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A NEWNES PUBLICATION

Edited by F. J. CAMM

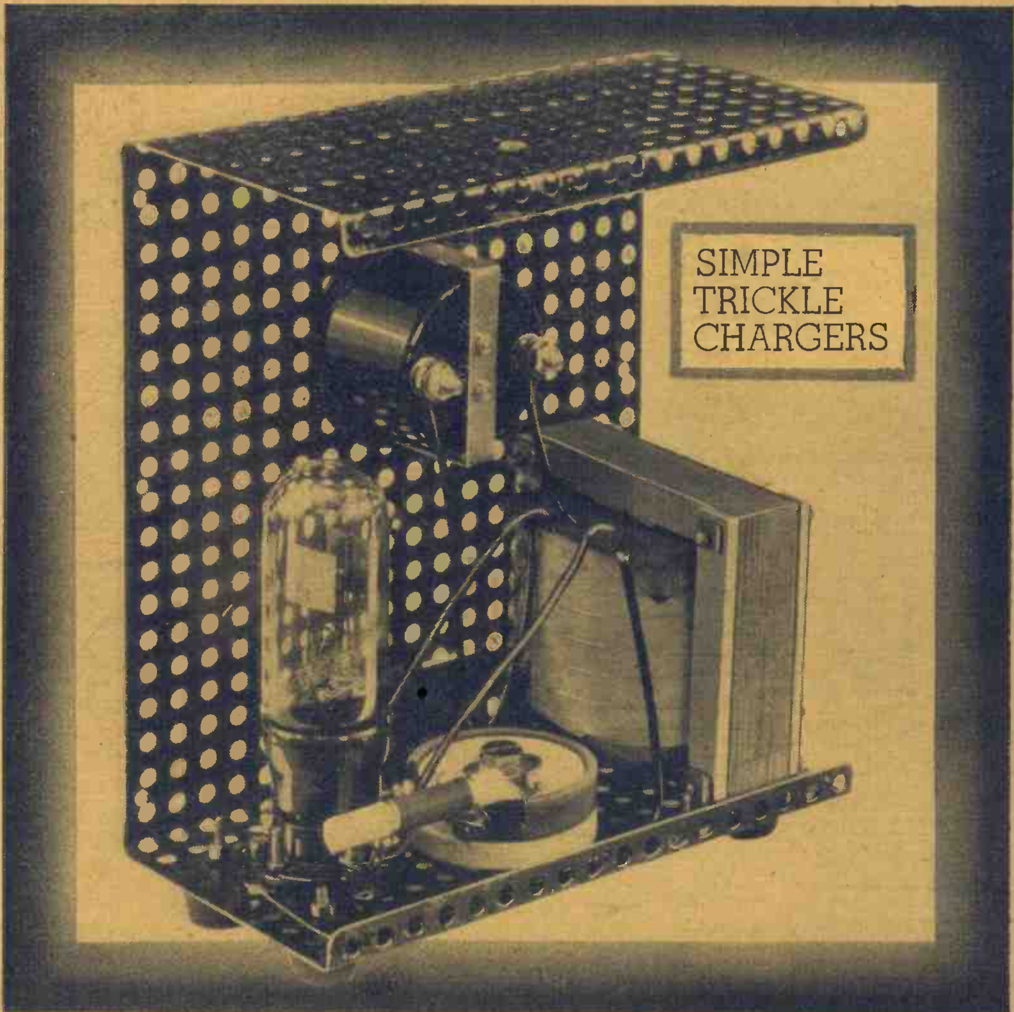
Vol. 16. No. 410.

Practical Wireless and PRACTICAL TELEVISION

4D. EVERY WEDNESDAY

July 27th, 1940.

Contents



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Two-valve : Blueprints, 1s. each.		
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A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
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£5 Superhet (Three-valve)	5.6.37	PW40
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F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
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Push Button 4, Battery Model / Push Button 4, A.C. Mains Model	22.10.38	PW95
SHORT-WAVE SETS. Battery Operated.		
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Simple S.W. One-valver	23.12.39	PW88
Two-valve : Blueprints, 1s. each.		
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Blueprint, 1s.		
S.W. Converter-Adapter (1 valve)	—	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE		
CRYSTAL SETS.		
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1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprint, 1s.		
B.B.C. Special One-valver	—	AW387
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det, Pen)	—	AW392
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
£5 5s. S.G.3 (SG, D, Trans)	—	AW412
Lucerne Ranger (SG, D, Trans)	—	AW422
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
Transportable Three (SG, D, Pen)	—	WM271
Simple-Tune Three (SG, D, Pen)	*June* '33	WM327
Economy Pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
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1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
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Minitube Three (SG, D, Trans)	*Oct.* '35	WM396
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2HF Four (2 SG, D, Pen)	—	AW421
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£5 5s. Battery Four (HF, D, 2 LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen)	—	WM384
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Super-quality Five (2 HF, D, RC, Trans)	—	WM320
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Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D, Pen)	—	WM394
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Home Lover's New All-Electric Three (SG, D, Trans) A.C.	—	AW383
Mantovani A.C. Three (HF Pen, D, Pen)	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	*Jan.* '36	WM401
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All Metal Four (2 SG, D, Pen)	*July* '33	WM329
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Heptode Super Three A.C.	*May* '34	WM359
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Two HF Portable (2 SG, D, QP21)	—	WM363
Tyers Portable (SG, D, 2 Trans)	—	WM367
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One-valve : Blueprints, 1s. each.		
S.W. One-valver for America	15.10.38	AW429
Rome Short-Waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG, det, Pen)	*Feb.* '36	WM402
Home-made Coil Two (D, Pen)	—	AW440
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World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
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Emigrator (SG, D, Pen) A.C.	—	WM352
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Listener's 5-watt A.C. Amplifier (1/6)	—	WM392
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De Luxe Concert A.C. Electrogram (1/-)	*Mar.* '36	WM403
New style Short-wave Adapter (1/-)	—	WM388
Trickle Charger (6d.)	—	AW462
Short-wave Adapter (1/-)	—	AW456
Superhet Converter (1/-)	—	AW457
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Wilson Tone Master (1/-)	*June* '36	WM406
The W.M. A.C. Short-wave Converter (1/-)	—	WM408

Practical and Wireless
★ PRACTICAL TELEVISION ★

EVERY WEDNESDAY
Vol. XVI. No. 410. July 27th, 1940.

EDITED BY
F. J. CAMM

Staff:
W. J. DELANEY, FRANK PRESTON,
H. J. BARTON CHAPPLE, B.Sc.

ROUND THE WORLD OF WIRELESS

Trickle Charging

ONE of the bugbears of the battery-user's existence is the accumulator. Many have overcome difficulties in the replacement of H.T. batteries by adopting small mains units, but for reasons of economy have not converted their receiver to mains operation, although mains facilities may be available. Consequently, repeated visits to a charging station are called for, and unless two batteries are kept, there is a period during which the receiver is out of commission. Two batteries may, of course, be used, and thus there will not be any gap in the times available for listening, but there is still the inconvenience of carrying the battery to the charging station and bringing it home. Furthermore, in some localities there may not be any facilities for taking the battery and the listener may have to wait until a service depot collects it, which is done in some country districts at regular intervals. However, with quite simple apparatus the battery receiver may be made, in effect, "mains maintained," if not mains operated. In this system, the H.T. is provided by a mains unit or battery eliminator, as it is generally called, and the accumulator may be kept always in a usable condition by recharging it when the set is switched off. This is possible on either D.C. or A.C. mains and some details of the arrangements available are given on page 395.

"Spring Meeting"

ALTHOUGH racing has now ceased, an amusing Irish play with a racing atmosphere will be heard on July 27th in the Home Service. This is "Spring Meeting," by M. J. Farrell and J. Perry. It is the story of an impecunious Irish baronet, his two daughters, a rather eccentric maiden aunt whose secret vice is gambling, a family butler who runs the entire household, and a couple of lovers for the two girls.

"Monte Carlo"

JACK BUCHANAN will be heard in his original part in the radio adaptation of "Monte Carlo" in the Film Festival series, No. 8, on July 29th. "Monte Carlo" was probably one of his greatest artistic successes, although at that time he was better known for a brilliant succession of musical comedies. In the play Jack Buchanan will be working with Douglas Moodie.

Du Mont Television

A PERMIT has been granted to the A. B. Du Mont Labs of New Jersey for the construction of a television transmitter on the top floor of the 42-storey office building at 515, Madison Avenue. It will operate on the 78-84 mc/s band as a Class 2 television broadcaster for programme research, using a system whereby changes may be made in the number of lines, number of frames and interlacing schemes at the transmitter and the receivers will automatically follow any transmitted signal.

"P.W." to be Published Once a Month

Owing to the acute shortage of paper, this journal will temporarily appear as a monthly magazine, and this issue is the last of the weekly series. The first monthly issue, dated September, price sixpence, will appear on August 7th, a fortnight hence.

It will contain more pages and the regular features will be augmented by new ones.

Readers will understand that these steps are of a temporary character to enable us to conserve paper supplies during the shortage, and that we shall reappear as a weekly publication as soon as circumstances permit.

It is essential that every reader, including those who have already placed a standing order for the weekly issues, should complete the new order form on page 406 of this issue. This is the only way to ensure receiving your copy as your newsagent is not able to return unsold copies and will thus only secure the exact number ordered.

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

Band of the Week

FOR the second time in just over two months, Joe Loss will provide the band of the week next week. Recently leaving a residential job to take up stage work, this is probably the only touring stage band playing solely dance music, indulging in no spectacular stunts and relying purely upon musical appeal. Vocalists with the band are Monte Rey, Paula Green and Chick Henderson.

News Flash

MOST listeners are familiar with the American term "News Flash," and at the moment a joke in the U.S.A. refers to the announcer who said "We interrupt these news bulletins to bring you a programme." Recently, however, a WLW announcer went one better. The station was relaying an NBC news bulletin from Europe when an important press bulletin came into the newsroom at WLW. The announcer cut into the relay and thus became one of the few announcers who have interrupted a news programme to present a news flash.

"Station BBLBBO"

CINCINNATI post-office officials are likely to go berserk soon if they get much more mail addressed to Station BBLBBO. The correspondents in reality are writing to Station WLWO, short-wave international outlet operated by The Crosley Corporation, which also runs WLW. It happens that on the air WLWO's call letters, read in Spanish, sound something like "doobluh-vey ellay doobluh-veh oh." This is because the Spanish W is spoken as a double-V. The Spanish V also sounds like a B. Listeners who fail to pay close enough attention think they're hearing "double B." But "double B" is two letters in any language. So WLWO is getting mail as BBLBBO — probably the longest set of call letters in any language.

Roy Speer

THE last job to be undertaken by Roy Speer before he joins up will be a programme on the life of Stephen Foster. The show will be produced by Douglas Moodie, and will be heard in the Home Service programme on August 1st.

Tracing Transformer Connections

Simple Methods of Identifying the Different Windings and the Various Tappings

By FRANK PRESTON

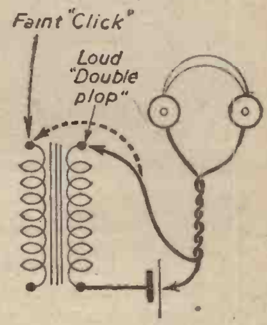


Fig. 1.—Method of making preliminary tests with an L.F. transformer.

IT sometimes happens that it is wished to make use of a transformer which has previously been relegated to the junk box. Provided that it is in good condition, the transformer may be just as good as a new one, but in many cases the terminals or leads may not be identifiable. In that case, the first step must be to trace the connections and find to which part of each winding they are attached.

L.F. Transformers

When it is a simple low-frequency transformer there will be only four connections, and therefore little difficulty will be experienced in dividing them into two pairs. It is necessary only to connect a pair of 'phones in series with a small dry battery, connect one battery terminal to one transformer connection and then to touch the second 'phone lead against the other terminals or leads in turn. When there is a "double plop" in the 'phones as the contact is made and broken in this way it will be known that the other end of the winding has been found. The point is illustrated in Fig. 1. It should be remembered that a rather faint "click" will probably be heard when other connections are touched, but the sound will not be repeated as the contact is broken.

Winding Resistances

Having thus separated the four connections into two pairs it will remain to find which is for the primary and which for the secondary. This can most easily be determined by simple resistance measurement, since the primary will have a lower resistance than the secondary. In most instances, however, the constructor will not have a resistance bridge or multipurpose meter with which readings can be taken in ohms. It is just feasible to use a pair of 'phones and a battery cell, as shown in Fig. 1, but it might be necessary also to connect a fairly high resistance in series between the battery and the transformer. By this means it may be possible to limit the current to such an extent that the sound heard when connection is made to the higher-resistance (secondary) winding is very faint.

Using a Meter

Alternatively, the 'phones can be replaced by a milliammeter reading up to about 5 mA. When using a 1½-volt battery cell or a 2-volt accumulator it will generally be found that the meter reading is about 3 mA. on the primary and considerably less on the secondary. If the primary had a D.C. resistance of only 500 ohms, however, the current would be 4 mA. at 2 volts. With a lower resistance than this it would be necessary to insert a resistance of about 500 ohms in series to prevent overloading the meter. On the other hand, if it were found that the resistance was so high that only a minute current passed, it would be necessary to increase the test voltage. In any case, accurate readings are not necessary since it is required only to find which winding has the higher resistance; and that winding is the secondary.

With class B transformers, output transformers and other types, the secondary may have a lower resistance than the primary. There would probably be some indication on the component to show that it was not an ordinary L.F. transformer, and by combining a little common sense with the resistance testing it would not be difficult to decide which were the proper connections.

Multi-winding Transformers

There is more difficulty when dealing with a mains transformer, since in that case there will generally be at least three windings. Even then, the leads or terminals attached to the different windings will probably be grouped in some way, so that the sets of connections can be recognised. A check can be made by using a small battery and 'phones or meter, as described above. To safeguard the meter, however, initial tests should be made with a 500-ohm resistor in series with it. This is because the resistance of the low-tension secondary is almost negligible by comparison with that of the other windings.

Another point to bear in mind is that there will generally be more than two leads from each winding, due to the provision of tappings. It is therefore necessary to make preliminary tests to isolate all

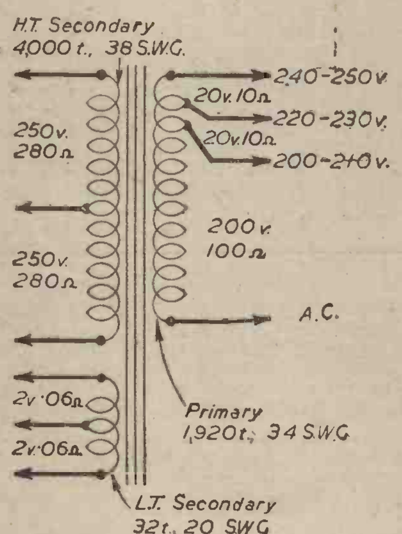


Fig. 2.—Approximate figures relating to a typical transformer of good design.

those connections to any one winding. Having done this, the terminals or leads can be marked with a spot of paint or by sticking on marked strips of adhesive paper.

Comparing Resistance

The next step is to find which of the windings has the highest resistance, or at least, to find the two connections between which the highest resistance exists. These will probably be for the high-tension secondary, but they may be for the primary. If, however, it appears that the winding is centre-tapped, it will be fairly certain that this winding is the H.T. secondary.

Similarly, if it is noticed that there are a number of connections to one winding, there need be little doubt that that is the primary, since there will be two or three tappings for different mains voltages between, generally, 200 and 250.

Of these, find the two between which there is the highest resistance and mark them. Then check the approximate resistance between each of these and the remainder. The highest reading obtained this time will show which is the A.C. or zero connection and which is the low-voltage (probably 200-210-volt) tapping. Mark these leads and repeat the tests between each of these and the remaining primary tappings. It will then be possible to mark the tappings in order of their voltage; tappings are usually provided for 200-210, 220-230 and 240-250 volts, but this is not standardised.

What to Expect

The general procedure will be simplified by examining Fig. 2, which shows the circuit for a typical well-made transformer, and shows the voltage points and the approximate resistances between them. The figures given are arbitrary, but apply to a good transformer wound on a core with a 1 sq. in. cross-section core and having eight turns per volt. It should be stressed that the resistance figures indicated are very approximate, and that they vary considerably according to the particular transformer. It will, nevertheless, be reasonable to assume that the relationship existing between the figures is about right for a transformer of the type indicated.

It might be found impossible to determine with any degree of accuracy the resistance of the low-tension secondary, and therefore it might be impossible to find which is the centre tap, and which are the two ends, by using any of the methods described above. A fairly simple test can easily be made, however, by connecting a flash-lamp bulb and 3-volt or 4½-volt (according to the rating of the bulb) battery in series with different pairs of terminals. It will be found that the light of the bulb is dimmed to a rather greater extent when connection is made between the ends of the windings than when the bulb and battery are in series with either half of it. If an ammeter is available the test can be made more easily, by using a 2-volt accumulator or dry battery with a 3-volt, .3 amp. bulb. The current passed will then be slightly over and slightly under an average current of about .2 amp. If an ammeter reading up to .5 amp. is not available a milliammeter can be used with a shunt so that the full-scale reading is between .25 and .5 amp.

The general arrangement described can be applied to any kind of transformer. Before starting to take current readings, however, find how many windings there are and draw the circuit; this will help in checking the working as the tests proceed.

Battery Auto-bias

Obtaining Automatic Bias for Variable-mu H.F. Stages, as well as for Output Stages in Battery-operated Receivers

By W. J. DELANEY

MANY users of battery-operated receivers are fascinated by the fact that the H.T. battery may be dispensed with by using an H.T. battery eliminator or mains unit. Generally, however, a grid-bias battery is retained, either for the L.F. stages, the H.F. stages, or both. In the A.C. mains receiver automatic grid bias is employed, and this has a number of advantages which the battery user is generally unable to obtain. In previous articles in this paper we have described how a simple circuit arrangement may be incorporated in a battery receiver to permit the G.B. battery to be dispensed with for the biasing of L.F. valves, and then, when a mains unit is employed, the question of battery replacements is automatically answered. The problem of the L.T. supply is, of course, overcome by using a trickle-charger, in which case the features of "all-mains" operation are brought to the battery set with a minimum of expense and with no material change in the receiver. The latter consideration is one which often has a great effect on the amateur. He has used a certain receiver for a considerable time and is attached to it, with the result that he hesitates to scrap it or modify it. When mains facilities are available, however, he can make the set 'all-mains.'

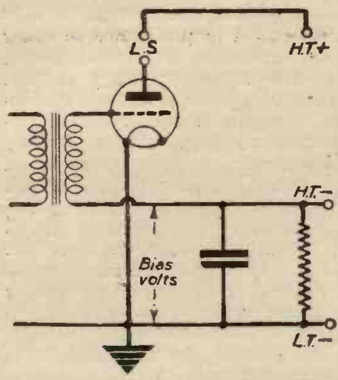


Fig. 1.—The normal method of providing auto-bias for an output stage.

L.F. Bias

The bias for an output valve of the battery-fed type may easily be obtained by arranging for the grid to be returned to a point which is negative in respect to the filament of the valve. This requirement is answered by inserting a resistance between the H.T. negative lead and the normal earth line, returning the grid connection to the H.T. negative and connecting a by-pass condenser across the latter two points. This is shown in Fig. 1. From this it will be seen that the total anode current of the receiver will flow through the resistance, and this will result in there being a difference of potential across the resistance, the actual voltage being easily calculated from standard Ohms Law. The total anode current is divided into the bias voltage required and this gives the answer in thousands of ohms. The wattage of the resistance may then be calculated in either of two ways. You can multiply the current by the voltage, or multiply the current by itself and then multiply the answer by the value of the resistance. In all cases of Ohms Law working, of course, the current is expressed in amps., remembering that 1 milliamp is .001 amps. An example will make the arrangement quite clear. Supposing we wish to provide an output valve with 10 volts bias, and the total anode current of the receiver is 5 milliamps. The value of the resistance will be 10 divided by 5, giving 2,000 ohms by the first method; or 10 divided by .005, which also gives 2,000 ohms. The wattage will be 10 by .005, or .05 watts by the first method, and .005 x .005 x 2,000 by the second method. This is also .05 watts.

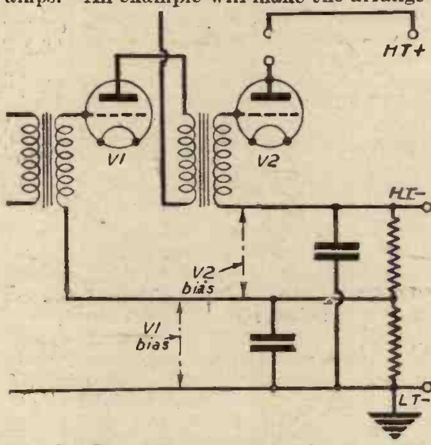
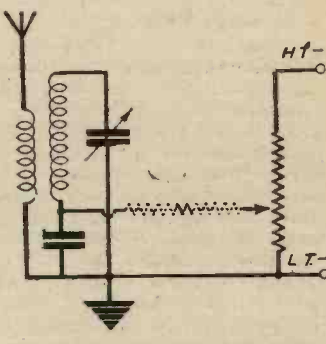


Fig. 2.—Bias for two stages may be obtained as shown above. Two resistors or a tapped component may be used.

Additional Bias

The arrangement just described, however, only provides a single biasing point, and if there are two L.F. stages in the receiver we will need a further bias voltage for the intermediate valve. This will, obviously, need a lower voltage than the output valve and this means that a lower value of resistance will be needed. However, by adopting the same method of calculation as has just been described, and then subtracting the answer from the resistance value found for the output valve, it will be seen that our requirements may be met by using two resistances in series, taking the biasing lead for the first valve from the junction of the two resistances. Thus, keeping to the example just given, suppose that our first L.F. stage needs 5 volts bias. The total current is still flowing through the biasing circuit and therefore the bias resistance will have to have a value of 5 divided by .005, or 1,000 ohms. Our total bias resistance will thus be made up from two 1,000-ohm resistances in series, and the biasing leads will be taken from the junction and from the "top" as shown in Fig. 2. Each lead should, of course, be by-passed to preserve stability and assist in the full reproduction of the lower notes. It will also be found that a small by-pass condenser or the omission of the condenser may also lead to loss of volume.

Fig. 3.—Using a variable resistance for variable bias for an H.F. stage.



We now come to the difficult point so far as the majority of battery users are concerned. That is, the biasing of H.F. valves. Normally, it is not desirable to

(Continued on page 405)

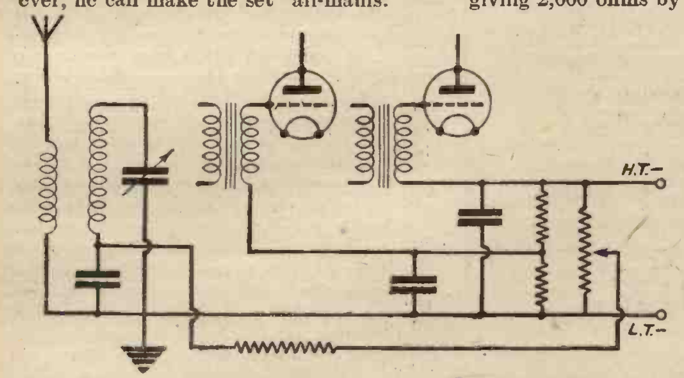


Fig. 4.—Complete biasing scheme, one variable H.F. bias circuit, and 2 L.F. circuits.

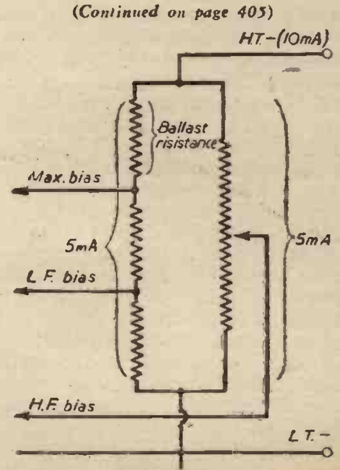


Fig. 5.—Using a ballast resistance to simplify calculations in the bias circuit.

Beginners' Blunders

This Article Explains How to Avoid Many of the Pitfalls Which Are Met With in Constructional Work

TWO qualifications essential for satisfactory participation in the great hobby of radio are a sound theoretical knowledge and a flair for practical constructional work. Unfortunately, however, the latter is often sacrificed to the former, in an endeavour to acquire a store of technical information, and this conception of starting the hobby might, in itself, be classified as one of the first blunders the average beginner makes.

Taken as a whole, the majority of the troubles usually experienced by the would-be radio enthusiast are not, as one would expect, due to the lack of knowledge of the fundamentals. For instance, it is highly probable that a beginner selects for his first constructional effort a well tried and reliable published design, thus eliminating the need for any technical knowledge. Any such design, however, cannot guarantee that the constructional work will be carried out with the same skill and experience as that possessed and used by the designer; therefore it is with this part of the work that the beginner encounters items which provide innumerable little traps for the man who is without any practical electrical or constructional experience.

Blueprints

Published blueprints of tested and guaranteed designs are one of the *greatest aids* to the beginner; all the problems associated with the selection and layout of the essential components are completely eliminated, and as such blueprints as those which are listed in each issue of PRACTICAL WIRELESS are full-size replicas of the actual set, it is practically impossible for the veriest novice to go wrong with the items mentioned above. There are, however, many other items, all connected with the ultimate completion of the constructional work, which are capable of ruining all the skill and care expended on the original design.

Fixing Components

When a blueprint is used, the correct positions of the fixing holes for the various components can be marked off on the chassis or baseboard by overlaying the print and pricking through the necessary spots. This method will ensure accurate location of all parts, an item of great necessity with many circuits. If a published print is not employed, *i.e.*, if the receiver is being assembled from a theoretical diagram, then it is strongly advisable to take a piece of cardboard or stiff brown paper the size of the proposed chassis, and on it lay out the components and, eventually, mark off the fixing points. When doing this, careful consideration must be given to all the wiring which will be associated with the components, as this will lead to greater efficiency, a cleaner wiring scheme, shorter connecting wires and, finally, the planning of the wiring to avoid possible interaction between various parts of the circuits.

When fixing components, always take the trouble to see that they *are fixed securely* and that the correct size of screws or bolts is used for each particular component. Nothing makes an assembly job look so unsightly and unprofessional as loose components and large hideous screws, many with their heads badly marked, and more often than not, not screwed right home. With a metal chassis, when suitable bolts have to be used, it is always advisable to slip a shake-proof washer under the nut, as it is surprising how soon a bolt can shake loose, often with very *disastrous* results.

All drilling should be carried out, whenever possible, before any components are mounted in position. This applies in particular to variable condensers and exposed H.F. chokes or coils, as any metal cuttings or filings from the drilling and finishing are likely to get into such components and seriously affect their efficiency.

Terminals

All terminal shanks *should be inspected* to see whether they are *perfectly secure* in their component before bolting it down, otherwise, when tightening up the terminal head there will be the possibility of the shank rotating with the result that an *imperfect* connection will be formed and, when a metal chassis is used, the shank being unscrewed sufficiently to cause it to touch the chassis and produce a *short-circuit* to earth.

Remember that all terminals used for radio work have a *right-hand* thread so see that the wire loop forming the connection is placed under the head in the manner which will cause the head, on being screwed down, to *close* the loop and not open it and tend to force the wire off the terminal collar.

Get into the habit of making a neat loop, with small round-nose pliers, when using single tinned copper wire, whilst with flexible wires it is essential to twist together all the strands as neatly and firmly as possible, and then form a loop having the correct diameter for the terminal shank concerned, the loop being completed by making two or three twists of the end round the flexible wire.

Insufficient attention is often given to these items. They might seem very unimportant, but in actual practice, a considerable loss of efficiency, short-circuits and intermittent results can be produced by carelessly made connections. Always cut the connecting wires to the exact length, see that their insulation is perfect right up to the terminal or soldering tag, and make quite sure that the wire or strands are not fractured, or partially severed whilst removing the insulating covering.

Soldering

The soldering of all radio connections is to be recommended in preference to other methods, but it must be realised that such connections must be well and truly soldered otherwise they can be greater trouble-makers than, say, a terminal. Many beginners blunder along, making what they think to be soldered connections, but which in actual fact are nothing more than an unsightly mess of solder and flux. Much has already been written in these pages describing the art of soldering, therefore, in this article essential reminders must suffice. See that the soldering bit is properly tinned, is at the correct working temperature, i.e., just sufficient to cause the solder to run, that the parts to be soldered are perfectly clean and free from the slightest trace of grease, and that only a very thin film of flux is applied.

The chief causes of unsatisfactory soldered joints are: iron too cold or too hot, dirty parts, the failure to keep the soldering-iron on the parts long enough to allow them to reach the correct temperature for the solder to take, and the too liberal use of flux. The beginner would do well to practise with odd lengths of wire until he can make a really satisfactory joint before he attempts to use the iron during his radio assembly work.

Live Spindles

Certain components, such as variable condensers, switches and potentiometers, often have their operating spindle in contact with other parts of the component. This is of no disadvantage in many instances, but there are circuit arrangements where a short-circuit could be produced if the component is mounted on, say, a metal panel or a metal bracket fixed to a metallised wood baseboard, without taking the precaution of fitting insulating washers. This applies in particular to reaction condensers if the anode is connected to the moving vanes, and potentiometers or switches in any way connected with the positive H.T. supply. If the beginner is not sure about any component, then a simple continuity test should be applied, using a small dry battery and low reading voltmeter or headphones which will soon indicate if the spindle is alive. Failing this test, then it would be wisest to play for safety, and insulate the component from any metal mounting.

Long Leads

On no account should the wiring of a receiver be carried out in such a manner that long lengths of wire are used when short, direct connections could be made. This applies in particular to all wiring associated with anode, grid, reaction and heater circuits.

ON YOUR WAVELENGTH

By Thermion

Once a Month!

THE paper problem has not improved during the past months, and the shortage is having its inevitable effect on all publications. Costs are rising, and the supply has to be conserved and equitably rationed. Some readers may not perhaps understand what the ration means. Publications are limited to 30 per cent. of their normal requirements. That would mean, in effect, that we should only be permitted to publish an eight-page journal, which would not be satisfactory, firstly, from the readers' point of view, and secondly, from an economic point of view.

The inevitable solution is that this journal must appear once a month instead of once a week until the time arrives for the paper supplies to flow freely and *ad lib.* once more. Every reader joins with me in expressing the hope that this time is not too far distant. Monthly publication is the only solution under present circumstances. This issue, therefore, is the last of the weekly series for a time. The character of the journal will be maintained as a monthly magazine, and it will continue to include all of the features which have found their places in our pages week by week. In order that too great a period will not elapse between the last week's issue and the first monthly issue, our next issue—the first of the monthly series—will appear on August 7th, a fortnight's time.

Readers will understand that this measure has been adopted under force of present circumstances, but whether published *per mensem*, or even per annum, we shall continue to keep the flag of wireless experimentation and the interests of constructors and listeners flying until the piping days of peace, plenteous programmes, amateur transmission, experiment, and blueprints, and freedom from the curse of Hitler, return.

When those times arrive, this journal will revert to weekly publication. In the meantime will readers please note that the first monthly issue containing more pages, dated September and price sixpence, will be on sale on August 7th.

Appeal

ONE of my readers, R. W. L., who is stationed at a lonely spot, appeals to a fellow reader to provide his Company with a small battery portable. Anyone who has such a set and is willing to supply it should communicate with me marking envelopes "R. W. L."

The Wrinkles Page

I HAVE had a large number of letters from readers expressing opinions concerning this feature. The Ayes and the Noes are in about equal proportion. As the journal is now to be published once a month there will be a little more time to select items and to check them. One or two readers point out that the feature provides those not too well blessed with this world's goods with an opportunity for purchasing components which they would not otherwise be able to possess. That, of course, was the idea in introducing the feature, and since it was introduced in the first issue we have distributed over £1,000 to readers in this way. The whole basis of such a feature, however, must be originality. Even in the best organised communities there are the few black sheep. I have before me as I write a hint submitted by one who claims to be a reader, the illustration and text of which is copied word for word from an American magazine, and this, in spite of the warning which has been issued on the Hints Page, and in my columns, during past weeks. When such hints slip through, as occasionally they are bound to do, other readers who have seen the hint in its original setting may presume that we have resorted to the practice of lifting from other journals. I am particularly anxious, therefore, to lend my aid to putting a stop to this despicable practice on the part of a dishonest few. Suitable action will be taken in any further attempts on the part of these few to obtain money under false pretences.

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This illustration indicates the handy size of "The Radio Engineer's Pocket Book", which costs 3/6, or 3/9 by post. It contains 160 pages of facts, figures and formulæ, and easily slips into the waistcoat or uniform pocket. Send postal orders to The Publisher, Book Department, George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

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The Short-wave Log

MANY readers have asked for this feature to be reintroduced, but there are difficulties in the way. Some of the short-wave stations have been broadcasting anti-British propaganda and it is illegal now for editors to publish the times and the wavelengths of certain foreign transmissions. Rest assured when the moment is propitious this feature will be reintroduced.

Many readers who wrote to me about the Hints Page have also made valuable suggestions for future articles. Some of these suggestions will be put in hand.

The Radio Engineer's Pocket Book

THERE has been a big run on the first print of The Radio Engineer's Pocket Book recently published at 3s. 6d., or by post 3s. 9d. from the offices of this journal. Readers on active service find this handy size book of great value because it does not occupy a lot of space, easily slips into the uniform pocket and contains practically every radio fact, formula and table required. Additionally, it contains a great amount of other useful information applicable to other industries, and the mensuration and trigonometrical formulæ are two examples of this.

"The Superhet Manual" and "Diesel Handbook."

SIMILARLY, the Superhet Manual at 5s., by post 5s. 6d., has had a good reception. A large chunk of the first print has gone. These two latest additions to our library of standard technical works have elicited many letters of appreciation from purchasers. Readers who require copies should, however, order them at once. Whilst I am dealing with books I should like also to draw their attention to another technical volume published from the offices of this journal. It does not deal with radio, but, as so many readers are now driving diesel vehicles, they will certainly be interested in "Diesel Vehicles: Operation and Maintenance," which costs 5s., or 5s. 6d. by post.

Analysing Circuit Networks

How to Examine and Follow Modern Radio Circuits by a Simple Process of Sub-division

By H. J. BARTON CHAPPLE, B.Sc.

WHEN being initiated into the principles of circuits the first thing encountered is the simple one of a direct current source connected up to one or more pieces of apparatus in series which possess pure resistance only. Voltage, current and resistance are then inter-related by the well-known Ohms Law which says that current is equal to voltage divided by resistance. In a radio receiver, however, especially one of modern design, this simple rule can seldom be applied straight away, because in nearly every case there is an inter-connection between circuits which means that one component or lead is usually performing a double or triple function. To quote a simple case as an example the low-tension circuit of a battery-fed receiver also carries on one side the high-tension circuit along which flows the full anode current of the set. Furthermore, it is very seldom that we can isolate one integral circuit which is functioning as a result of a steady direct current flow. Alternating or fluctuating circuits at both high and low frequencies are circulating in the various circuit branches, and it is common knowledge that the behaviour of the various components in the set varies according to the rapidity of the alternations, and again is quite different from what would occur if only D.C. were present. The inductance of coils and wires, together with the capacity of condensers and wires have special effects on current flow and usually assume much greater importance in the receiver circuits than the resistance alone.

Points to Remember

The old hand will remember, and the beginner should know, that capacity and inductance offer a degree of opposition to the flow of alternating currents, which varies according to frequency and in a way which differs very materially. It simplifies matters considerably, therefore, if circuits and components are treated as separate networks in which are included inductance, capacity and resistance in either series or parallel combinations. This will enable the behaviour of the network to be predicted with accuracy when the values of the quantities are known or calculated in relation to the frequency of the alternating currents flowing in the circuit. There is no need to delve into mathematical intricacies in order to understand better the problems of networks, but one or two facts should be memorised. Although at very high frequencies a pure resistance increases slightly in value due to what is known as the skin effect, to all intents and purposes the resistance can be regarded as unchanged whether the current flow is alternating or direct. If resistances are placed in parallel so as to split the current path, the overall circuit resistance is decreased, but when in series the total resistance is increased.

When it comes to coils, transformers, chokes, etc., these possess what is known as inductance and present a definite impedance to the flow of alternating current, which impedance is measured in ohms. The higher the frequency the higher becomes the impedance, and in consequence it is frequently found that the drop in voltage across an inductance, when direct current is flowing, is much less than the A.C. voltage drop when an alternating current is passed through the componen

A Cancelling Effect

In the case of condensers the property they possess is that of offering impedance to the passage of an alternating current, this impedance decreasing in ohmic value as the frequency increases. That is to say, its opposition to current flow works in the opposite way to that of an inductance, and if an inductance and condenser are placed in series, then the effects tend to cancel one another out. Of course, it is known that no one component or part of a circuit possesses inductance, capacity or resistance in a pure form, but they can be treated in network form as having these items correctly interlinked for the purpose of any calculations.

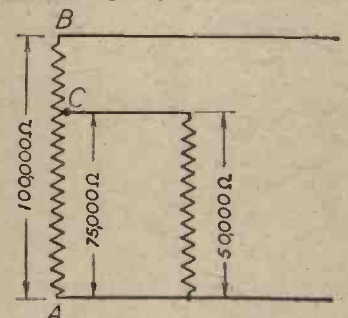


Fig. 1.—A potentiometer application for a simple network.

For example, a special coil may offer a high impedance to the flow of an alternating current, but the capacity effect of the windings themselves is equivalent to placing a condenser across the extremities of the component, and this may seriously affect its working, while the D.C. resistance of the coil is another factor which has to be taken into consideration.

A Practical Example

Armed with the knowledge of these elementary facts, however, it is now possible to see how simple network analysis can be undertaken. Hardly a single receiving set is made now, whether mains driven or battery fed, without some form of potentiometer being incorporated in the circuit so as to break down the full voltage to one or more intermediary values to enable valve electrodes to be furnished with their rated potentials. This is really a simple network, but its simplicity provides a pitfall into which many people fall. For example, if a 100,000 ohm potentiometer is joined across a D.C. source of 200 volts there will be a uniform reduction of voltage along the resistance winding in direct proportion to the amount of resistance in circuit. It is very seldom, however, that voltage alone is required but rather that current has to be drawn from the network, while at the same time maintaining the voltage which should be applied, to, say, one of the screens of a valve. Furthermore, the addition of a resistance in parallel with the potentiometer tap point reduces the total resistance across the main voltage supply.

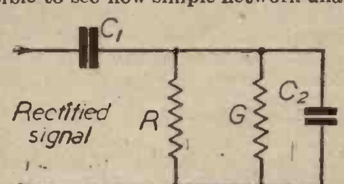


Fig. 2.—The elements of R.C. coupling shown as a network.

A suitable example will make this clear, and as an illustration it will be assumed that there is a 100,000 ohm potentiometer across a 200 volt supply, this giving a current flow through the resistance of 2 mA. If, as shown in Fig. 1, a 50,000 ohm impedance is tapped on to a point distant 75,000 ohms from the bottom end, then at first sight this would seem to give a voltage of 150 between A and C. The 50,000 ohm resistance in parallel between points A and C has altered matters, however, and the combined resistance between A and C is now 30,000 ohms, making the resistance AB equivalent to 55,000 ohms. Current flow from B to C will now be just under 4 mA, and the drop of voltage between B and C will be approximately 90 volts, making the potential available between A and C equal to 110 volts, instead of the 150 volts without the 50,000 ohms in parallel.

A Popular Coupling

Yet another application of network analysis is seen in the familiar form of resistance-capacity coupling, which was so popular in the early home constructor days. The rectified or low-frequency signals are fed via a coupling condenser to the grid of the first L.F. valve whose grid is taken to bias via a grid leak. If this circuit is turned into a network it will be as shown in Fig. 2 where R is the grid leak, G the filament to grid resistance of the L.F. valve, C1 the coupling condenser, and C2 the capacity existing between grid and filament. To apply the necessary rectified signal to the grid of the L.F. valve, that is across R, there must be only a small drop of voltage across C1, in other words the capacity of C1 must be reasonably high. After this there are three paths in parallel, which reduces the overall impedance, and it is essential to keep the impedance across the grid of the valve high. This condition is usually met by the normal value of G, but if C2 happens to be of too large a value, then the reactive impedance offered by that section of the network will be too low at the highest frequencies the circuit is called upon to handle. This simple network, therefore, explains why a limitation to successful operation of such a simple circuit is so often set by valve inter-electrode capacities.

Yet another simple network is provided by the familiar smoothing circuit placed after the valve or dry rectifier used for converting A.C. into D.C. This circuit smooths out the rectified supply, and if the main smoothing choke and second condenser are regarded as being in series across the rectified supply, then it is easy to see that there is only a very small D.C. drop of voltage across the choke, which leaves the remainder for feeding to the appropriate voltage feed.

Simple Trickle Chargers

Details of A.C. and D.C. Charging Systems for the Beginner

IN conjunction with an H.T. battery eliminator, a trickle charger provides the simplest means of operating a battery set from the mains supply. In addition, the conversion is less costly than that involving the use of special A.C. valves, because it makes possible the use of exactly the same components as before. Yet another advantage is present when the mains supply is D.C. because the modification of a battery set to run from this supply is not always easy.

The trickle charger can be made up either as a unit entirely on its own, or as a part of the H.T. supply unit. In this article, however, we will consider the L.T. portion as being separate from the rest of the power supply, although readers will readily understand how it can be incorporated.

For D.C. Mains

The very simplest form of trickle charger is that for use on a D.C. supply, since this does not necessarily involve the use of any wireless components at all, but only of an electric lamp, lamp-holder, and a length of flex. The arrangement is shown in Fig. 1, where it will be seen that the electric lamp is wired in series with one lead to the accumulator from the supply socket. The purpose of the lamp is to limit the current passing through the accumulator to the correct figure for charging purposes. Thus, by changing the lamp for others of different wattage rating the charging current can be varied as desired. This a a point which is frequently misunderstood, and readers often write to ask how the lamp can possibly be suitable since a voltage approximately equal to that of the mains supply must be applied to its terminals, and thus the same voltage must be applied to the accumulator. This reasoning is not sound, for the voltage actually applied to the lamp or to the accumulator is dependent upon the resistance of the component concerned. (If you cannot appreciate this, apply Ohm's Law, which has been given often enough in these pages.)

The Charging Current

We have said that the charging current depends upon the wattage of the lamp, so we must now explain further. The wattage is the product of the applied voltage and the current in amps, so that if the voltage is, say, 240, a 60-watt lamp will pass .25 amp. (60 divided by 240). In the same way, a 40-watt lamp will pass .16 amp., or a 100-watt lamp about .4 amp.

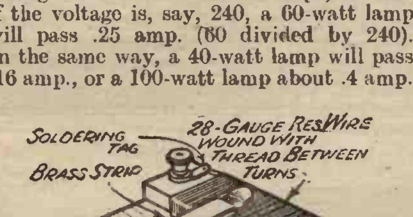


Fig. 3.—This illustration shows the constructional details of the 10 ohm variable resistance described.

The same method of working can be applied to other supply voltages and other lamp ratings.

Generally speaking, a charging rate of between .25 and .5 amp. will be suitable, and a 60- or 100-watt lamp can thus be used. There is only one point to watch in

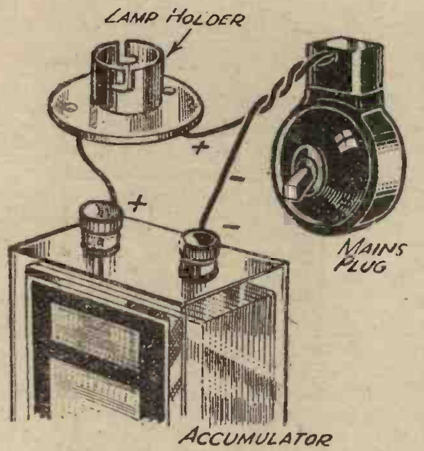


Fig. 1.—Showing the simple arrangement of a trickle charger for use on D.C. mains.

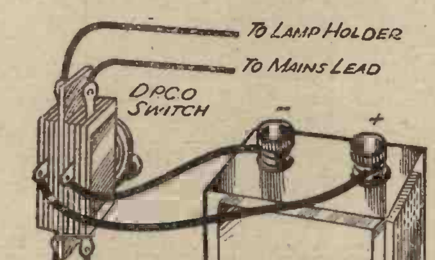


Fig. 2.—The switching system for transferring the accumulator leads from the set to the charger when the former is out of use.

connection with this simple form of charging from D.C., which is that the polarity of the supply to the accumulator must be correct and as shown in Fig. 1. There are different methods of finding the polarity, but the simplest of all is to dip the two leads to be connected to the accumulator terminals into a glass of salty water. A lamp must be included in series with one lead. Keep the leads well apart, grip the insulated flex with a strip of rubber or other good insulating material and observe the bubbles given off from the ends of the wires; the wire from which the greater number of bubbles is liberated is the negative. After finding this, clearly mark the leads by binding coloured string round them, or by fitting coloured spades. Also mark the mains plug connector so as to ensure that it is always replaced in the socket with the pins the same way round.

Switching Arrangements

It will be convenient to provide a simple switching arrangement so that when the L.T. supply to the set is cut off the accumulator is automatically put on charge. This can most easily be done by connecting a double-pole-double-throw Q.M.B. switch, as shown in Fig. 2. The time of charging should be such that slightly more power is put into the accumulator by the mains than is taken out by the set. Thus if the L.T. consumption of the set is .4 amp and the charging rate .25 amp., the accumulator should be charged for about two hours for every hour the set is in use. By careful choice of the lamp wattage, however, it will be possible to leave the accumulator on charge for the whole of the time that the set is out of use.

An A.C. Trickle Charger

Charging from A.C. mains is an entirely different proposition, because it is necessary to reduce the supply voltage to a suitable figure, and also to rectify the current, so that D.C. is applied to the accumulator. In practical terms, this means that a transformer and a rectifier must be interposed between the mains and the accumulator. The transformer may be made by using three dozen No. 4 Stalloy stampings for the core, and allowing 16 turns per volt for both primary and secondary windings. The primary may be wound with 38-gauge enamelled wire, and the L.T. secondary with 24-gauge d.c.c., assuming charging current up to .5 amp to be suitable.

The actual charging voltage required is 2.7 volts per 2-volt cell, but allowance must be made for the voltage drop across the rectifier. The latter, incidentally, can be done by using two of the cells as described for the H.T. section wired in parallel, as indicated in Fig. 4. The secondary should then be wound to supply 7 volts (112 turns) when a 2-volt accumulator is to be charged, 9 volts for a 4-volt accumulator, and 11 volts for a 6-volt accumulator. In nearly every case the lowest voltage will be used, but it is a good plan to wind the transformer for the highest, and to take tappings for the other two outputs. We are not going to give any further constructional details for the transformer, because these have all appeared in previous issues.

Making the Variable Resistance

A variable resistance is shown in Fig. 3, and although this is not strictly essential, it is very desirable, since it prevents fluctuation of the charging voltage and

(Continued on next page.)

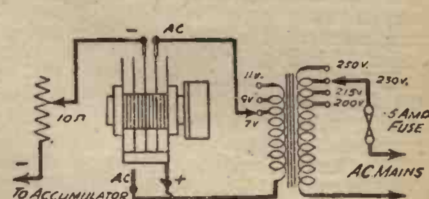


Fig. 4.—The circuit required when using the Westinghouse L.T. 2 rectifier.

SIMPLE TRICKLE CHARGERS

(Continued from previous page.)

allows the current to be varied over fairly wide limits. The resistance is shown as being of 10 ohms, and it can be made by winding 2½yds. of bare 28-gauge Eureka wire on a strip of fibre, and making a springy brass strip to slide over it, as shown. It will not normally be necessary to vary the resistance, and the slider can be set to its midway position, but it is well to check the current in the first place by inserting an ammeter between the resistance slider and the accumulator positive terminal. The resistance can then be varied until the charging current, determined as described above, is provided.

Switching With the A.C. Unit

The method of switching the accumulator from "charge" to "discharge" is somewhat different from that suggested in connection with the D.C. unit, but a reliable (and it must be of good make) Q.M.B. switch can be used by following the connections indicated in Fig. 5.

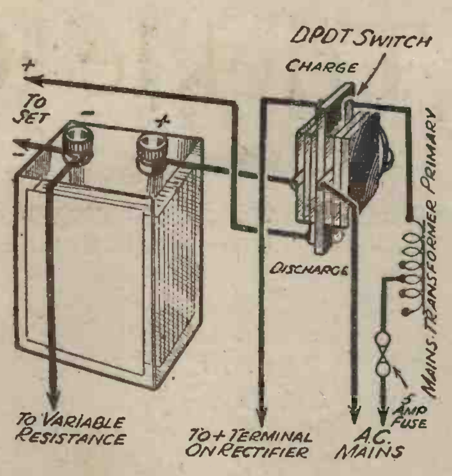


Fig. 5.—The switching system required when using an A.C. trickle charger.

It is possible to modify the mains transformer used for H.T. supply so that it includes an L.T. winding to feed the rectifier, but this is not quite so satisfactory from the constructor's point of view. Should any readers care to adopt the idea, however, it will only be necessary to wind the L.T. secondary winding over the other windings on the spool—placing a layer of oiled silk or insulating tape between the windings—and to connect this to the rectifier. The number of turns will be according to the voltage required and the turns per volt allowed on the original transformer. When this system is followed the method of switching the accumulator will be the same as that shown in Fig. 2, except that the two upper terminals on the switch will go to the variable resistance and rectifier, instead of to the negative mains lead and the lamp. It will also be necessary to include an additional on-off switch in the H.T. circuit.

Problems of the Potentiometer

How to Calculate Voltage Drop and Current Distribution

MOST experimenters can apply the simple rule known as Ohm's Law to the calculation of the value for a voltage-dropping resistance in a radio receiver. Whether the resistance be required for adjusting the value of the anode voltage, or the provision of automatic grid bias, or as a line resistance to ensure the correct heater current in a universal set, the method of calculating its value is the same, namely, to multiply the required voltage drop by 1,000 and to divide the result by the current to be passed expressed in mA. The answer will give the required resistance in ohms.

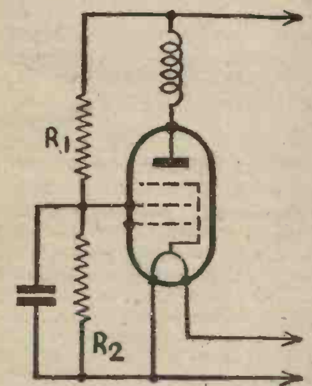


Fig. 1.—A fixed potentiometer for obtaining the screening-grid voltage.

In certain positions, however, a mere series resistance is not entirely satisfactory, and in such cases—as, for instance, for obtaining the screen voltage of a screen-grid or screened pentode valve, it is necessary to make use of a potentiometer arrangement with a fixed tapping point as indicated in Fig. 1.

Although the calculation of the values of the two fixed arms of the potentiometer is really quite a simple matter, being nothing more nor less than a slight extension of the Ohm's Law principle, many constructors find it something of a bother. The following brief explanation, however, should relieve the problem of all its difficulties.

Referring again to Fig. 1, it will be seen that the circuit consists of three parts: the upper portion of the potentiometer resistance, R1; the lower arm of the potentiometer, R2, in series with R1 across the high tension supply: and the screen-cathode path of the valve, which is in parallel with R2. If we consider the screen-cathode path as a simple resistance, the "equivalent circuit" of the arrangement will be shown in Fig. 2, where R3 represents the screen-cathode path.

Current Distribution

We can now examine the current distribution in this network. First of all, it will be clear that if the valve were removed from its socket there would be a steady flow of current through the potentiometer of a value equal to the H.T. voltage divided by the sum of R1 and R2. This is what is called the "standing current" of the potentiometer. Now, if the valve is again plugged into its holder, the screen current will flow through R1 and R3, in addition to the standing current through R1 and R2. Thus, the current in R1 will be equal to the potentiometer standing current plus the screen current of the valve, the current in R2 will be equal to the standing current only, and the current in R3 will be the screen current only.

In order to ensure "good regulation"—that is to say, a reasonably constant screen voltage under varying circuit conditions—it is usual to arrange the network so that the potentiometer standing current is at least four times the screen current. Let us assume that in a certain battery receiver an anode feed voltage of 100 v. is available, that the correct screen voltage for the high-frequency pentode employed is approximately 40 volts, and that under these conditions the screen current will be 0.4 mA.

The first step is to decide upon a suitable value for the potentiometer standing current, which, for the sake of argument, we will make 1.5 mA., or a little less than four times the screen current. It will be clear, therefore, that the resistance R1 will have to carry 1.5 plus 0.4 mA., or 1.9 mA. in all, and in doing so drop 60 volts, leaving 40 volts, the required screen voltage. The value of R1 should be 60 multiplied by 1,000 and divided by 1.9, or, approximately 31,500 ohms. R2, which has to pass only the standing current of 1.5 mA., and drop only 40 volts, should have a resistance of approximately 26,500 ohms. As these values are not standard resistance sizes, R1 would probably be made 30,000 ohms and R2 25,000 ohms.

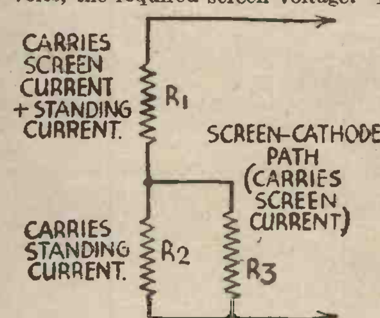
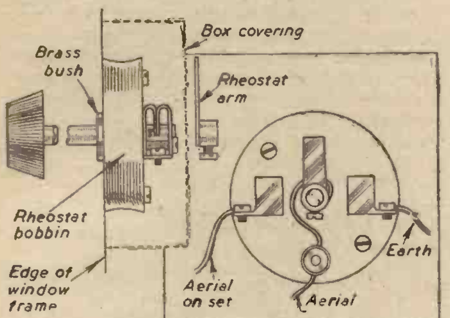


Fig. 2.—The equivalent electric circuit of Fig. 1.

Practical Hints

Semi-rotary Aerial-earthing Switch

HERE are particulars of a very useful aerial-earthing switch I have constructed and used with great satisfaction. It is made so that the hole in the window frame for the existing aerial can be utilised.



An improvised semi-rotary aerial-earthing switch.

The ebonite bobbin and arm (cut short) were taken from an old rheostat, and the two clip contacts from an old knife switch. The clips need drilling and are fixed by means of a nut and bolt to the base, thus providing terminals. A brass bush is fitted in the centre hole, and in this revolves the rod with the arm attached. A pigtail connects the aerial terminal to the arm, and the switch is enclosed in a small wooden box on the outside of the window frame, as indicated in the sketch.—JOHN BRIDGES (Gateshead).

Making Insulating Spacer Washers

THE constructor frequently finds the necessity to space and insulate certain components away from panels, baseboards, brackets, etc., and for this some form of insulating washer or collar is required.

Where such extras are not supplied with the component, the amateur will generally cut them from a sheet of ebonite or paxolin, filing each down to the required thickness, which is often a rather laborious process.

A simple method, worth a trial, is that of cutting these washers out of plastic wood. As will be seen from the sketch, the plastic wood is rolled out to the required thickness on a sheet of glass or metal (not wood), small home-made punches being then used to cut out the required circles. These are then left flat to thoroughly harden, and can afterwards be dipped in thin shellac to make them damp-proof. The punches can be quickly made from a sheet of copper foil, cutting strips, and rolling round pencils, etc., and giving each a touch of solder at the top and bottom of the seam. In making the washers, it will generally be found best to cut out the outside diameters first, and then the small inside ones, as the centres can be more easily judged in this way.—R. L. GRAPER (Chelmsford).

A novel method of making insulating spacing washers.

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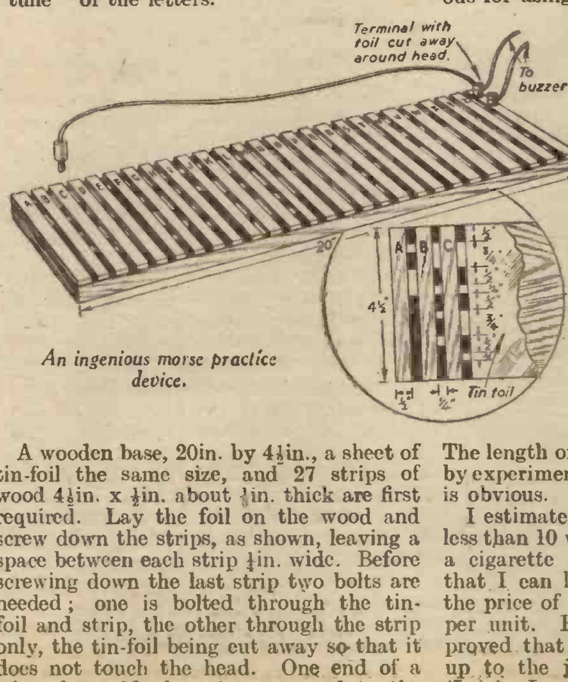
A Morse Practice Device

THE accompanying illustration shows a device I use for morse practice. Readers learning the morse code will find this simple apparatus a help for getting the "tune" of the letters.



An ingenious morse practice device.

A wooden base, 20in. by 4½in., a sheet of tin-foil the same size, and 27 strips of wood 4½in. x ½in. about ⅛in. thick are first required. Lay the foil on the wood and screw down the strips, as shown, leaving a space between each strip ½in. wide. Before screwing down the last strip two bolts are needed; one is bolted through the tin-foil and strip, the other through the strip only, the tin-foil being cut away so that it does not touch the head. One end of a wire about 2ft. long is connected to the latter bolt, and to the other end of the wire a plug is connected.

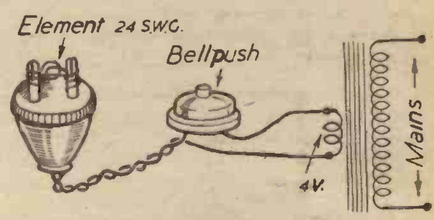
Now, beginning in the first space on the left-hand side, measure down ½in. from the top and paint over the space with a small brush. Now miss a ¼in. space, paint a space ½in. long, miss ¾in. and paint the remaining space down to the bottom. Mark this strip A. It will be seen that a space ¼in. is left for the dots and ¾in. for the dashes, with ½in. painted between the dots and dashes. The illustrations make this clear, the shaded parts being the ones that are painted.

It may be found necessary to paint the parts over with two or three coats to make good insulation.

In use, the terminals are connected in place of the morse key, then on drawing the plug down the slots the appropriate letters are sounded in the buzzer or oscillator. It will be noted that the timing will be correct at any speed.—A. SOUTHWOOD (Saltford).

A Cigarette Lighter

JUDGING from the burnt matches which found their way into the ash-tray, my den is a popular resort for the short-wave fans of the district. Since they are notorious for using my matches, I constructed a lighter which has proved its worth, especially now that the match shortage has become evident.



An electric cigarette lighter for the radio den.

I found an old two-pin plug top in my junk, and this, together with a piece of flex, a couple of inches or so of 24 S.W.G. resistance wire, and a small bell-push, completed the job. The flex is wired into the plug in the normal way and the resistance wire in the form of a double loop is connected in the slots of the plug pins. The supply is taken from the 4v. winding of the old mains transformer in my test panel. The length of the heating element I found by experiment. The object of the bell-push is obvious.

I estimate the loading of the element at less than 10 watts, and the time for lighting a cigarette at five seconds. This means that I can light over 2,000 cigarettes for the price of one match with current at 1d. per unit. For the drawing-room I have proved that a bell transformer will stand up to the job without harm.—E. JACKS (Leigh, Lancs).

Comment, Chat and Criticism

Outline of Musical History–10

Further Sketches of the Lives of Some of the Leading Figures in the Romantic Movement. By Our Music Critic, MAURICE REEVE

CONTINUING our sketches of the lives and work of the great figures of the nineteenth-century romantic movement, we must not omit that of Hector Berlioz who was born in Côte-Saint-Ande, France, in 1803. Sent to Paris to study medicine, he forsook his search for the Hippocratic oath and entered the Conservatoire, gaining the coveted "Prix de Rome," with his cantata "Sardanapalus" in 1830.

All his life he was also a literateur, and most of the inspirations for his major works came from his study and admiration of such kindred spirits as Byron, Scott, Hugo, Dumas, etc. His own memoirs are one of the most remarkable and outspoken autobiographical works. He made concert tours and visited London in 1851. After visiting Liszt in Weimar, he settled in Paris, where he died in 1869.

Berlioz was a remarkable genius and, not unnaturally, possessed all the defects of his qualities. Throwing all conventions to the four winds and, in spite of a worship of Beethoven, abandoning all classical forms, he wrote programme music *par excellence*. His orchestra was his palette and he used it solely to illustrate the story he set out to tell. It was an enormous orchestra, which, in his "Requiem," contained sixteen kettledrums, sixteen trombones, sixteen trumpets, four ophicleides, two tubas, ten cymbals, twelve horns, etc.

His so-called symphonies and overtures are all expressions of some story or scene from life founded on the poetry or prose of the similar movement which governed literature then, as it did music. "Les Francs Guges," "Waverley," "Rob Roy," "King Lear," "Harold of Italy," "Symphonie Fantastique" (episode in an artist's life), are some of the titles. His choral works include "La Damnation de Faust," "Romeo et Juliette," and "l'Enfance du Christ." His operas, "Benvenuto Cellini," "Béatrice et Bénédict" and "Les Troyens," are no longer on the repertory as such, but much of the music is standard fare in the concert hall.

All Berlioz's work is on a colossal scale, and stamped with a most original genius, though many a page is tedious padding and many an effect a vulgar display. But movements such as the "Royal Hunt" and the "Storm," in "Les Troyens," are imperishable masterpieces.

I purposely brought forward the notice of Rossini and his work for reasons stated at the time. Otherwise, and chronologically, he would occupy this and the following paragraphs.

Chopin

Chopin, 1810-1849 is altogether a unique figure in music, and to his work, perhaps more than to that of any of the others, would we refer to if we wanted to cite the quintessence of the romantic movement.

Born near Warsaw of a French father and a Polish mother, he made his home in Paris from 1831 onwards, and lived amongst the highest society and all the leading spirits of the movement. A brilliant pianist and teacher, he founded a dynasty of great "Chopin" players, the first generation of whom were his own pupils. The supreme poet of his instrument, he founded both an entirely new school of piano writing and of piano technique.

His work, with a few minor and second-class exceptions, was given wholly to the piano. Consequently one cannot mention his name along with the great symphonic or operatic masters—more especially one like Beethoven who was supremely great in almost every department and branch of music. But although Chopin must be considered a miniaturist by the side of such men, his work for the piano was so perfect, and as a musician he was so astonishingly original, that, coupled with the enormous influence he has exercised right down to our own time, he must be ranked amongst the first flight of creative masters, even if we impose the qualification already alluded to.

His output was very small—judged by any standard—and limited to one instrument. But he furnished that instrument with a series of master works which still holds its place of supremacy in pianoforte literature. In his four Ballades, four Scherzos, twenty-four Studies, Polonaises, Nocturnes, two Sonatas (the first one is negligible), Barcarolle, Fantasie, Polonaise Fantasie, Berceuse, etc, he gave us an entirely new type of work based on an entirely new conception of the piano as a medium of musical self-expression.

Although austere in so far as they are "absolute" music and devoid of semblance of a programme, they glow with romantic passion and an intoxicating "something" that renders them unique in piano literature. Daringly original in form and exploiting the chromatic scale to lengths undreamed of before, they have held the platform with an ever-increasing devotion on the part of pianists, musicians other than pianists, and audiences alike.

As a Melodist

But it is above all as a melodist that he is revered by so many, though the thoughtful musician finds him the subtlest of harmonists as well. A Chopin melody, together with its incomparable ornamentation, has no counterpart anywhere else in music. Only Schubert or Mozart might stand alongside with him. But their styles and media were so different that comparisons are scarcely legitimate.

A spirit of romance pervades every page of his work. But it is not a namby-pamby romance, but a virile and masculine emotion which is charged with all the pulsating throb of life itself. Works like the scherzos and polonaises are demonaic in their furious energy, and they rush and sweep the listener onward with their cataclysmic fury.

Even in the gentlest and sweetest numbers such as the G major Nocturne, the Berceuse or some of the preludes, Chopin is always the tenderest and most solicitous of lovers; never the mere sentimentalist. But when he is aroused, as in the works mentioned above, the two sonatas, some of the other preludes, etudes, etc., no piano music outside Beethoven's can compare with his for their thrill and emotional appeal. They range over the whole gamut of human feeling and they exploit the instrument, in every direction, to the fullest limits of its capacity. The very soul of the piano is enshrined in his pages to a greater degree than in any other writer for the instrument. Beethoven and a few of Liszt's choicest works excepted.

Chopin was a master craftsman, if on a small scale. His "Ballade" and "Scherzo" forms—if I may coin such a phrase—are entirely original and have never been even successfully imitated. All his work is finished and polished to the nth degree, and not a ragged thread can be found in his entire output.

A Brilliant Pianist

He was an extremely brilliant pianist and numbered most of the leading lights of Parisian society and fashion as his pupils. As with Beethoven, the dedications at the head of his works offer an illuminating key to the world he moved in. It is said that on the days before his public appearances as pianist he practised nothing but Bach's preludes and fugues.

The "Chopin technique," the "Chopin rubato;" in fact, the whole "bag of tricks" for playing Chopin's music and imparting to it that enchanting "something" which always stirs us so when we hear it, are traditions which have been passed down through five generations of pianists and pianist teachers from the master himself, who confided with such of his own disciples as Scharwenka, Mikuli, Klendworth, etc. To-day, the Pole, Vladimir Horowitz, is unquestionably the most inspiring exponent of this most delectable music in the world. He has just turned thirty and, ultra-modern in his method and style, he is an incomparable pianist in many other masters than Chopin, but in Chopin's music particularly.

The playing of Chopin's music is perhaps the most "personal" thing there is in the concert world to-day. Unquestionably the most widely performed of all the piano masters, it is, for this reason, the least frequently well played. It demands qualities of temperament and of a personal approval to the music which makes it readily understable why we so seldom hear it played to our complete satisfaction.

Circumstantial evidence strongly shows that the chief of these requirements is a few drops of Polish blood in the player's veins. For it is undeniable that, with one or two honourable exceptions, all the master Chopin players are Poles. They alone succeed in imparting to it that "something" without which it falls so flat. Or perhaps I might put it the reverse way, and say that they alone distil from it the incomparable perfume, or otto, which makes of it the most unique, striking and seductive work that the most fortunate of instruments can claim for its own.

Intervalve H.F. Coupling

In This Article We Discuss the Choice of Couplings to be Used Between an H.F. and a Detector Stage

LAST week we dealt with the question of amplifiers employing two H.F. stages, but there are also several interesting details worthy of explanation in simple H.F. stages. We have seen in past issues that questions of selectivity and sensitivity are answered by H.F. amplifier design, but many constructors find difficulty in deciding upon the circuit to be used in a simple single H.F. stage. We refer in this connection to the intervalve coupling, and not the aerial circuit. There are at least three forms of coupling available, and each of these has its own particular merits, and all are suitable for incorporation in a modern receiver. Perhaps the most usual form of coupling is that known as the tuned-grid, and shown in diagrammatic form in Fig. 1. In this arrangement an H.F. choke is included in the anode circuit of the H.F. valve and a lead is taken from the lower end of this to one side of a fixed condenser, the other side of which is joined to the tuning coil in the grid circuit of the detector.

This circuit arrangement is very suitable when building an amplifier for adding to a normal detector-L.F. receiver, since the fixed condenser is then merely connected to the aerial terminal of the original receiver. It is evident that the high-frequency amplifier simply takes the place of the aerial, supplying the input to the detector—but after amplification. The tuned-grid coil calls for very little consideration, for it is simply a standard tuner of any type, although if a ganged condenser is to be employed it should have characteristics exactly similar to those of the tuning coil used in the grid circuit of the preceding valve. If the coil is of different type it is probable that it will be impossible properly to trim the sections of the gang condenser, with a result that there must be a tremendous loss in signal strength, especially at certain parts of the tuning scale.

Ganged Tuning

To prevent this trouble, the best course is to employ separate condensers for the two circuits or to use a two-gang condenser of the type having an external trimming adjustment capable of producing a fairly wide variation in capacity—.0001 mfd., for example.

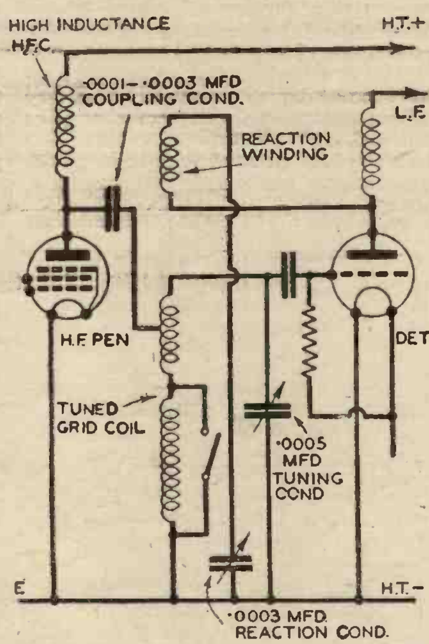


Fig. 1.—A tuned-grid intervalve circuit (with reaction). Battery valves are shown, but the connections are similar for mains valves.

The H.F. choke is a very important link in the circuit, and has a considerable influence upon the efficiency of the finished set. First and foremost, the choke should have an inductance of not less than 200,000 microhenries, whilst a value of twice this figure is to be preferred when using a high-frequency pentode, the A.C. resistance of which might easily be as high as 1,000,000 ohms. The choke should also have as low a self-capacity as possible consistent with the appropriate inductance, a value of 3 to 5 mmfd. being sufficiently good for the purpose. It is also desirable that the choke should be of the screened type, since the screening assists very considerably in obtaining stable operation of the receiver when it is adjusted to give really high amplification. It is sometimes considered that if the coils are screened it is unnecessary to screen the chokes as well, but it must be remembered that the latter can create an extensive magnetic field which might easily "link" with nearby connecting leads and other necessarily unscreened components such as fixed condensers.

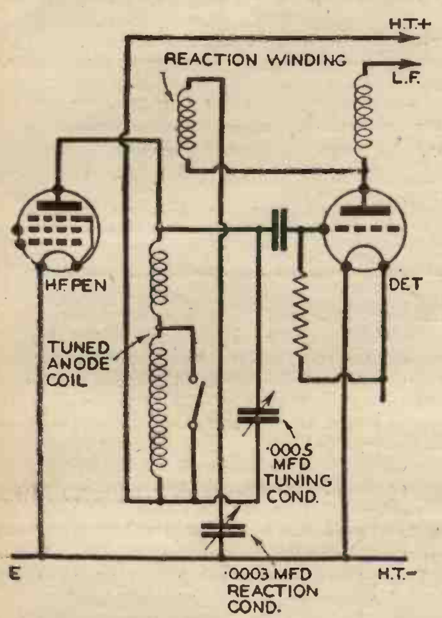


Fig. 2.—The simplest form of tuned-anode circuit in which the tuning condenser is connected in parallel with the anode coil (the same type may be used as in a tuned-grid circuit).

The fixed coupling condenser is not generally a critical component, and it is almost invariable to choose a value of .0002 mfd. for it. This is, in fact, a good average, but a certain increase in selectivity can be obtained by reducing this value to .0001 mfd., and a little extra signal strength may be gained by using a capacity of .0003 mfd. This point will best be appreciated when it is remembered that the condenser acts in a very similar manner to that component frequently included between the aerial lead-in and the aerial terminal on the set; this being the case, many constructors may prefer to use a preset condenser, which can be modified until the most suitable capacity is found.

Tuned-anode Coupling

A simpler circuit than the tuned grid is the tuned-anode arrangement shown in Fig. 2. In this case the choke is not required, the tuned winding of the coil being wired directly in the anode circuit of the H.F. valve. Correctly used, this method of connection—in theory, at any rate—gives rather greater input to the detector than the tuned-grid circuit, although in practice this is not always realised. The reason for the greater efficiency is that the impedance in the anode circuit of the H.F. valve is infinite when the set is tuned to a signal, whereas the impedance of the choke must be appreciably lower. The chief practical advantage of tuned anode, however, is that it saves a choke and a fixed condenser. On the other hand, the circuit as shown has the definite disadvantage that the moving vanes of the tuning condenser are not connected to earth, but to H.T.+, which means that a gang condenser of normal type could not be used. This little difficulty can easily be overcome by using the connections shown in Fig. 3, where a 1 mfd. fixed condenser is connected

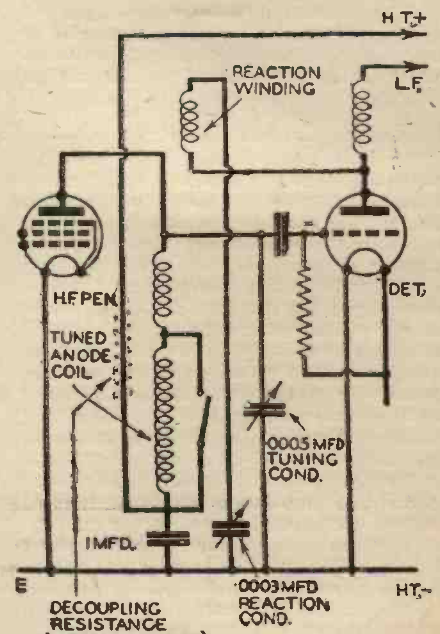


Fig. 3.—An improved tuned-anode arrangement in which an ordinary gang tuning condenser can be employed.

INTERVALVE H.F. COUPLING

(Continued from previous page)

between that terminal of the coil which is joined to H.T.+ and earth, the variable tuning condenser being connected between the anode of the H.F. valve and earth. It will be seen that in this case the tuning condenser is in series with the high-capacity condenser across the coil; this, however, produces the same effect as when the tuning condenser alone is in parallel with the windings. When it is necessary to

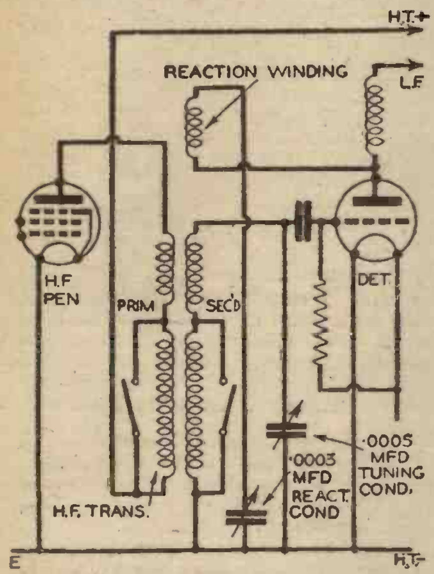


Fig. 4.—An intervalve coupling circuit which combines the advantage of tuned-grid and tuned-anode—the tuned H.F. transformer arrangement.

decouple the anode circuit of the H.F. valve, or when the H.T. voltage to it has to be "dropped," the 1 mfd. condenser is required in any case, and so its cost need not be considered. A decoupling resistance is indicated in Fig. 3 by broken lines. There is one other slight disadvantage of the tuned-anode circuit, even when it is arranged as shown in Fig. 3, which is that the full voltage of the H.T. supply is applied between its terminals, so that if the vanes were to touch, a short-circuit would result. Provided that a good-class condenser be used, however, this can be ignored.

H.F. Transformer Coupling

The third form of intervalve coupling is that shown in Fig. 4, and this is in reality a combination of the other two arrangements. The coupling provided is by means of an H.F. transformer, the secondary winding of which is tuned, the primary being aperiodic. In the present instance it is not possible to use a three-point wave-change switch, and two separate on-off switches, or a four-point switch, must be used instead, unless a by-pass condenser is used in the same manner as in the tuned-anode circuit described above. The tuned-transformer method of coupling combines the advantages of both of the systems previously considered, besides which, theoretically, it provides a certain amount of voltage step-up, due to the secondary winding having a greater number of turns than the primary. This additional amplification is not always realised in practice, but the method of coupling is extremely good when a well-designed coil is employed. But if a poor coil is employed it is usual to find that the receiver is very inefficient at various wavelength settings, or that reaction control is very "unsteady."

As far as the single-valve high-frequency amplifier which we are considering is concerned, it does not matter very much which of the three types of coupling is used, provided that the disadvantages and special points dealt with are borne in mind. On the other hand, when we come to consider a receiver having two H.F. stages the position is rather different, and it is best for the amateur to avoid using a pair of tuned-anode circuits, because it is then usually rather difficult entirely to avoid self-oscillation, due to the fact that the circuits are *too* efficient, as mentioned in last week's article.

Component Layout

It will probably be best now to turn away from the purely circuit design for a time and deal with the question of component layout. This is, unfortunately, a matter which is rather difficult of adequate explanation. The principal reason for this is that the actual disposition of the components must depend, essentially, to a very great extent upon the size of chassis or baseboard, and the type of cabinet into which the finished receiver is to be fitted. Because of these difficulties we must first explain the matter in rather general terms in an attempt to supply the information required by the constructor-designer in planning his own particular receiver.

One explanation of the matter of arranging the parts is to the effect that they should be placed as nearly as convenient in the same relative positions as they occupy in a conventional circuit diagram. This is not a bad way of viewing the question, since a circuit is drawn in the most compact form possible, so that the leads between the various components are as short as possible, that the H.F., detector, and L.F. sections of the circuit are spaced out, and that there is a logical sequence of valve stages. This general idea can be followed whether chassis or baseboard construction is adopted, but in the former case the parts can be rather closer together and may "overlap" to a certain extent, due to the fact that some are mounted on the upper and some on the lower surface of the chassis. An example of a suitable general arrangement of the components in a three-valve (variable-mu H.F., detector, and pentode) circuit is shown in Fig. 5, which indicates the approximate lengths of wiring.

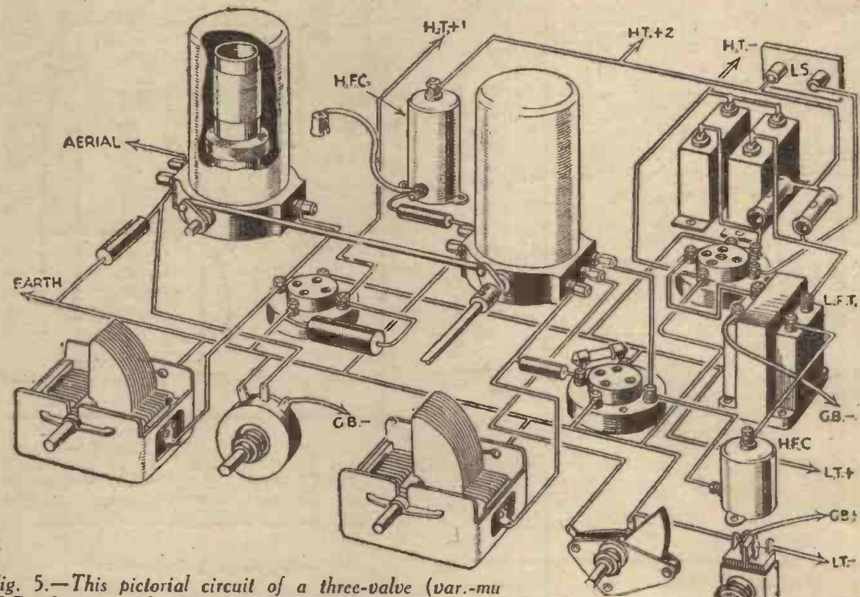


Fig. 5.—This pictorial circuit of a three-valve (var.-mu H.F., detector and output pentode) receiver gives a good idea of a suitable component layout.

LATEST PATENT NEWS

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume or in bound volumes price 2s. each.

NEW PATENTS

These particulars of New Patents of interest to readers have been selected from the Official Journal of Patents and are published by permission of the Controller of H.M. Stationery Office. The Official Journal of Patents can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2., price 1s. weekly (annual subscription, £2 10s.)

Latest Patent Applications.

11028.—Philips Lamps, Ltd.—Remote-control wireless receivers. June 29th.

10998.—Standard Telephones and Cables, Ltd.—Single side-band diversity radio-receiving system. June 28th.

10999.—Standard Telephones and Cables, Ltd.—Single side-band diversity radio-receiving system. (Cognate with 10998.) June 28th.

Specifications Published.

522889.—Eckersley, P. P., and Carpenter, R. E. H.—Wire broadcasting-receivers.

522737.—Murphy Radio, Ltd., and Davies, K. S.—Synchronisation of television receiving apparatus.

Printed copies of the full Published Specifications only, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at the uniform price of 1s. each.

Open to Discussion

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

Audible Radio Frequencies

SIR,—I have read with interest the articles of Mr. D'Arcy Ford on the subject of detection, and have, each week, hoped to find a letter from one of your readers disproving the new theory which he refers to. However, as I have not yet read anything of the sort I felt bound to write and comment on it myself, as, were Mr. Ford's principle correct, it might cause great trouble to newcomers to radio who are endeavouring to understand the principles of audio-frequency coupling.

Although the output from a detector might consist of a radio frequency wave with its datum line shifted, I cannot believe that such an output can pass through the A.F. stages of a receiver, or at least through the A.F. stages of a receiver of normal construction. Therefore I do not propose to disprove any of the theory of the workings of the detector itself, but rather to discuss its effect on the A.F. stages and, in particular, on the coupling of those stages.

The effect of shifting the datum line of a wave, whether modulated or not, can be achieved by adding to it a source of constant potential, i.e. D.C. Now to obtain any useful output from an amplifying valve having an input similar to that in Fig. 7 of Mr. Ford's article in the July 13th issue of your paper, it is necessary for that D.C. potential to be faithfully passed on and amplified. With any normal method of coupling this is impossible, and the graph of the output of the valve reverts to that of the input to the detector. A circuit with characteristics similar to that of the V.F. stages of a television receiver is required, using the D.C. restoring diode which has been the subject of so many discussions. An alternative is either to direct-couple the stage or to preset the degree of bias on the stage in accordance with each station tuned in. The first method is inconvenient and the second consists essentially of providing a second anode bend detector instead of an audio stage. As, anyway, none of these methods is used or is necessary in the normal set, we may presume that the theory is erroneous.

Without in any way wishing to reflect on Mr. Ford's undoubted ability, and indeed, I am glad to see that the old experimenting spirit remains in the radio world, I would recommend him also to study the effect of the output of an additive mixer of the old type, and the subsequent effect on I.F. tuning, should such an output consist of a shifted datum line carrier with I.F. superimposed.

I trust that this letter will be interpreted in the spirit in which it is written, namely, that of an honest desire to correct an ingenious but incorrect theory.—GERALD R. W. LEWIS (Cheltenham).

Station HCJB–Quito

SIR,—I have noticed several letters recently in your paper about station HCJB in Quito. Just before restrictions were placed on Q.S.L. cards I wrote to this station in March, and have just received a reply with a very nice card showing a photo of the station with the national colours. In the accompanying letter the times of programmes directed to N. America are given. They are Ecuadorian Echos at 6 p.m. E.D.S.T. and Friendship Hour at 9 p.m. E.D.S.T. Both these programmes are in English. For those (they say) who are technically minded here is a description of the station. It is a 10 kW transmitter, and at present has a four-element close-spaced rotary beam fed by a 500 ohm line delta matched. The antenna is 2 x λ/2 high, the entire mast being rotatable. The mast weighs approx. 2 tons and is 95ft. high. The general practice of a buried copper wire fixed to the ground is used. The transmitter tube line up is a 42 oven crystal oscillator driving a pair of 807 push-pull doublers, driving a pair of 100THs in parallel, working a push-pull stage 450TLs. The final R.F. stage is a push-pull F129B Federal valve designed for television operation. The modulator is a resistance impedance coupled driver, making it produce 18 db of inverse feedback into the audio final, which is a pair of F891s. The transmitter has the conventional protection for overload, relays, and automatic power switches. I hope this will be of interest to other readers of your fine paper. —E. J. BRIGGS (Wallasey).

Prize Problems

PROBLEM No. 410

STURVIS had a two-valve short-wave battery set which had been in operation for some time. His normal broadcast receiver broke down, and as he wished to listen to some special programmes he decided to convert his short-wave set. He therefore took out the short-wave coil and replaced it by the coil taken from his broadcast set. He short-circuited the long-wave section correctly, but could not get the Home Service programme. He had previously ascertained that the breakdown in his broadcast set was not due to a faulty coil. What was wrong? Three books will be awarded for the first three correct solutions opened. Entries should be addressed to The Editor, PRACTICAL WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 410 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, July 29th, 1940.

Solution to Problem No. 409

The transformer which Barnes purchased had the terminals marked in the old form, OP, IP, OS and IS. He wrongly assumed that the "O" terminals referred to the primary and the "I" terminals to the secondary and thus his connections did not permit of the action of a transformer.

The following three readers successfully solved Problem No. 408 and books have accordingly been forwarded to them:

A. Smith, 100, Laburnum Road, Redcar, Yorks.

R. Smart, Stragglethorpe Grange, Brant Broughton, Lincoln.

A. Faslin, 38, Whitton Avenue, Greenford, Middx.

"Radio Training Manual"

SIR,—At last I find myself in a position to follow the example of some of your other readers now in the Services, and drop you a few lines.

I have been rather out of touch for the past few months, as I was unable to get my copy of PRACTICAL WIRELESS in France.

I have only just read about the "Radio Training Manual." Can you tell me how I can qualify for a copy? I know I have to save the coupons, but I would like to know where to get a form to fill in.

I can tell you that I am really glad to be back in the Old Country, and to PRACTICAL WIRELESS, too. We had some exciting times but were lucky enough to scrape through. I am looking forward to our final victory, and then we can settle down to our hobbies as before.

Wishing PRACTICAL WIRELESS the very best of luck.—RANSOME C. L. BAKER (Ayrshire).

[*You can obtain a copy of the "Radio Training Manual" by forwarding to our Publishing Dept. a P.O. value 2s., and four coupons cut from consecutive issues of* PRACTICAL WIRELESS.—ED.]

Super One-valvers

SIR,—For the benefit of readers in the same position as Mr. Maynard, I should like to describe how I have turned the "Simplest Short-wave One" into a Super One-valver.

Instead of using the usual single tuning condenser, I am now using the bandspread system by having a .00025 and .000005 mfd. condensers in parallel.

All these controls are mounted on an aluminium panel.

I also have a variable condenser with capacity of .0001 mfd. in series with the aerial which is an indoor one about 15ft. long with a right-angled bend in it to the opposite wall of the room, so as to make it more directional for receiving purposes.

Lately, I have picked up besides the more usual stations, TAP and 8BV on the 31 m. band, and also VLQ2 and three Americans.

I usually operate the set with 80v. H.T. —M. POLIMENI (New Malden).

"P.W." in France

SIR,—I wish to assure you of my continued support of your periodical. Even while in France I was receiving my copy of PRACTICAL WIRELESS regularly. Somewhere over there reposes my folder of the weekly data sheets you published, and which I used to collect each week. I am glad that you have decided to re-publish these sheets in the form of a handbook, and assure you that I shall be one of the first to apply for my copy. Those data sheets were undoubtedly the most extensive of their kind that I have seen.

I also have my copy of the "Radio Training Manual," and although I have not yet had an opportunity to read it right through, I see that there is much information in it that I shall find useful.

I am afraid that at present my radio activities are confined to planning for the future, and hoping that I shall be able to make a start sooner than I expect. I had the good fortune to come through Dunkirk safely, and am now back in England. I have quite a number of back copies of PRACTICAL WIRELESS to catch up with, which have been to France and returned without reaching me. With many thanks, and congratulations on carrying on under present difficulties.—JOHN B. DORE (Bishop Auckland).

More About Distortion

Decoupling and Other Circuit Details are Discussed Here

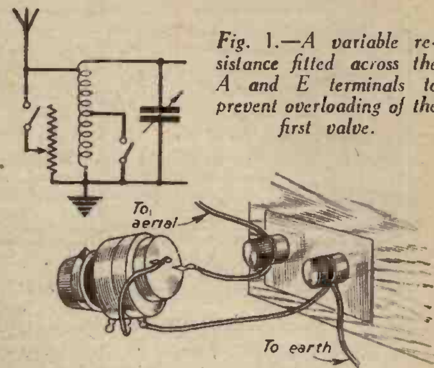


Fig. 1.—A variable resistance fitted across the A and E terminals to prevent overloading of the first valve.

As has already been explained on many occasions, a falling-off in the response to some frequencies may be due to a variety of causes. When it is the high notes which are lacking, the most obvious cause is that the tuning is too selective. It is well known that to sharpen the tuning beyond a certain degree means a loss of the higher notes. The popular band-pass tuning arrangement was introduced for the express purpose of overcoming this defect.

The transmission from a broadcasting station, although stated as being radiated at one definite frequency, say 1,000 kilocycles (300 metres), actually occupies a band of frequencies extending over about nine or ten kilocycles, so that to get proper reception the receiver must not tune too sharply or some of the side bands will not be received. On the other hand, if the tuning is too flat, there will be interference from other stations. A band-pass tuner gives a more or less even response over a band of frequencies of about nine kilocycles, while on either side the response drops off sharply. In this way the demands of both quality and selectivity are satisfied.

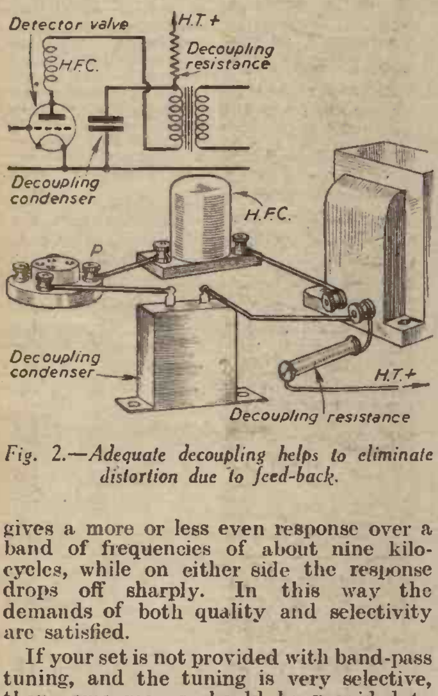


Fig. 2.—Adequate decoupling helps to eliminate distortion due to feed-back.

If your set is not provided with band-pass tuning, and the tuning is very selective, then some means should be provided to compensate for the cutting off of the higher notes which will naturally result. One method is to use an L.F. transformer which has a rising characteristic, that is to say, one which provides greater amplification of the high notes than the medium and low ones.

Tone Control

An even better arrangement is to use a tone-control circuit such as we have recently described. Most careful designers will specify something of this sort in a set with ordinary tuning, but if your receiver is not so provided, or if it is lacking in high-note response for some other reason, then a simple tone control, consisting of a fixed condenser with a variable resistance across it, should be connected in series with one of the speaker leads. The effect of this will be to reduce the response to the low notes and so level matters somewhat.

A point worth mentioning in connection with high-note cut-off is that reaction can introduce noticeable distortion. As the reaction control is advanced, so the tuning becomes more selective. Reaction should never be used to any great extent with band-pass tuning, as it immediately alters the shape of the response curve from a flat topped one to a pointed one, and so defeats the whole object of the system.

If a receiver suffering from poor upper frequency response is fitted with a triode as the output valve, then its substitution by a pentode will, in a large measure, restore the brilliance of the original transmission. Matching of the impedance of the speaker and the new valve is, however, necessary. If a multi-radio speaker is used, then the adjustment can easily be carried out. Failing this an output choke with suitable tappings for a pentode should be used.

"Attack"

We now come to what is known as lack of "attack." This is a slurring of reception caused by the inability of the moving elements of the speaker to follow the rapid fluctuations of the speech current. It is due, of course, to the inertia of the reed or the moving coil (as the case may be) together with that of the cone. This may sound rather technical, but it simply means that the moving parts are too heavy and do not "jump to it" as they should do.

Unfortunately, if a speaker suffers from this defect to any marked degree, the only course open is to substitute another one. Naturally, nothing can be done to the trouble receiver itself, since the cause of the trouble lies entirely with the speaker. Obviously, it is unwise to try to lighten the reed (moving iron) or the moving coil, as this will probably do more harm than good. The use of a lighter cone may help matters, but here again care must be taken that rigidity is not sacrificed for the sake of lightness. Incidentally, with good-class moving-coil speakers the weight of the moving coil is kept very low by the use of the lightest materials, so that if the reproduction from your present speaker lacks sparkle, try the effect of substituting another of modern design.

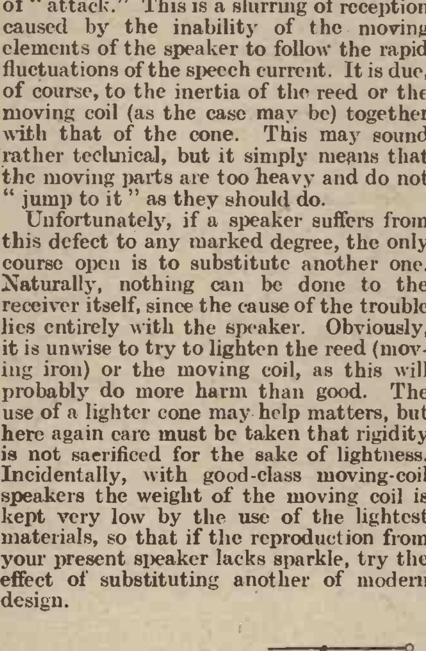


Fig. 3.—Showing how a simple choke-filter system provides decoupling for the output stage.

In the case of distortion resulting from deformation of the wave-form, there are so many different causes giving much the same effect that it is almost impossible to say, by listening to a receiver suffering from this form of distortion, to what particular cause it is due. We know the results are characterised by blurred, muffled, or rough reproduction, but it must be left to the reader to find out, by the process of elimination, the actual cause or causes. Distortion of this type is most frequently associated with the incorrect use of valves, such as under and over-biasing, overloading, etc.

Let us take an elementary case of incorrect bias causing distortion in a battery set. Suppose the H.T. battery has been in use for some time and its voltage has dropped considerably. Distortion sets in. This may be partly due to the increased internal resistance of the battery resulting in a certain amount of back coupling, but it may also be very largely attributable to too much bias. Naturally, when the battery was new the bias would be set to the maximum figure for undistorted reproduction, but it must not be forgotten that as the H.T. voltage drops so the grid bias needs lowering, since the amount of bias necessary depends on the anode voltage—the higher the grid bias required, and vice versa.

Therefore, if the setting of the grid bias was left unaltered it would be too high after the H.T. battery had been in use for some time. In such a case reducing the setting of the bias tappings will usually improve matters considerably and so give the H.T. battery a new lease of life.

Overloading the Detector

Overloading a valve is quite a common cause of distortion. With modern receivers employing high-magnification valves in the H.F. stages it is very often the detector which causes the trouble. Detector overload is not always easy to diagnose, as the resulting distortion is not of a very blatant nature. However, if it is present it will spoil the reproduction, although in a somewhat intangible manner. The symptoms to look for are over-emphasis of the high notes and a marked double-hump effect in the tuning of loud transmissions, the maximum signal strength being obtained just slightly on either side of the true wavelength. Another feature is that the reaction control or any pre-detector volume control will appear insensitive on powerful transmissions, quite a large movement of the control making but little difference to the volume. A screen-grid valve used as a detector is particularly liable to overloading.

To increase the power-handling properties of the detector it is always worth while trying an increase in anode voltage, at the same time using a grid leak and condenser of suitable values. The leak should be about ½ megohm to 1 megohm and the condenser .0001 mfd. For short-wave the leak may be increased to 3 megohms. If overloading still occurs, then some form of predetector volume control must be fitted and brought into operation on the strong transmissions. The ideal form of control is provided by the use of variable-mu valves in the H.F. stages. Another good scheme for reducing the input to the detector, in the case of a straight tuned circuit, is the connection of a variable resistance between the aerial and earth terminals of the set. The resistance should either have a definite "off" position or else be fitted with a switch to cut it out of circuit when maximum sensitivity is required. A suitable value for the resistance is 50,000 ohms. One of the combined volume controls and switches now on the market can be recommended for this purpose. (See Fig. 1.)

Distortion Due To Back Coupling

It was mentioned just now that distortion may be caused by the internal resistance of the H.T. battery. The reason for distortion in this case is two-fold. Firstly, there is the obvious reason that the anode current of the various valves is lowered between the optimum figure, and, secondly, there is the question of back coupling. Obviously, since the anode circuit of all the valves is completed through the high-tension battery, the internal resistance of this is common to each anode circuit, and thus forms a coupling between one valve and another. In this way fluctuations in the current passing through the later valves will cause corresponding fluctuations in that passing through the earlier ones. These fluctuations, owing to the time taken for the currents to travel through the succeeding stages, will be out of step, or out of phase as it is called, with the fluctuations of the original current. This will produce a howl. Sometimes, instead of a howl, the noise produced is of so low a pitch that each separate beat can be distinguished. It is then called "motor-boating."

The way to cure L.F. howls and motor-boating is to get rid of the undesirable coupling by decoupling. First of all, a resistance and condenser connected in the plate circuit of the detector valves, as shown in Fig. 2, should be provided. If this fails, then further decoupling of a similar nature should be employed in the intermediate L.F. stages (if any) and the last valve should be decoupled by using choke output, if it is not already fitted, as in Fig. 3. A very old dodge for curing motor-boating consists of changing over one pair of leads to the L.F. transformer. Either the wires to the terminals marked "H.T.—" and "P" are changed round or else those to terminals "G" and "G.B."

Of course, L.F. howling and motor-boating are of so blatant a nature as to hardly come under the heading of distortion at all. On the other hand, there may be just sufficient back coupling in the L.F. stages of a receiver to introduce distortion without actually causing a definite howl. The reproduction will be characterised by a certain roughness. Where it is due to a run-down H.T. battery there is also loss of volume. The use of a pocket voltmeter will soon determine if the battery is getting low. If so, the remedy is obvious. Of course, the use of adequate decoupling, and the readjustment of grid bias, as already explained, will help to increase the useful life of the high-tension battery.

Adding Extra Decoupling

It is quite possible to get distortion, due to L.F. back coupling, in a receiver in which the H.T. battery is quite O.K., or in a mains receiver even although decoupling should be supplemented. The best way to do this is to either fit larger decoupling condensers (say 2 mfd. in place of existing 1 mfd. components) or else to connect extra ones in parallel with the present ones.

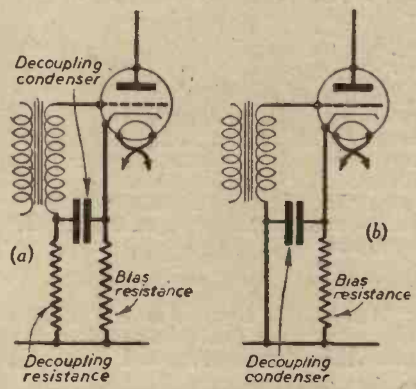


Fig. 4.—The effectiveness of a decoupling arrangement can be increased by adding another condenser in parallel.

In an all-mains set, where grid bias is obtained by utilising the drop in voltage across a resistance, decoupling of the associated grid circuits is necessary, and this is actually carried out by using a resistance and condenser as in Fig. 4 (a). In some receivers, however, the resistance is omitted, the condenser being used as in Fig. 4 (b). In the latter case, a resistance may often be included with advantage.

Microphonic Tendencies

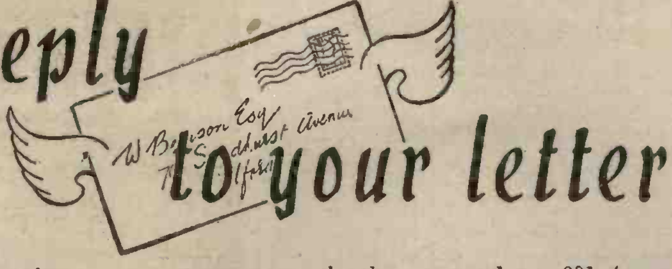
A frequent cause of distortion which is sometimes overlooked is that produced by microphonic feed-back. The sound waves from the speaker travelling through the air and also, in the case of a combined receiver and speaker, through the cabinet and chassis, set up vibrations in the valves and vanes of the variable condensers, etc. In extreme cases a loud, sonorous howl will build up, which drowns everything. However, this condition is not often met with, but a receiver will frequently be found to be working in a state where a microphonic howl must almost manifest itself on loud passages, the result being a rough, jarring kind of reproduction.

The most usual cause of the trouble lies with the detector valve, this valve being particularly susceptible to any vibrations transmitted to it through the holder or through the air. Modern valves are not generally subject to this trouble.

Condenser Vane Vibration

The vanes of variable condensers, especially if they are thin and unsupported at the tips, are liable to start vibrating when sound waves from the speaker impinge on them, or are transmitted to them through the chassis. The remedy here consists of mounting the condensers on rubber buffers. This is easily done with ganged condensers as a soft rubber washer can be placed under each foot of the condenser. With panel-mounted condensers of the one-hole fixing variety it is rather more difficult, but the mounting of the panel, or even the whole chassis, on pieces of sponge rubber will prevent the direct transmission of the vibrations through the cabinet and panel to the condensers.

In reply to your letter



Accumulator Charging

"I wonder if it is possible to modify and perhaps alter the full-wave rectifier circuit on page 35 of your "Wireless Transmission for Amateurs" in order to use it as a charging plant. I have made up this unit with a type 80 American valve and the transformer gives 4 volts at 1, 2, 3 amps. and 250 volts D.C. The condenser used is a single one, electrolytic, of 4+4 mfd."—K. T. (Chigwell).

FOR charging purposes you need a low voltage, generally not greater than 6 volts, and at a current of up to 2 amps. Trickle charging may, of course, be carried out with a current of only .5 amps. Now the latter current is equivalent to 500 milliamps, and you will see, if you examine the curves of your type 80 valve, that it is designed to deliver a current of only 135 mA max., and that is with 550 volts per plate. At 250 volts per plate you will only be able to get about 100 mA and thus accumulators would take weeks to charge. It is a general rule that mains units designed for H.T. supply purposes cannot be broken down for charging purposes in view of the small current which is supplied. It is a simple matter to break down the voltage to the required 2, 4 or 6 volts, but the current will not increase to permit charging to be carried out. The article in this issue on trickle charging should be of interest to you.

Twelve-range Test Meter

"As a regular reader I wish to build up your test meter described on June 29th. You state the switch can be obtained from A.B. Metal Products. Will you kindly give me the name and address of these people so I can get into touch with them?" —T. T. (Horbury).

THE switch in question may be obtained direct from Messrs. Peto Scott, of 77, City Road, E.C.1, and the reference number is PW.5. We regret we are, at the moment, unable to quote a price for this particular switch unit. The full description is a 2 bank, 1 pole, 12 way combination.

Conductance

"I have noted in some valve references recently a term 'conductance.' I cannot find this in my dictionary and wonder if it is possible to state exactly what it is. I presume that as it is absent from my dictionary that it is a new or coined word used only in valves and I should be glad of an explanation."—L. R. (Edinburgh).

THE term is an abbreviation of mutual conductance, or, in American literature, transconductance. This latter term is also an abbreviation for control-grid-plate transconductance and this term explains itself. Conductance is sometimes referred to as "slope", and it is the ratio of a change in anode current to the change in control-grid voltage producing it, under the condition that all other voltages remain unchanged. Thus, if a grid-voltage change of .5 volts causes an anode-current change of 1 mA, the slope is 2 mA per volt. It may also be expressed as .001 (amps.) divided by .5, or .002 mho. The mho, it will be remembered, is the unit of conductance and is the spelling of the word ohm backwards. For convenience a millionth of a mho of a micromho is used to express the transconductance, and therefore .002 mhos would be expressed as 2,000 micromhos.

Best Detector

"I am building a quality set and am keen to incorporate the best detector. I cannot decide between anode bend and a standard diode, and should be glad if you could advise me which, in your opinion, would be the better."—S. T. E. R. (Canterbury).

THERE would probably be not much to choose between the two if both were arranged properly. The diode would probably give weaker signals but from a quality point of view, with normal speaker and other circuit arrangements, you would no doubt find it hard to distinguish between the two. For general use, however, we think you would find it preferable to incorporate a grid leak rectifier, using low values of leak and condenser and high H.T.—the arrangement generally referred to as power-grid detection. With normal components, speaker and room acoustics this would no doubt prove the most useful and economical detector scheme.

Cabinet Resonance

"I have built a good radio-gram cabinet, using ⅞in. timber, and with good area for speaker. There is just one point and that is undue boominess on speech. This does not seem so troublesome on music, but speech is too deep for comfort and I should like to overcome it."—S. S. A. (Bispham).

THE trouble may be due to the circuit or speaker, but it is possible to have cabinet resonance which can give rise to the trouble you are experiencing. This may be overcome by lining the cabinet, or by adopting some anti-resonance scheme. A good plan is to line the cabinet, say, by using felt or other "deadening" material. Among the various materials we have tried we recommend felt carpet underlay; several thicknesses of newspaper, or corrugated cardboard. It is sometimes also possible to close in the back of the cabinet, with holes cut in it to break up the air column.

Voltage Tapping

"I need a lower voltage from my H.T. unit but do not know whether to use variable or fixed tapping for this. The volts are for detector and perhaps you would tell me which is the proper thing to do."—G. de T. (Paisley).

THERE is no rule regarding the provision of a voltage tapping point on an H.T. unit. If you can be certain regarding the voltage you require, and the current which is flowing, you could fit a fixed resistance. For a detector stage, however, it may be worth while to provide a variable voltage so that smooth reaction could be obtained under all circumstances. A low value potentiometer in series with a fixed resistance could be connected across the H.T. output, the values being chosen according to the output of the unit and the range of voltage required.

RULES

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.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

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.

K. D. R. (Cumberland). The details were given again in our issue dated May 11th. They are included in most of our books, including the latest "Radio Engineer's Pocket Book."

H. E. (Plymouth). Do not try to remove the screening. We suggest you look elsewhere for the trouble, but doubt that the valve is at the root of it.

L. R. (Manchester.) The wavelength is approximately 49.8 metres, but there is no data available at the moment concerning the transmission.

T. T. (Winchester). The coils are not now available. Use the Bulgin multi-range units or separate coils made up to form an all-wave unit.

A. G. S. (Kingsknowe). We do not advise fitting the arrangement as the radiogram was designed for high-quality without the feed-back. In this particular circuit there would be no advantage in fitting it.

G. E. (Blackburn). The pick-up is quite sensitive and should work satisfactorily. Use a good speaker for maximum quality.

L. R. (Penzance). We have no details of the set and cannot recommend any modification.

B. A. F. (Colchester). Use straight push-pull arrangement, that is, with normal grid bias.

O. O. (Lewisham). The carrying case could be lined but it will affect signal strength. We would suggest that you try some alternative circuit rather than to try screening.

E. G. C. (Primrose Hill). Stranded wire is definitely superior, although more expensive. All enamelled would be preferable.

L. D. A. (Winchester). The battery is now a standard line and should be obtainable from any good radio dealer.

L. W. (Rickmansworth). The volume should be controlled by the volume control, not by detuning. This is bound to introduce distortion in a modern superhet.

P. F. (Newark). Double the current is flowing and therefore the resistance value must be halved.

T. K. (Goldthorpe). The 6 mA range has a resistance of 40 ohms; the 30 mA range is 12 ohms, and the 120 mA range is 3 ohms. The normal resistance on the voltage range is 330 ohms per volt.

B. M. (Faversham). Two I.F. stages are often employed in communication type receivers, but for normal broadcast reception you will find a single stage will prove adequate.

L. T. R. (Hereford). Ten watts is more than ample. The quality will undoubtedly be high when the volume control is kept down to normal domestic level, but there will be a considerable waste of power. Five watts should prove quite satisfactory under the conditions mentioned.

The coupon on page iii of cover must be attached to every query

NEW COSSOR RECEIVER

MESSRS. A. C. COSSOR announce two new receivers, Models 34 and 47, with which is coupled Model 77. Of the latter pair one is for A.C. and the other A.C./D.C. operation, whilst Model 34 is a battery model. This has been introduced for the benefit of country dwellers who need a receiver giving "mains performance" but who have no mains facilities. It is a four-valve superhet fitted with Q.P.P. output stage. The circuit incorporates full A.V.C., and among the various features may be mentioned tone control and volume control; extension speaker and pick-up sockets; full station-name dial, and a 10-in. moving-coil speaker. The price of this model, with double capacity 120-volt H.T. battery and 60 A.H. accumulator, is 11 guineas.

The circuits of Models 47 and 77 are identical except for the slight differences called for in the Universal mains model, and again a superhet circuit is utilised. Permeability-tuned iron-cored I.F. transformers are fitted, as well as iron-cored aerial transformers on the medium and long wavebands. In addition to these there is also a short-wave section covering from approximately 16 to 52 metres. A single slow-motion control is provided and has a concentric three-position wavechange switch. Volume and tone controls are provided, together with output or extension speaker sockets. In both models there is a triode-hexode frequency-changer, variable-mu I.F. stage and double-diode triode detector/amplifier. In the A.C. model a power triode output stage is fitted, whilst the A.C./D.C. model has a tetrode in the output stage. An 8in. speaker is fitted to both sets and the prices are 11½ guineas for the Universal model and £11 7s. 6d. for the A.C. model. Descriptive leaflets and other data may be obtained from Messrs. Cossor on application.

One of the new Cossor receivers—Model 77.

BATTERY AUTO-BIAS

(*Continued from page 391*)

use a common circuit for H.F. and L.F. biasing in view of the risk of instability. That is the first problem. Secondly, the H.F. valves generally need variable bias and this introduces the difficulty of keeping other voltages constant. However, by splitting our circuits it is not a difficult matter to arrange for the supply of the bias which may be adjustable and which will not affect L.F or other voltages. The same rules apply as in the case of the L.F. stages, taking the maximum bias needed by the H.F. valves; that is generally referred to as the "cut-off voltage." This will give the total value of the potentiometer needed for the H.F. stage, and then the arm of the potentiometer is joined to the tuned circuit. A series resistance may be included here, with a condenser by-pass for H.F stopping in the usual way. The arrangement is shown in Fig. 3, and it will at once be apparent that the difficulty which will now arise is that we need two resistors across the H.T. negative circuit, as the values needed for H.F. and L.F. will undoubtedly clash. That is to say, the value of the variable component will be such that the bias tappings for the L.F. stages will have to be at such a point that the potentiometer would have to be tapped. This may be possible in some cases, especially where a home-made potentiometer is used. Alternatively, tappings may be possible on some commercial types of potentiometer, where the winding is exposed, but it is desirable to use a separate component. This brings us to a little difficulty, as the use of two separate biasing circuits such as are now indicated will result in the provision of two alternative paths for the anode current and thus the original calculations will be upset. For instance, if we needed a 2,000 ohm circuit for the L.F. stages, and our calculation shows that a 2,000 ohm component is also needed for the H.F. circuit, the inclusion of these two components in parallel will result in an equivalent resistance of only 1,000 ohms in circuit, or looked at in another way, the total anode current will divide equally into two sections. Thus there will only be half of the current which we normally calculated in each bias circuit. Remember in this connection that the current is fixed in this type of calculation, and that the current will thus divide proportionately through the two biasing circuits. It may take a few minutes to arrive at suitable values, although it is possible to calculate the values exactly by one or two various formulae. These are, however, rather complicated, and trial and error methods will undoubtedly prove most satisfactory for the majority of readers, especially as a high standard of accuracy is not necessary on the H.F. side in view of the fact that the control is adjustable. As a simple way out of the difficulty it is best to adopt the following arrangement. The H.F. bias will, in the majority of cases, be in excess of that needed for the output valve. Therefore, make the L.F. and H.F. bias circuit values identical, which will result in the current dividing into two equal portions. For the calculations already given, therefore, take half of the normal anode current when working out the values of resistance, and then on the L.F. side you will have to use an extra resistance to make up the total value, this resistance being included between the H.T. — point and the grid return circuit of the output valve. Fig. 5 illustrates the point clearly.

PATENTS AND TRADE MARKS.
Any of our readers requiring information and advice respecting Patents, Trade Marks or Designs, should apply to Messrs. Rayner and Co., Patent Agents of Bank Chambers, 29, Southampton Buildings, London, W.C.2, who will give free advice to readers mentioning this paper.

YOU MUST ORDER "PRACTICAL WIRELESS"

(6d. Monthly) from your newsagent to-day!

As you have read elsewhere, this is the *last weekly issue* of "PRACTICAL WIRELESS." It now becomes a monthly, and the first monthly number will be on sale on Wednesday, August 7th (dated September).

It is IMPORTANT, however, that your newsagent has your order for a regular supply, so in your own interests please fill up the form below and hand it to him. Unless you do this you may be unable to obtain your copy. GO TO IT—NOW!

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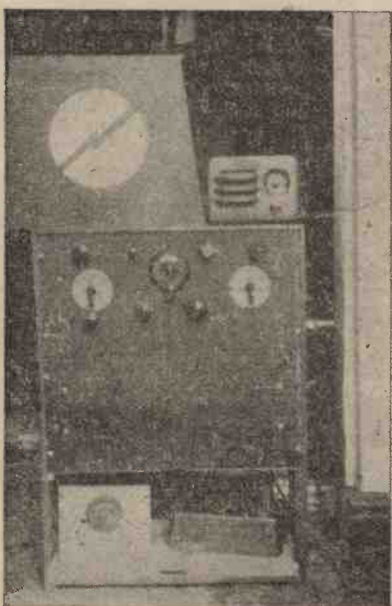
B.L.D.L. The British Long-Distance Listeners' Club

JUDGING by the correspondence which we are still receiving, it would appear that the real enthusiasts are still able to find time for the continuation of their hobby, in spite of the summer months and, in a great number of cases, longer hours of working. We have taken a few letters at random from the rather extensive B.L.D.L.C. mail, and these, we think, bear out the contention mentioned above.

Member 6711 enclosed a photograph of his equipment, which is reproduced below. He says: "The R.X. at the top of the rack is a four-stage S.W. receiver, consisting of an H.F. Pen (Hivac HP215), in a T.R.F. stage, which incorporates the usual tuned-grid system. The detector is a triode, D210, and this feeds an R.C.C.-coupled stage, L210, which, in turn, is transformer-coupled to the Y220 output pentode. The power supply is obtained from a D.C. eliminator, in conjunction with an accumulator for the L.T. feed. This part of the equipment occupies the lower part of the rack, where a frequency meter can also be seen. The small receiver next to the loudspeaker is a four-valve midget commercial set, tuning on medium and long waves. In the middle portion of the rack, which was originally intended for a transmitter, spare parts and log-books, etc., are kept."



A corner of the wireless den of Member 6711, showing the neat arrangement of his equipment.

National Appeal for Aluminium

Although this appeal is meeting with such magnificent response, it offers a particularly fine opportunity for all B.L.D.L.C. members to make a most useful contribution to the country's needs, and Member 2713 of Gravesend puts forward the following suggestion, which we think is very praiseworthy: "I think the appeal for aluminium will give members of the B.L.D.L.C. an opportunity to do something towards the National Effort, and I suggest that if one or two members in each town or village would be willing to act as receiving depots, all other members in their localities could take all their old condensers, those of the variable type having aluminium frames or vanes, together with all other scrap aluminium, to them, and the collectors could then take the material to the nearest authorised depot. I am sure if members will look through their junkboxes, they will find many odds and ends of aluminium which they do not require."

The above suggestion is certainly very sound, but in view of instructions already given in the National Press and to avoid complications, we think it would be more satisfactory if each member took his own contribution to the nearest official collecting centre. We hope every member will take an active part in this scheme, as no aluminium part is too small, and it is amazing how much material can be collected if a thorough search is made amongst the old components which have no immediate use.

An Appeal

Member 6409, now in the R.A.F., sends us a very interesting letter, in which he makes an appeal on behalf of the other members of his Hut. He states: "There is one form of entertainment which is lacking at the moment, and which we all miss very much, namely, radio. If any of your readers have a battery portable which has seen better days, and of which they are willing to dispose, we would indeed be very grateful to receive it. We would, of course, pay all carriage costs. While making this appeal I would like to say how very much I appreciate PRACTICAL WIRELESS every week, and how much I regret that I cannot join in any active contests at the present, owing to very obvious reasons."

If any members or readers can do anything towards the above request, we think they had better communicate with us first, so that we can put them in touch with the member mentioned above. We would add that Member 6409 comes from the East Barnet district.

Contact Wanted

Member 6575, of 22, Drummond Drive, Stanmore, Middlesex, when sending details of a very fine log he has compiled on a 1-v-1 home-constructed receiver, asks us to put him in touch with other members, so will those in his area get in communication with him.

Member 6727, of 24, Charles Street, Heaton, Newcastle-on-Tyne, is most anxious to hear from any fellow members, especially those who have built the World Ranger Three, or the Fleet S.W. Two. He is particularly anxious to know of the results obtained with the two receivers mentioned above.

Member 5932, of 27, Unity Street, Sheerness, Kent, who appears from his very interesting letter—for which many thanks—to be a very active member, would like to make contacts with other S.W. enthusiasts in his district. We would add that he has been carrying out some interesting work with a beam aerial, which is very simple to construct, so perhaps we shall be hearing from him again giving us more details.

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0- 5 v.	0-250 v.
0-25 v.	0-500 v.
A.C. VOLTAGE	
0- 5 v.	0-100 v.
0-25 v.	0-250 v.
	0-500 v.
D.C. CURRENT	
0-2.5 mA.	0- 25 mA.
0-5 „	0-100 „
	0-500 „
RESISTANCE	
0- 20,000 ohms	
0-100,000 „	
0-500,000 „	
0- 2 megohms	
0- 5 „	
0-10 „	

Weighing only 18oz. and measuring but 4¾"×3¾"×1¾", this is a really portable meter of high accuracy for measuring A.C. & D.C. volts, D.C. milliamps and ohms. An accurate moving-coil movement gives a 3" full scale deflection. Total resistance is 200,000 ohms. Complete with leads, interchangeable testing prods and crocodile clips; and instruction booklet.

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ADVERTISEMENTS are accepted for these columns at the rate of 2d. per word (minimum charge 2/- each paragraph). Series discounts of 5 per cent. for 13, 10 per cent. for 26 and 15 per cent. for 52 insertions are allowed. All advertisements must be prepaid.

EACH paragraph will commence with the first word printed in bold face capitals. Additional words in bold face capitals are charged at 4d. per word.

ALL communications should be addressed to the Advertisement Manager, "Practical Wireless," Tower House, Southampton Street, London, W.C.2.

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Challenger Radio Corporation, 31, Craven Terrace, London, W.2. Paddington 6492. Nearest point Marble Arch, down Bayswater Rd., turn 5th right.

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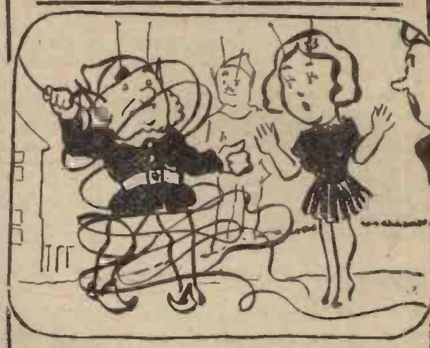

You should have seen "EH" tear his hair,
When his aerial fell a la terre.
But if he'd fixed it right; that's to say, with FLUXITE
It, not he, would be in the air.

See that FLUXITE is always by you—in the house—garage—workshop—wherever speedy soldering is needed. Used for 30 years in government works and by leading engineers and manufacturers. Of Ironmongers—in tins, 4d., 8d., 1/4 and 2/8.

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