstalls

6D.

George Newnes, Ltd.

W.C.E. 21

Printed in Great Britain by NEWNES & PEARSON PRINTING CO., LTD., Exmoor Street, Ladbroke Grove, W.10, and published by GEORGE NEWNES, LTD., 8-11, Southampton Street, Strand, W.C.2. Sole agents for Australia and New Zealand: GORDON & GOTCH, LTD. South Africa: CENTRAL NEWS AGENCY, LTD. *Practical and Amateur Wireless* can be sent to any part of the world, post free, for 17/4 per annum; six months, 8/8. Registered at the General Post Office for Transmission by Canadian Magazine Post.