

**HOW TO IMPROVE QUALITY**

**FIFTY HINTS AND TIPS**

# Amateur Wireless

Every Thursday 3<sup>d</sup>

# Wireless

and  
Radiovision

Vol. XVIII. No. 117

Saturday, January 3, 1931

**HOW TO IMPROVE**

# QUALITY

**50**

**HINTS**

**AND TIPS**



# Four Strings that make the Perfect Instrument



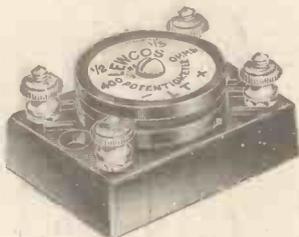
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REPRODUCTION..... THAT MAKES YOU VISUALISE

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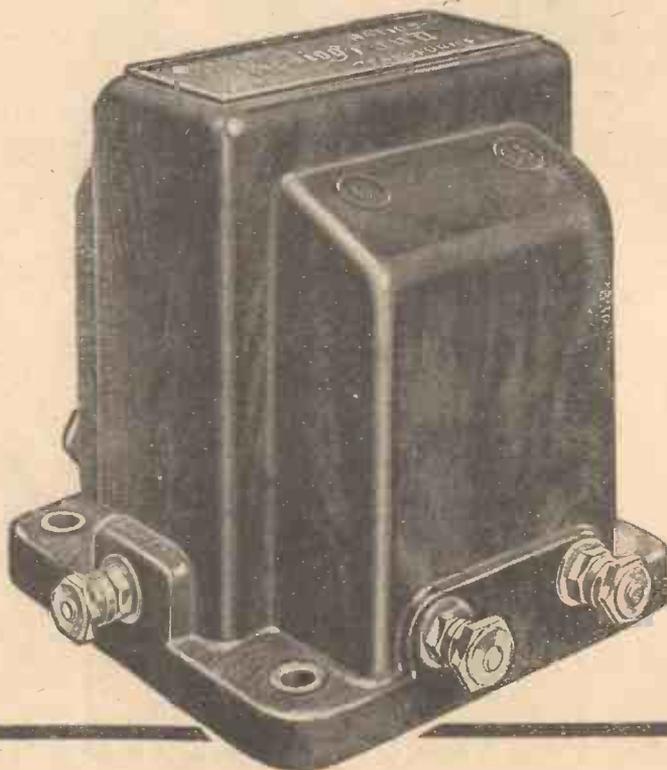
TELSEN Transformers are built on PROVED radio engineering principles that have stood the test of time. A TELSEN in your set means not only greater purity . . . greater volume . . . but a clarity and realism unsuspected before. Make your set LIVE with



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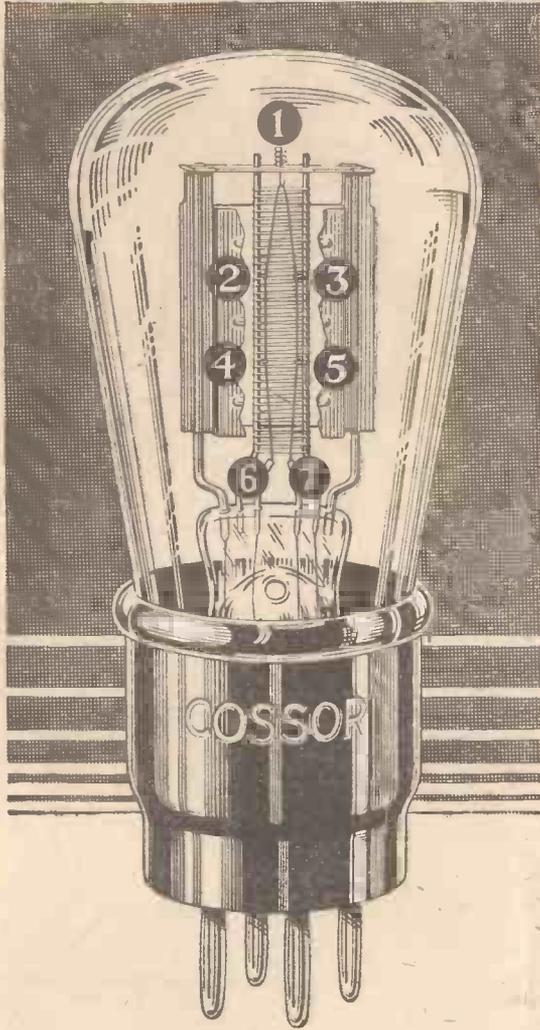
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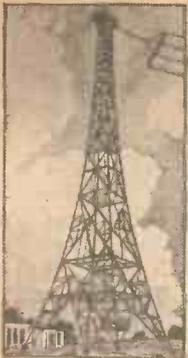
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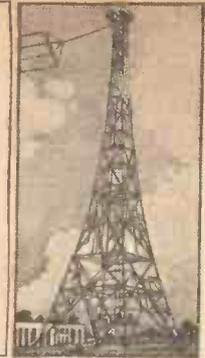
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# Amateur Wireless and Radiovision



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THE LEADING RADIO WEEKLY FOR THE  
CONSTRUCTOR, LISTENER & EXPERIMENTER.

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## NEWS · & · GOSSIP · OF THE · WEEK

### SCOTTISH SITE AT LAST

THE site for the Scottish regional station has been chosen at Westerglen, three miles south of Falkirk in Stirlingshire. The work of building the station is being put in hand immediately, the design being similar to that adopted for the London and North regional stations. This will be the third twin transmitting station to be built as part of the B.B.C.'s regional scheme and will, when in operation,

replace the existing low power transmitters at Glasgow, Edinburgh, and Dundee.

### ALTERNATIVE PROGRAMMES FROM PRAGUE

WHEN the new transmitter near Böhmissch Brod is ready, Prague will have two broadcasting stations. These will be the existing 5-kilowatt station and the new transmitter which will have a power of from 60-120 kilowatts. It is the policy of the Prague authorities to run alternative programmes as soon as the new transmitter is ready.

### PRINCIPAL CONTENTS

	Page
News and Gossip ... ..	3
The Important Last Link ... ..	5
How Tuning Affects Quality ... ..	6
Announcers Tell Their Stories ... ..	7
More Simple Formulae ... ..	8
On Your Wavelength ... ..	11
Pick-ups and Quality Reproduction ... ..	13
Controlling Volume Without Distortion ... ..	14
Is Your Detector Distorting? ... ..	17
Getting the Best from Your Speaker ... ..	18
Without Fear or Favour ... ..	19
A Short-wave Super-het. Adaptor ... ..	20
Plenty of High-tension ... ..	22
The Wates' Universal A.C. Four ... ..	24
In My Wireless Den ... ..	26
A New Home Recorder ... ..	28

### AMPLIFIED BOW BELLS



This amplifier, installed in the steeple, is used to give gramophone reproduction of Bow Bells, which have been silent for five years, and for which a fund is being raised. Records had been made of the bells, and these are now reproduced by loudspeakers at the top of the church

### GETTING A JOB BY RADIO

THE Canadian unemployment authorities at Ottawa are now broadcasting daily information regarding unemployed workers and their trades. These broadcasts are at regular hours so that employers can listen in at the appointed time should they be requiring staff. A telephone call to the labour exchange quickly brings as many skilled or unskilled men as may be required.

### A MAYERL BROADCAST

BILLY MAYERL, the syncopated pianist, like many other artistes whose names are associated with the lighter forms of entertainment, has a leaning towards more serious work. To-night, January 1, when he broadcasts with the

B.B.C. Orchestra, listeners will find that he has a greater range of talent than is suggested by his reputation for syncopation alone. He will play, with the orchestra, conducted by Joseph Lewis, the first movement of Grieg's Pianoforte Concerto, and he will conduct the orchestra in the Suite "Pastoral Sketches," of which he is the composer.

### LECTURES FROM VIENNA

LONDON National listeners are familiar with the Friday evening science broadcasts which have caused an enormous amount of interest. Vienna has followed London's example and is arranging a similar course of broadcasts which will not only be broadcast by Vienna, but by the majority of the German stations. Dr. Ferdinand Scheminzky, a well-known scientist, will lecture on sounds of the heart and muscles.

### CHOOSING AN ANNOUNCER

AS the Bordeaux station officials were not satisfied with the station announcer, it was decided to let listeners choose their own announcer. Accordingly, for several days anonymous announcers presided in the studio, each doing one day's duty. At the end of the test period, listeners were invited to say which voice they liked best—the new announcer being appointed on the majority vote.

**NEXT WEEK: A FINE LOCAL-STATION "TWO" WITH PUSH-PULL OUTPUT**

# NEWS · & · GOSSIP · OF THE · WEEK —Continued

## THE WARSAW FAILURE

IN spite of all the preparation made by B.B.C. engineers, there was a last-minute failure in the Warsaw landline relay. According to Savoy Hill, the line was in good working order between London and Berlin, but was not fit for broadcasting between Berlin and Poland. The B.B.C. engineers preferred to abandon the attempt altogether rather than to allow an indifferent relay to be broadcast. After Christmas the lines will be tested again. When an outstanding programme is arranged by the Warsaw station a further attempt will be made to relay it to British listeners.

## MIDLAND REGIONAL PROGRAMMES

WHEN the London Regional programmes started nearly a year ago there was quite an outcry against the B.B.C.'s policy of broadcasting the same programme through both Midland and London Regional stations. Even now we find such broadcasts as organ music and dance music common to both stations, but within the past few months the programme compilers at the Midland Regional centre have undoubtedly introduced more individuality into the Midland programmes. It will be interesting to see what happens on the Northern Regional wavelength.

## B.B.C.'s POST BAG

IT is a surprising fact that during the course of a year the B.B.C. receives over

100,000 letters from listeners. Sixty a day, we are told, need answers. The B.B.C. accounts department has worked out that about £125 per annum has been spent on postage. So listeners are now reminded that, when their letters relate to enquiries about programmes that have been broadcast, they must send a stamped-addressed envelope. The total number of letters in a

to the B.B.C. "Radio is real, but radio is earnest!"

## 1931 TALKS

ONE of the bright spots in the recently issued B.B.C. syllabus of talks for the period January to April, 1931, is the return of Vernon Bartlett, who will continue his series "The Way of the World" on Thursdays. Women listeners will be

## GETTING GOOD QUALITY

—That's what every amateur wants. In this issue you will find a number of special practical articles each giving helpful hints and tips on getting really good quality from every type of set. Each stage of the receiver is fully dealt with under its own heading. Turn over the pages and see for yourself.

year can be usefully compared with the total number of licences. Such a comparison shows that only 1 in 30 listeners ever writes to the B.B.C. We are led to wonder whether, if the B.B.C. is influenced by correspondence, the programme compilers are really in touch with listeners' wants.

## ADULT EDUCATION

ALL listeners will watch with great interest the results of the National Conference of Group Leaders and Student Listeners, which has been arranged for January 3, 1931, at Savoy Hill. Mr. C. A. Seipman will talk on "The Group Listeners' Problems" and at the Conference will be Sir John Reith and Mr. R. S. Lambert, Editor of *The Listener*. At the sectional meetings, Professor A. M. Carr-Saunders, Dr. Cyril Burt, Professor Arnold Toynbee, Mr. Otto Siepmann, M. Stephan, and Mrs. Mary Adams will take part. Altogether, we imagine January 3 may be a big day in the history of the B.B.C.'s policy of adult education.

## DOWN FOR DISCUSSION

AMONG the subjects to be discussed by this National Conference is the question of suitable hours for broadcasting talks designed for educating the adult listener. Suitable subjects, also, will be thrashed out. We are glad to learn that the technique of the speaker is to be examined. Another question will be the value of publishing literature to supplement and follow up the broadcast talks. Truly, one may say of the educationists attached

particularly interested in the morning talks at 10-45 a.m., which will be introduced on January 2 by Lady Diana Duff Cooper. The weekly *Housewives News* bulletin should also be appreciated by listeners who want to buy at the most advantageous moments. Looking through this syllabus we are impressed with the fact that the talkers ability to talk has evidently been considered in addition to his knowledge of the subject of the talk.

## THE SCHOOLBOYS' EXHIBITION

THERE are plenty of things of radio interest at the *Daily Mail* Schoolboys' Exhibition, which opens to-day, January 1, in the Empire Hall at Olympia. The B.B.C. is staging an exhibit, and there will also be a radio-controlled model boat, the Theremin "radio-music-from-the-air" machine, and talkie-film amplifiers in action.

## RADIO WAVES AND RAILWAY LINES

AS the result of experiments carried out near Berlin, it was found that the presence of railway lines running approximately in the same direction as the distant transmitting station had a marked effect on reception. Using a small frame aerial the signals came in at abnormal strength, though at the same time, the directional effect of the frame almost disappeared.

It seems clear that the metallic lines helped to concentrate and guide the signal waves in their passage. A similar effect was observed in the case of a group of telegraph wires.

## SPARKS

An inquirer says he gets a sound like tinkling coins when trying to get Bergen, operating on 364 metres. More like the gas-man, operating on one meter!

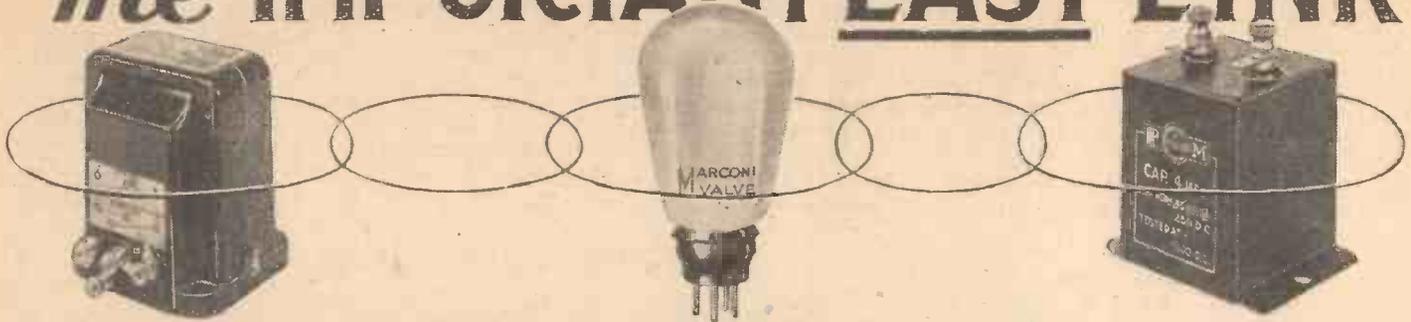
It was stated in court that the noise caused by a radio experimenter's oscillations could not be defined. It ought to be £ s. d. fined!

Someone asks, "How are unlicensed listeners-in tracked down?" Probably by a Flying Squad car loaded with "detectors"!



"Lumme—zin't these people never 'eard of portable sets!"

# The IMPORTANT LAST LINK



No set can give good results if the output stage is faulty, for that is the final link in the chain. Here some simple output choke and transformer arrangements are described by Kenneth Ulllyett

MANY sets fail to give a pleasing tone because the output arrangements connecting the last valve with the speaker are not so good as they should be.

Indeed, it is surprising how many amateurs one meets who are constantly arguing the respective merits of various new super power valves and low-frequency couplings,

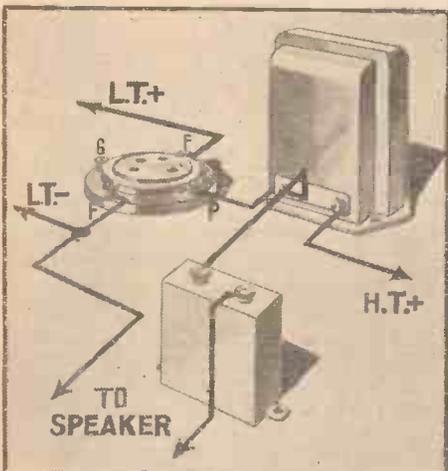
overload, the set as a whole may still appear to be suffering from overloading. In nine cases out of ten this is because proper arrangements have not been made for output transformation from the anode circuit of the power valve to the speaker windings.

The two important reasons why an output filter of some kind is necessary are, first that the filter, if properly arranged, matches up the impedance of the speaker to that of the anode circuit, and, second; that the comparatively heavy anode current flowing in the power valve circuit is prevented from passing through the speaker windings.

Many of the new balanced-armature and dynamic speakers will not work properly if there is a large steady current flowing through the magnet windings, and apart from the possibility of breakdown caused by this large current at a high voltage, the working of the armature mechanism is upset. A filter circuit eliminates this steady current.

On the other hand, there is the importance of having the impedance of the speaker approximately the same as that of the valve. Accurate matching is not essential, nor indeed can accurate matching be checked by rough and ready means. If the matching of impedances shows more than about 25 per cent. error, then the ear will notice a difference in tone and, generally, in volume.

Power valves have impedances ranging from anything below about 20,000 ohms up to 9,000 or 10,000 ohms. Speaker units have impedances covering an even wider range and any unit may be dissimilar from the valve with which it is used. The impedance of a speaker unit is generally greatly different from its ohmic resistance,

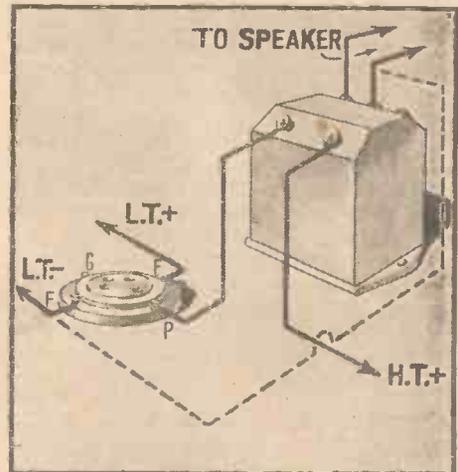


Schematic arrangement of a simple choke-output arrangement

and the merits and demerits of moving-coil and dynamic speakers, and yet they do not get good results because the output arrangements are wrong.

If the set overloads and gives a "reedy" tone then it is quite probable that a larger power valve is called for. The existing valve may have an impedance of 9,000 or 10,000 ohms and be capable of standing up to a relatively small grid swing. A larger valve is fitted having perhaps an impedance of 2,000 or 3,000 ohms and a much greater grid swing, provided that it is given sufficient grid bias—at least 12 or 15 volts—and 120 volts high tension.

Many users of these new power valves do not give sufficient anode and grid volts and good results are hardly to be expected under incorrect operating conditions. But even when the valve is operating on the correct part of its curve, with ample grid bias and high-tension, the tone may not be satisfactory. It may be excessively boomy in place of the former excessive reediness and because the speaker rattles at the slightest

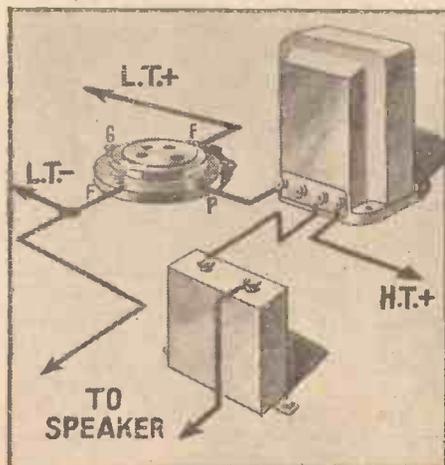


How to connect up a speaker output transformer. A tapped-secondary type is shown. An optional earthing connection for the speaker is indicated by the dotted line

so far as direct current is concerned. The effect of this difference in impedance can be counteracted by the use of a choke output or a transformer output.

Transformer manufacturers produce anode transformers, the primary of which is connected in place of the speaker terminals in the anode of the power valve, the secondary is connected to the speaker. Generally the primary is wound to have an inductance of 40 to 50 henries with a fairly low ohmic resistance. The secondary may have a tapping so that one may try the effect of altering the impedance to suit the speaker windings. There is no necessity, with most sets; to connect the secondary winding to earth, although with some receivers, especially those working from the mains, it may be desirable to do so.

A tapped choke is sometimes used in place of a tapped transformer and then the coupling to the speaker is made by means of



The connections for a simple tapped-choke and condenser output

(Continued at foot of next page)

# HOW TUNING AFFECTS QUALITY

By J. H. REYNER, B.Sc., A.M.I.E.E.

**TUNING** exercises an appreciable effect upon the quality of the reception, the extent of this depending upon the nature of the set. The customary arguments involve the use of sidebands, but I hope in this article to present the matter in a more practical light.

If one sets a tuning fork in oscillation the vibrations continue for quite a long time, gradually dying away. A tuned circuit is somewhat similar to this, for if we start an oscillating current in such a circuit and leave it, the current will persist for a relatively long period, gradually dying away to nothing. In the same way, if we try to start a current in an oscillating circuit it will take a little time to build up to its full value. The better the circuit—i.e., the lower the loss—the longer does it take for these currents to build up or die away.

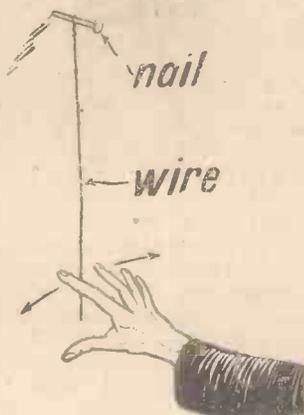
Now, when we are receiving telephony the currents must vary quite rapidly. Telephony consists of a carrier wave, the strength of which is varying many times a second, according to the speech or music. A low note from an organ varies from a maximum to a minimum, perhaps, thirty or forty times a second, whereas with a very high note, such as a piccolo, variations take place 4,000 times a second. Consider this last case in more detail.

Suppose we have a tuned circuit which takes about one-hundredth of a second to build up to its full value. If we apply to this circuit a voltage varying 4,000 times a second there will be absolutely no response. Before the current in the circuit has had time to grow the impulse has gone and has been replaced by another one in the opposite direction.

## A Mechanical Experiment

You can easily try this effect for yourselves with a pendulum. Take a light rod or wire and twist one end to form a loop, and suspend it from a nail as shown in the diagram. Now place the first and

second finger on each side of the rod, as shown in the diagram, and rapidly move the hand from side to side. Each time one of the fingers hits the rod it will move, and so it will be kept in a state of continuous vibration from side to side. Now hang a heavy weight (say, 7 lb.) on the end of the wire and try the experiment again. You will find that the rod does not move appreciably and hardly vibrates at all. This is because it is too sluggish and has not time



to get under way, as a result of one impulse, before the effect is immediately cancelled by an impulse in the opposite direction.

So much for the theory. The point is that a low-loss circuit will not respond to the higher frequencies which are therefore lost, and this is what is meant by side-band cut-off. If one uses a circuit of this character, speech loses its crispness. Indeed, if the effect is carried too far it even loses its intelligibility. Try tuning in to a distant station on a set which requires a lot of reaction. You will probably find that you cannot understand what is being said. Ease off the reaction a bit. The signal

strength will go down, but you will find that you can distinguish the words much better. One has to be content with smaller strength and less reaction in order to understand the speech.

A somewhat similar effect may occur when using a high-frequency amplifier which is too good. It does not follow that the amplifier should be unstable, but it may be too sharply tuned—i.e., too selective—even when no reaction is applied.

## Selectivity and Quality

It will be gathered from the last paragraph that a set can be made too selective for quality. Does this mean that one can either have selectivity or quality, but not both? The answer to this lies in the number of circuits employed. If one endeavours to obtain selectivity by means of a small number of circuits very sharply tuned, then the quality will be bad. This is shown by the simple detector circuit which can only receive distant programmes, if at all, in rather distorted form. A circuit using one or more high-frequency stages is better in this respect, and therefore, there is a tendency to-day towards more and more high-frequency stages with tuned circuits accompanying them. The band-pass filter which has come into prominence recently is an attempt to provide more tuned circuits without more valves.

## Points to Observe

Therefore, to obtain good quality one must remember never to force reaction. If one then requires more selectivity, add more tuned circuits. If the selectivity problem arises from the relative closeness of one's local station, the solution may lie in the use of a wave-trap, which will act as an additional tuned circuit on the local station only. If one requires selectivity all over the scale, then the use of a band-pass filter may be resorted to, or a further high-frequency stage may be added.

## "THE IMPORTANT LAST LINK"

(Continued from preceding page)

a fixed condenser. A tapped choke should have an inductance of the same value as the primary of the transformer which it replaces—that is, between 40 and 50 henries. The condenser, which can have a value of anything over 2 microfarads, must have good insulation for it has to stand up to the high-tension voltage.

It is advisable to arrange the condenser coupling so that one speaker wire is earthed. If, for any reason, it is desired to have both the speaker leads insulated from earth, then another fixed condenser may be connected in the return lead. Such a necessity may arise where the negative side of the set is not connected to the mains earth, as in some sets working on direct current mains.

There is no real advantage in using power valves in parallel unless only small valves are available. When this system of coupl-

ing is used, however, it is a real advantage to have an output transformer, because with valves in parallel impedance is practically halved (depending entirely on the characteristics of the valves used) and it is very probable that the speaker unit will not match up with this low impedance. Generally speaking, push-pull power valves necessitate an output arrangement and there are many push-pull output transformers on the market.

The ratio of an output transformer used with a single stage, depends upon the speaker employed. Many new dynamic speakers have a suitable output transformer incorporated, or suitable values are indicated.

With a speaker of normal impedance used with a power valve, the transformer ratio may be anything from one-to-one, to one-to-five, but with low-impedance speakers ratios so large as 25-to-one may be used.

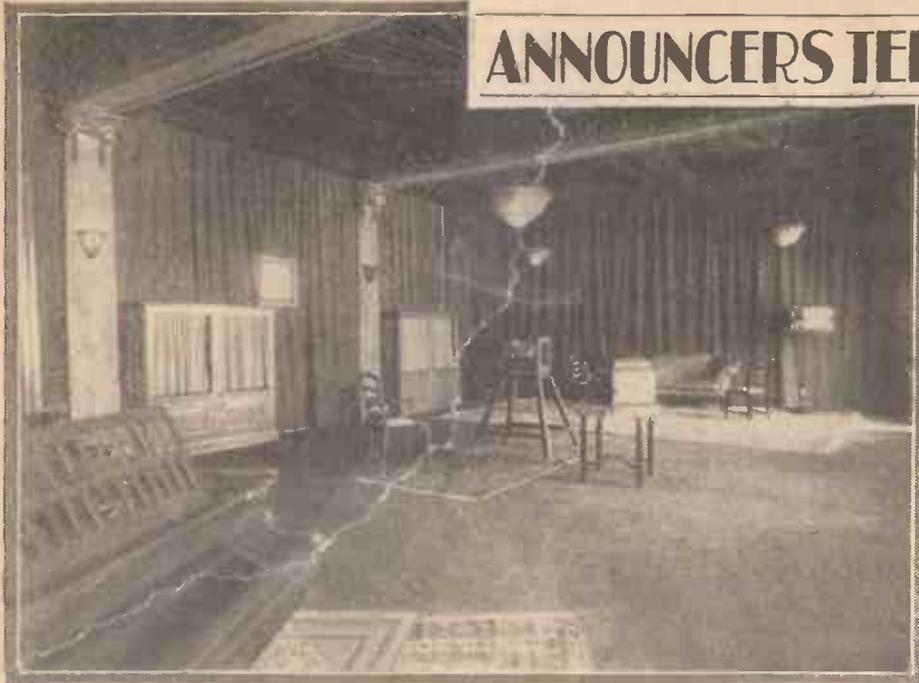
## PICK-UP QUALITY

**T**HE use of a low-resistance volume-control across the pick-up is liable to shunt the higher frequencies and produce "woolliness." A worn needle will also rob the higher notes, since the blunt point naturally ignores or "short-circuits" the sharper angles on the record track. Similarly the capacity leakage across a long pair of leads between the pick-up and amplifier attenuates the higher frequencies more than the low. On the other hand, the ordinary type of loud-speaker usually accentuates the high notes more than the low, and this tends to restore the proper balance.

B. A. R.

Upon the completion of the Chenju radio station near Shanghai, direct radio communication between China and the United States will soon be opened.

# ANNOUNCERS TELL THEIR STORIES



A general view of the Berne studio

## THE WOMAN'S POINT OF VIEW . . .

By  
MARGOT SCHENKER  
of Radio Berne

I FIRST listened to the wireless during my school days in London, in 1923. In those days wireless sets were almost unknown in Switzerland, and the owners of such marvels were overwhelmed by visits from real and alleged friends. I felt a sort of sneaking wish to try my luck as an announcer upon my return home to Switzerland, if only for the reason that I am most interested in the study of languages.

One day I found in the papers an advertisement offering a position as female announcer at the Berne studio.

I was not the only applicant, by a long way, but only one among sixty! Our voices were first of all subjected to a short test before the microphone, and I found myself selected, with some three or four others, for a more exhaustive examination.

The examination was much more severe. I was asked to read long passages aloud on several occasions, in German, French (announcements are made at Berne in two languages), Italian, and English, and I

can't say I found the proceedings very amusing!

Anyway, I was selected.

In those days Berne was one of the very few European stations in which women announcers were employed, and many of my correspondents wanted to know my age (fancy asking a woman!), the colour of my hair and eyes and so on. Many men asked for my photo, but that is not unusual.

Berne commenced its broadcast service very modestly. True, the studio was large and elegantly furnished, according to the standards which prevailed in those days, but as we only had one room, this must, of necessity, be used by the announcer also. There was no question, in those days, of a separate room for announcements and for lectures. One simply had to do the announcing surrounded by crowds of the artistes, singers, and actors.

One Sunday visitors came to the studio. An honest farmer, accompanied by his children, begged permission to visit the station. The visit stretched itself out interminably, however, and when I became thoroughly tired I took them to the control room and handed them over to an engineer. When they did eventually leave, the farmer suddenly pulled out his purse (a red checkered knotted handkerchief) and solemnly presented me with a two-shilling piece, whilst jerking his thumb in the direction of the engineer and inviting me to "share it with him!"

Although I know that all listeners are critical, it seems to me that the Swiss are even harder to please than the British.

The B.B.C. has to cater for urban and rural populations, but in Switzerland the problem is complicated by the fact that the public is divided into three main religions and three main languages. Although the whole population of the country is less than that of London alone, this faces the management of the programmes with a difficult task, for its means are very limited. There are at present about 100,000 licence holders in the country, and their contributions have to be allotted among five broadcast stations. In the beginning we used to receive a good many letters of approval, but there were also others demanding more programmes of local interest and the peasant population, in particular, was always clamouring for the yodel songs so typical of our country.

So for two or three months several of our programmes contained yodel songs every week, with the result that the public became thoroughly sick of their beloved yodel songs in a very short while. After that the programme director was left in peace!

Switzerland possesses a large number of artistes, and among the vocalists, violinists, and pianists there are a few who enjoy a European reputation. These, of course, are engaged by the station on many occasions. Apart from these, however, we book prominent artistes from abroad and it has always been interesting to me to observe their varied temperaments.

The French always struck me as being a trifle "sloppy," whereas the British, to my surprise, were nervous from the moment they entered the studio. The Germans, on the other hand, were often far more self-possessed before their performance than afterwards. As for the Italians, their chief worry used to be whether they would be heard properly in their own country, on the other side of the Alps.



The studio light orchestra at Radio Berne

LET "AMATEUR WIRELESS" SOLVE YOUR PROBLEMS.

THE HOW AND WHY OF RADIO

XVI—MORE SIMPLE FORMULÆ

If you are a beginner in wireless, now is your chance to gain a clear conception of its theory and practice. In this series of articles, specially prepared for the beginner, no previous knowledge of wireless is assumed. It is intended to deal with every aspect of the subject and the whole series will endow the beginner with sufficient knowledge to enable him to derive the greatest possible interest from the fascinating hobby of wireless

THOSE beginners who were able to digest the formulæ discussed last week may care to wade into slightly deeper technical waters. For condensers, either fixed or variable, there are some simple formulæ well worth knowing, since they are a practical help when building sets.

Let us look at Fig. 1. Two fixed condensers are shown in parallel. The capacity of one condenser is .0001 microfarad and the capacity of the other condenser is .0002 microfarad. The total capacity across A and B is .0003 microfarad. Here is our first formula: When condensers are connected in parallel the total capacity is equal to the sum of the individual capacities.

When condensers are connected as in Fig. 2 we say they are in series. The total capacity of condensers in series is always less than the capacity of any one of the

This formula applies to any number of series condensers; but for only two condensers in series there is a more simple formula that may help beginners. This is

$$C = \frac{C_1 \times C_2}{C_1 + C_2}$$

or the total capacity of two condensers in series equals the product of the two capacities divided by the sum of the two capacities. So in Fig. 2 we get

$$C = \frac{.001 \times .002}{.001 + .002} = \frac{.000002}{.003} = \frac{.002}{3} = .000666$$

.0006 as in the previous formula.

Lest the beginner should imagine that all this theory is unnecessary, let me give a practical example. Very often in these days we are told to connect a fixed condenser in series with the aerial and the set, with the object of improving selectivity. What does this series condenser really do?

Now the capacity of the average aerial is .0002 microfarad, so the total capacity across the coil, apart from the self-capacity of the coil, is easy to find from the formula:

$$C = \frac{C_1 \times C_2}{C_1 + C_2} = \frac{.0002 \times .0002}{.0002 + .0002} = \frac{.0000004}{.0004} = \frac{.0004}{4} = .0001 \text{ microfarad}$$

The reason the range of the tuning circuit is increased is now easy to see. For the minimum tuning capacity, as governed by the fixed parallel capacity, has been reduced, and the range of capacity from minimum to maximum has been increased.

Now we come to formulæ for the connection of resistances. When two resistances are connected in series the total resistance is equal to the sum of the individual resistances. So in Fig. 5 the total resistance is  $R = R_1 + R_2$  or  $R = 100,000 + 50,000$  ohms = 150,000 ohms. That is an easy formula to understand, but when resistances are connected in parallel, as in Fig. 6, the formula is a little more involved. A curious fact worth noting is that the formula for parallel resistances is very similar to the formula for series condensers. Thus

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

This formula applies to two or more resistances in parallel, but for just two parallel resistances a more simple formula can be used, namely:—

$$R = \frac{R_1 \times R_2}{R_1 + R_2}$$

So in our example of Fig. 6 we get, by the first formula,

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}, \text{ or } R = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}$$

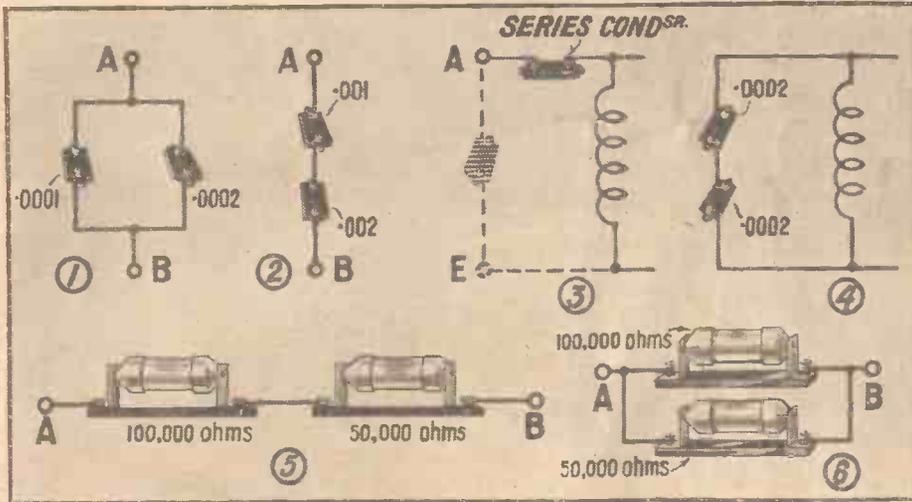
$$R = \frac{1}{\frac{1}{100,000} + \frac{1}{50,000}} = \frac{1}{\frac{1 + 2}{100,000}} = \frac{100,000}{3} = 33,333 \text{ ohms.}$$

By the second formula,

$$R = \frac{R_1 \times R_2}{R_1 + R_2} = \frac{100,000 \times 50,000}{100,000 + 50,000} = \frac{5,000,000}{150} = 33,333 \text{ ohms.}$$

When resistances are connected in parallel the total resistance is always less than the resistance of the smallest individual resistance. HOTSPOT.

Next Week: Simple Basic Circuits.



This series of diagrams illustrates the explanation given in the text of simple radio calculations

series. In Fig. 2 the capacity of one condenser is .001 and of the other .002 microfarad. The total capacity is roughly .0007 microfarad, which is less than the capacity of the smaller condenser.

The formula whereby we arrive at the capacity of condensers in series is not so simple as the parallel formula. For two condensers in series the formula is

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}$$

when C is the total capacity, C<sub>1</sub> is one of the series capacities, and C<sub>2</sub> is the other series capacity. So C

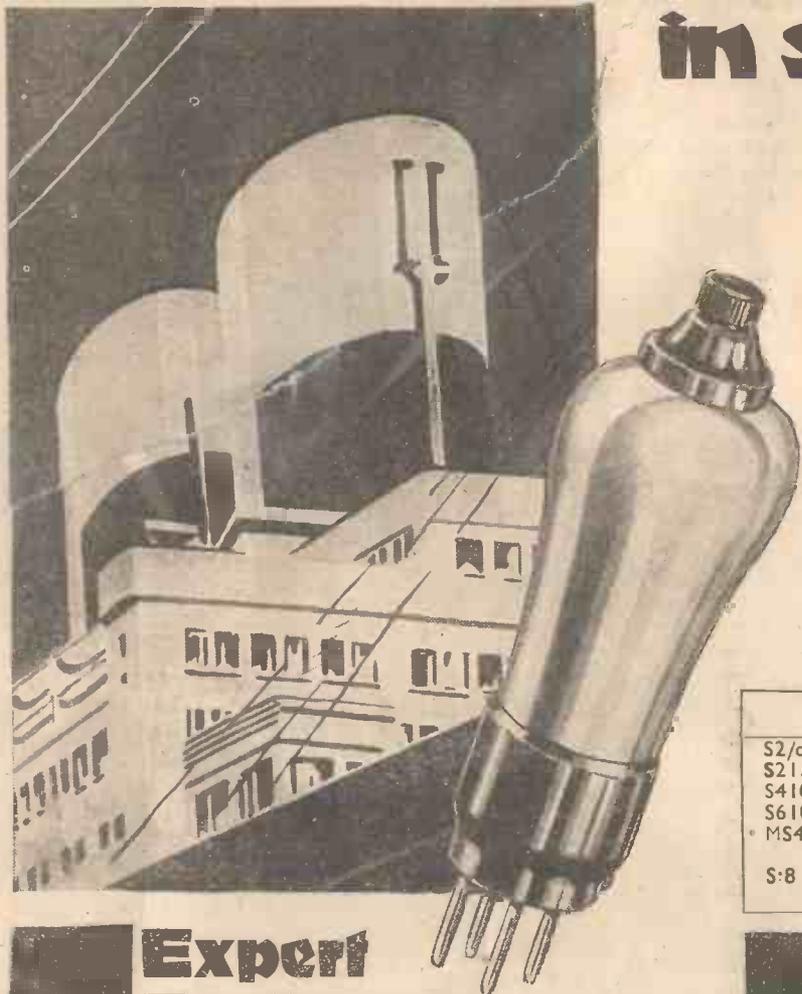
$$= \frac{1}{\frac{1}{C_1} + \frac{1}{C_2}} = \frac{1}{\frac{1}{.001} + \frac{1}{.002}} = \frac{1}{\frac{2 + 1}{.002}} = \frac{.002}{3} = .000666$$

= .0006 microfarad.

The answer is that it reduces the effect of the aerial to earth capacity, with which it is, in fact, in series. Every beginner must have noted how, when a series condenser is used, the tuning range of the coil is increased. This is because the effective parallel capacity across the coil is reduced, so enabling the minimum point of tuning to be lowered.

This explanation may not be very clear until we dissect the scheme as in Figs. 3 and 4. At Fig. 3 is the familiar series condenser connection. In dotted lines is shown the condenser formed by the capacity of the aerial to earth. Now the interesting thing to note is that the series condenser and the dotted line condenser are in series with one another. The total capacity across the coil is therefore, as in Fig. 4, the series capacity of the two condensers. And as we have seen from the formula, the total capacity of the two condensers in series is less than the capacity of either of them.

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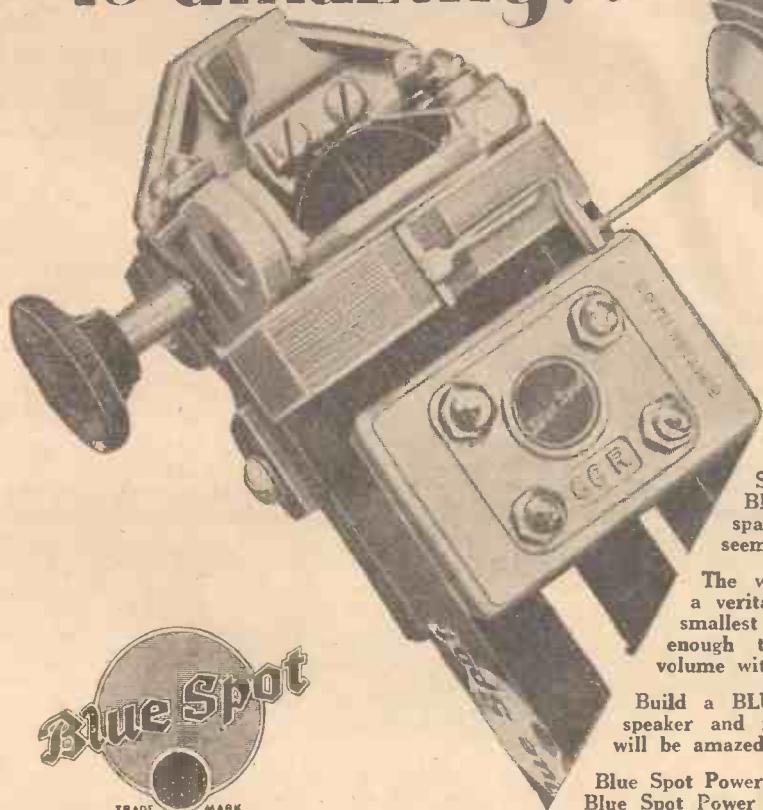
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# On Your Wavelength!

## NOT A WHISPER

THE mystery of the American medium-wave stations still continues to baffle long-distance enthusiasts. Conditions for DX work, so far as European stations are concerned, are magnificent at present; every bit as good, in fact, as they were three or four years ago, when even single-valve sets used to pull in the Yanks. On most nights there is not an atmospheric to be heard, all-round signal strength is splendid, and fading is far less noticeable than it was in the autumn. Yet even my Stenode, with its six-figure over-all amplification, brings me no message from the U.S.A.

On several recent occasions I have switched on in the small hours and, though I have heard the breathing noise which indicates a carrier from several stations, I have, so far, nothing better to record in my log than the reception on one isolated morning of almost inaudible strains of music from WGY. I don't propose to know the explanation, and I don't suppose that anybody else does, but I wish to goodness that things would settle down and let us hear the American once again. About two and a half million people have taken to wireless since American reception on broadcast wavelengths was good, and probably not one in ten thousand of these has ever obtained direct reception from the U.S.A. Hence there is a large scale thrill coming when WBBZ, KDKA, and the rest begin to come across the Atlantic once more.

## SETTING A FRAME

I HAVE a hint, by the way, for those DX enthusiasts who have sufficient high-frequency amplification at their command to make use of frame aeriels. Everyone knows that the frame is directional, but it is not by any means too easy to discover by simply twiddling it about exactly in which direction it should be pointed in order to obtain the best results from a weak and distant transmission that is just audible. Experiments long ago showed that by far the best method of discovering the precise direction of a station was to turn the frame, not so that signal strength was at a maximum, but rather so that it was at a minimum.

You may get apparently very little difference in signal strength if you turn the frame from 10 to 15 degrees to either side of an imaginary line joining it to the transmitting aerial. But if you try turning the frame until signal strength is at its weakest you will find that there is one quite clearly defined setting at which signals produce their minimum volume. Provide your frame with a pointer at right angles to the windings and when you first tune in a station turn the aerial to the position of smallest signal strength. Note where the pointer comes, and then turn the frame exactly through a right angle. The windings will now lie along the line previously occupied by the pointer, and

you can be quite sure that the frame is turned accurately to the best position. Direction finders work on the principle just described.

## "NOISES OFF"

THE other night my big set proceeded to misbehave itself in a surprising way. No matter to what wavelength it was tuned it made the loud-speaker keep on saying "Tick-tock-tock, tick-tock-tock" at the top of its voice and at quite regular intervals. Motor boating? No, quite obviously A.C. interference from somewhere or other. But where, exactly? Hastily reviewing buildings in the neighbourhood and their occupants, I couldn't think of any where apparatus likely to cause such interference could be in use. However, reception had become completely impossible, for the tick-tock-tock came through on every single wavelength that was within the compass of the set. Something had to be done about it. This set uses a frame aerial, and I have also in the house a transportable possessing a built-in frame mounted on a turntable. Leaving the big set where it was, I took the transportable into various rooms as far away from it as possible, and discovered by turning it the direction from which the interference was coming—it was so strong that it caused this little fellow to play up almost as badly. Then I went back to the set and put in further D.F. work with its aid. I happened to possess a twenty-five miles to the inch map on which the bearings obtained could be plotted. They crossed at a building not very far away, which is in use as a wireless shop—of all things!

## TRACKED DOWN

"A CHARGER with a sparking brush," thinks I, and round I went to inquire. They hadn't a rotary charger in use, so that was not that. The tick-tock-tock, tick-tock-tock continued, and I had to abandon reception. On the following evening the mystery was solved. On my way home I passed the shop and noticed that a flashing sign had been installed as part of the Christmas decorations and that its lights were flashing out exactly one-two-three. I turned on the big set and found the interference still present. Over the telephone I asked that the sign might be switched off for a couple of minutes. Directly this had been done a beautiful background of silence occurred, but the moment that the sign was switched on again the tick-tock-tock started. Suitable condensers have since been fitted to the rotary switch responsible for the sign, and the ticks and tocks ceased.

## A QUEER CASE

LATELY I seem to have been having quite a lot of adventures. One of the funniest occurred the other night, when I got back home rather late and connected up my 6-volt accumulator, which had just

come back from the charging station. This, I may say, consists of three fat glass-cased cells, two of which live in one crate and are connected together by a lead strip, whilst the third is in a crate of its own. Having joined up the two cells and the single one in series, and connected up to the set, I switched on, and was astonished to find that the filament ammeter showed about a quarter of the normal current and the H.T. milliammeter hardly anything at all. Putting the voltmeter right across the three cells, I obtained a reading of 2.2 volts. Now, please, don't jump to the conclusion! I had *not* connected up the cell with a crate of its own the wrong way round. The voltmeter showed that this was giving its proper reading, but when I placed the instrument across the two series-connected cells the reading was 0.0000. Testing each of these two by itself, I found that the first showed 2.2 volts, but when I placed the positive voltmeter prod on the positive terminal and the negative lead on the negative terminal of the second cell of the pair the instrument did its best to read backwards.

## TOPSY-TURVY

HOWEVER, when I reversed the connections, putting voltmeter positive on cell negative and vice versa, I got a respectable reading. I thought, first of all, that some careless johnny at the charging station must have fed the cell the wrong way round with electrons—I have known this happen before now, and there wasn't much left of any cell so treated. But examination showed that the plates were in pretty good order and, obviously, hadn't received an inside-out charge. What had taken place was this. There *was* a careless johnny and he had separated the two cells from the twin crate for charging purposes. He had screwed the lead terminals on which the positive and negative marks appeared right out of their sockets, and had eventually put them back positive terminal in negative socket and negative terminal in positive socket. He had then connected up the two cells in opposition instead of in series, and there we were. I don't mind betting a pentode to a cat-whisker that a good many readers would have been sorely puzzled if their batteries had been dealt with in the same way.

## AN IMPORTANT POINT

THERE is a point that has always puzzled me very much with regard even to some of the best of sets that are not of my own make. This is the remarkably low standard of smoothness in the reaction control that many people appear to have. For example, a friend was displaying to me the other night a set of which he was very proud. "Just see how velvety the reaction is," he cooed. Well, I found that on the first wavelength tried the set went into oscillation with a grunt at, say, 40 on the reaction condenser and

## On Your Wavelength! (continued)

didn't come out of it again until I had turned back to 32. Personally, I should call that perfectly beastly reaction control, but he seemed to think that it was jolly good.

My own standard is this. If you are using reaction (I prefer myself to have an extra H.F. stage instead) you should be able to put on telephones and, as you approach the point of resonance by tightening up the reaction coupling, you should become gradually conscious of a faint rustling noise when the set is just short of the oscillation point. Further tightening should produce a smooth glide into oscillation without the slightest grunt or groan. Further, if the set goes into oscillation at 40 on the reaction condenser it should come out of it at once when the condenser is turned below this mark. If you can get perfectly smooth reaction it makes the most enormous difference to the set's powers, for it means that you can work far closer to the oscillation point, and therefore obtain vastly more amplification than is possible if reaction is at all fierce.

### MY METHODS

**M**YSELF, I would not use any grid-leak-and-condenser set in which the grid-leak return was not taken to the slider of a potentiometer instead of direct to L.T. positive. With a potentiometer you can obtain exactly the right positive grid bias for the detector valve and, provided that your circuit is decently laid out and made up of respectable components, smooth reaction should be ensured in this way in any set with not more than one stage of high-frequency or low-frequency amplification. It is, of course, necessary to use common sense in adjusting the plate voltage of the detector valve, and a little time spent over plate and grid voltages will generally suffice to effect enormous improvements.

In larger sets—that is, four- or five-valvers with two or more stages of high-frequency amplification; three-valvers with detector and two L.F. stages; four-valvers with two H.F., detector, and pentode; or five-valvers with two H.F., detector, and two L.F.—other considerations will probably arise. The first of these is something on the H.F. side to prevent interaction between tuned circuits. Inefficient screening will nearly always mean, amongst other things, fierce reaction. And in these bigger sets we are up against feed-back effects caused by the common source of high-tension supply to the various circuits. If we want efficiency, stability, and smooth reaction, decoupling on both the H.F. and L.F. sides is essential in nearly every case. By the use of decoupling circuits we can prevent H.F. and L.F. impulses from getting into the batteries or the eliminator, for we provide stoppers in the form of resistances whilst by-pass condensers offer easy paths to earth. The difference that the addition of decoupling circuits can make to an unstable and floppy set is sometimes almost incredible.

### RADIO "MAGIC"

**A** FLAVOUR of mystery will always go far to lighten the more serious side of a lecture on wireless. For instance, a demonstration of what was called "direct projection" of speech into the human brain by wireless, recently given before the New York Electrical Society, proved so successful that the lecture had to be repeated on three separate evenings, each time to a crowded house. In the experiment the lecturer and his assistant each took hold of one terminal of a two-wire circuit carrying a high-frequency current modulated with speech from a distant room. The other hand was then placed over the ears of the "subject", who at once repeated the distant message, though no sound could be heard by the remainder of the audience. The explanation given was that the current passed through the bodies of the lecturer and his assistant, rectification took place across the points of contacts, whilst the capacity of the eardrum and surrounding tissues served as an electrostatic loud-speaker.

I remember a similar kind of thing being done over here some time ago, though the idea was carried out on somewhat different lines. A network of wires was hidden under a ballroom floor and fed with microphone currents from a distant source of music. The dancers wore small earphones which picked up energy radiated by the hidden wires and rendered the distant music audible only to themselves. If high-frequency currents are used a small crystal rectifier is inserted in the earphone windings.

### PICK-UPS

**I** AM glad to see that inventors are giving special attention to the problem of perfecting the operation of the gramophone pick-up. Mr. S. G. Brown recently exhibited to the Institute of Electrical Engineers a new instrument he has designed to work on the principle of the moving-coil speaker. The usual iron armature is replaced by a flat coil mounted so that the windings lie in the narrow gap between the poles. The coil is, of course, vibrated by the needle, and the quality is certainly very good. The other day I also happened to notice in an American magazine the advertisement of a pick-up control

### DO YOU KNOW—

that there may be a loss of signal strength resulting from the use of a high-resistance potentiometer shunted across the aperiodic aerial coil, and used as a volume control? It is possible to control volume by using a 50,000-ohm potentiometer in this way, but it may not be the most convenient way of doing so.

that if you still get "sparks" when testing the wiring of your set a few minutes after it has been switched off it does not necessarily indicate a fault? Good condensers should store current for several minutes, and will give a spark if short-circuited.

in which the response could be regulated from "mellow" to "brilliant" by means of a sliding contact. Details of the method of control were not given, but I fancy that it was obtained by varying the constants of a tone-shaping circuit shunted across the pick-up output. If this is so, it seems to me rather a useful idea.

### A CURIOUS HAPPENING

**I** DID a funny thing the other day with even more curious results. I suddenly wanted an amplifier for a certain purpose, and found that the one which I had been accustomed to use had been taken for another job. I, therefore, dug out a power amplifier which I sometimes use, and which contained a U8 rectifying valve, the amplifier portion consisting of an AC/HL and two P650 valves in push-pull. One of the valves was missing and, casting my eye rapidly over the assembly, I decided that it was the rectifier. I therefore got hold of a U8 valve and inserted it in position. I switched on and, as everything seemed to work O.K., I continued with the experiment.

A short time afterwards, happening to look up, I noticed that one of the anodes of the U8 was running to a dull red heat, while the other one was quite cool. I immediately switched off to investigate the cause, because a U8 is not intended to run red-hot, and therefore there was some overloading taking place. This was more particularly the case as only one anode was hot, whereas the other was apparently normal. So that it showed an unbalance on the system, and it required immediate investigation if the valve was to be saved from damage.

### A SUGGESTION

**A**S I say, I switched off the set, and as soon as I had done so I noticed that I appeared to have two rectifying valves in the set. A more calm and collected examination showed that I had replaced the U8 instead of one of the P650 valves. Now, if you draw a push-pull circuit and, instead of one of the valves, place a rectifying valve with one anode connected where the grid ought to be, and the anode connected where the normal anode is, you will obtain quite a novel circuit. I have not yet had an opportunity of testing the valve by itself. I rather suspect that the other P650 was taking the whole of the load and that the U8 in the incorrect position was not contributing towards the power output. Yet I cannot say definitely that this was the case, because I did not notice anything seriously wrong with the quality. In fact, it seemed to be quite satisfactory, which made the effect all the more puzzling.

Perhaps some reader with an inquiring turn of mind would like to duplicate this experiment and see exactly what happens. I certainly shall myself when I get a moment, and I shall try removing the other push-pull valve to see whether the rectifying valve is capable of handing on any power to the loud-speaker at all.

THERMION

# PICK-UPS AND QUALITY REPRODUCTION

By W. JAMES

## Practical Hints on Securing the Best Results

**M**OST people, when they play gramophone records through their wireless sets, like to avoid scratch. They find that although the quality of the reproduction of wireless is good, records do not sound too well.

This is understandable to an extent as records do not carry all frequencies, both high and low being of relatively lower strength. Some pick-ups are arranged to give a relatively greater bass output, but the output characteristics of the different specimens vary over wide ranges.

A form of tone control is, therefore, worth having, and whilst I do not claim that the results are greatly improved at both ends of the frequency range, the tone control is usually appreciated. It consists of a .0005-microfarad adjustable condenser connected between the grid and anode of the first valve used in the gramophone amplifier.

other words, the carrying arm and pick-up must be so arranged with respect to the turntable that the record is played properly.

Wear takes place when the tracking is wrong, when the needle is not upright, and when the turntable is not level. These points should be seen to if the best results are desired.

It is possible to compensate for the characteristics of a pick-up by adjusting the amplifier and choosing suitable valves. A pentode will bring out the high notes and sometimes the low notes as well.

Most people like to hear the low notes rather strongly and therefore try strengthening them by attention to the amplifier. When a transformer is used, the valve connected to it should be of low impedance. The treble may also be emphasised by doing this, but the tone control will take care of this.

A resistance-coupled transformer having a coupling condenser of suitable size for the transformer will also increase the relative strength of the bass.

The circuit Fig. 2 shows the connections which are well known, the value of condenser c being determined by trial. Some makers suggest a value which suits a given transformer and resistance. This value may be increased if necessary. Most loud-speakers do not deal properly with the bass notes



with the result that a little emphasis is worth while.

Good results can hardly be expected from a power valve of small size and a 100-volt high-tension battery. It is essential to use a big valve or a push-pull output circuit and to apply the maximum voltage available to the stage. The point is, unfortunately, soon reached with dry cells where maintenance becomes too costly. With mains available there is no limit to the power if suitable apparatus is used.

## AROUND THE SHORT-WAVE DIAL

**A** BATCH of interesting correspondence from Australia has brought with it a very interesting short-wave circuit, namely, the circuit of the prize-winning receiver at the Melbourne Amateur Radio Show. It is entirely A.C. operated and makes use of four valves, one of which is a tuned screen-grid stage. The whole receiver is completely shielded and de-coupling arrangements have been made very complete. A screen-grid valve is also used as a detector and is resistance-capacity coupled to the first L.F. valve, whilst a choke output is used for the telephone circuit. An interesting feature is the use of differential reaction, which, as a rule, has not been found very effective on the short waves.

Many amateurs have probably been surprised to find that on the short waves a receiver which is built entirely in a metal cabinet is liable to suffer from bad hand capacity, even if the cabinet is well earthed. The whole of the metal seems "live," and if it is touched with the finger the tuning is completely altered. Experience has shown me that this can be due to a number of causes, the most prominent being incomplete by-passing of H.F. currents.

I have used receivers built in metal cabinets which had no H.F. by-passing arrangements, and their body-capacity effects were horrible, whilst I have also used receivers in metal cabinets in which the H.F. by-passing arrangements were practically as complete as possible and it was possible to touch any part of the cabinet or the battery supply without the slightest alteration in the tuning or the slightest body-capacity effects. Therefore, if your receiver suffers from bad body-capacity effects, even though it may be completely shielded, try using a H.F. choke and a 2-microfarad condenser in each of the H.T. leads.

MANDER BARNETT.

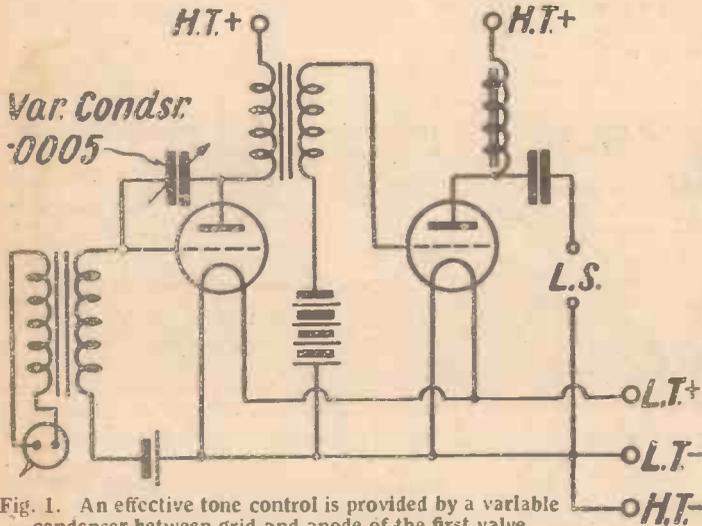


Fig. 1. An effective tone control is provided by a variable condenser between grid and anode of the first valve

phone amplifier. A condenser having leaves of bakelite, paper or other insulating material is recommended as the voltage difference between the grid and anode may be considerable. The connections are given in Fig. 1.

A condenser could be connected across the secondary of the transformer. The effect here will be to reduce the high notes, but the first method is to be preferred.

It is well known that the output in volts varies with the type of needle used and so does the quality. For a given pick-up the user should find by experiment the best sorts of needles. Usually there is magnification to spare so that "medium tone" needles may be used without loss of useful volume.

Surface noise can to an extent be minimised by choice of needles and the weight distribution. Some pick-ups with their carrying arms press far too heavily upon the record. A balanced carrying arm is to be preferred from all points of view. Correct tracking is, of course, essential. In

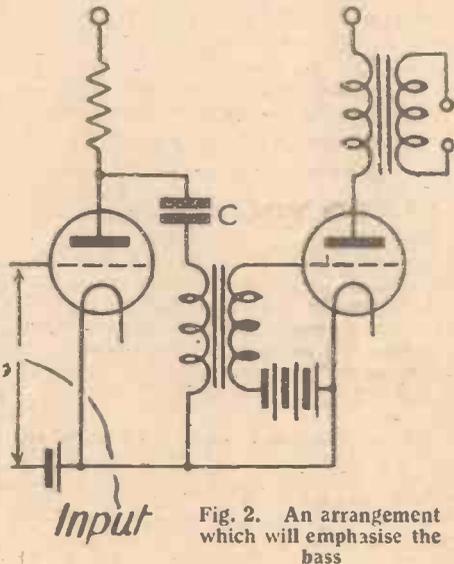


Fig. 2. An arrangement which will emphasise the bass

The object of all volume-control systems should be to control the signal voltage without suppressing

# CONTROLLING VOLUME WITHOUT DISTORTION

either high or low notes. In this article the best systems are described and practical advice on their application given.

THE volume of sound from the loud-speaker can be controlled at either the high-frequency or low-frequency end of the set.

For example, the average gramophone pick-up needs some form of control, otherwise the initial pick-up voltage, of say 1 volt, may be amplified too much by the succeeding valves.

If a variable resistance is shunted across the pick-up the top notes will almost certainly be suppressed and distortion will be

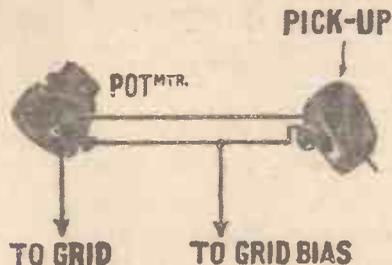


Fig. 1. A simple volume control for a pick-up

very marked. But, as Fig. 1 shows, it is quite easy to arrange a potentiometer between the pick-up and the first amplifying valve.

The two ends of the potentiometer are connected across the pick-up; one end goes to grid-bias and the slider of the potentiometer is taken to the grid of the valve. When the slider is at the centre of the potentiometer only half the pick-up voltage is handed on to the grid. As the slider approaches the end of the potentiometer remote from grid-bias, the voltage applied to the grid increases. As the slider approaches grid-bias negative the voltage gradually decreases.

In this control one must be careful to choose a potentiometer with the right resistance. With the average pick-up a 5,000-ohm potentiometer is suitable. If the resistance is much lower the potentiometer may easily load the pick-up and high notes will be lost.

A good form of low-frequency volume control is shown by Fig. 2. Here the secondary of the low-frequency transformer is shunted by a potentiometer. One end goes to grid-bias negative and the slider is connected to the grid. The action is then similar to the pick-up, in that voltages from the primary are handed on to the grid by an amount that varies according to the position of the slider.

Still another good potentiometer system

for low-frequency control is shown by Fig. 3. Here is a resistance-capacity amplifier, with a 150,000-ohm wire-wound potentiometer utilised as the anode resistance. The slider is taken to one side of the coupling condenser. The nearer the slider is taken to the anode end of the potentiometer the greater will be the voltage handed on to the next valve.

Sometimes it is necessary to control the signal voltage before detection. There are several ways in which this can be done. A variable condenser can be connected in series with the aerial and the set. As the capacity is decreased so is the voltage passed on to the set. This form of control is useful

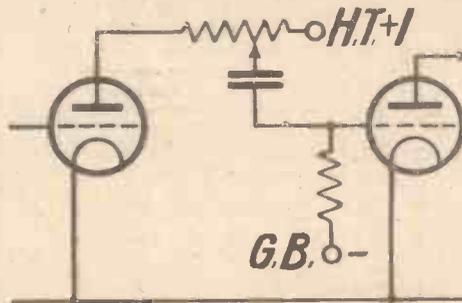


Fig. 3. This is another potentiometer-system of L.F. control which gives good results

in all-electric sets, where it is not very easy to arrange a filament control.

For battery-operated sets including a screened-grid valve the circuit of Fig. 4 is strongly recommended. Here it will be seen that a filament rheostat is connected in the negative lead of the filament of the screened-grid valve. The characteristic of

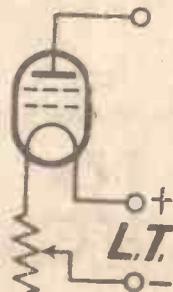


Fig. 4. Use is made of a rheostat in the filament lead of the screen-grid valve in this arrangement

this type of valve is such that when the filament voltage is reduced the amplification decreases without introducing distortion. But one should remember to connect it in the negative lead, since by so doing the grid-bias is automatically adjusted. This

form of control is not advisable with a three-electrode high-frequency valve.

Many sets rely upon reaction as a volume control. Although it is quite true that an increase in reaction causes an increase in the strength of a weak signal, it should be remembered that when a signal is initially too strong without reaction, this control is useless as a means of decreasing volume. De-tuning is another common method of cutting down the volume of a station too strongly received. This is a bad practice

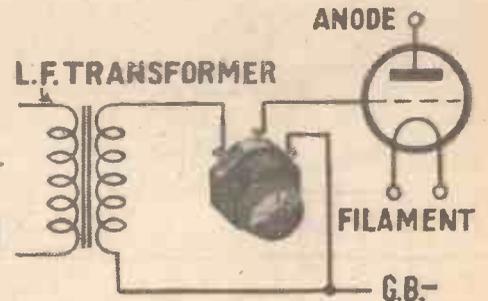


Fig. 2. A good type of low-frequency volume control

in these days, because by de-tuning one may quite easily bring in a background of interference from an adjacent station. One or other of the volume controls mentioned above should be included in every set.

## GRID BIAS

IT is a great mistake to leave the same grid-bias battery in operation for more than six months. Usually a falling-off in quality is the first symptom to indicate that the battery requires renewal, but very often the change in quality has been so gradual that it is not noticed until too late. If the grid bias is allowed to drop below its proper value, not only is an unnecessary drain made on the H.T. battery, but the life of each valve is appreciably shortened. The cost of a new grid-bias battery should be regarded as an insurance premium on both the H.T. supply and valves.

B. A. R.

There is a possibility that Basle (Switzerland) may shortly work on another portion of the waveband, as up to the present it has been sharing a borrowed wavelength with Dresden. This position was originally allotted to Bulgaria, and in the course of a week or so the new Sofia 12-kilowatt station will be launched on the ether.

# GRAMOPHONE RECORDS OF ALL YOUR RADIO FAVOURITES MADE IN YOUR OWN HOME!

**THEY COST ONLY — 6<sup>D</sup>**  
**THEY'RE 6 INCH AND PLAY AS LONG AS A 10 INCH RECORD AND THEY'RE DOUBLE-SIDED TOO!**

**6<sup>D</sup>**

Many efforts have been made to produce a perfect home-recording outfit. At last it has made its appearance—the Kingston Home Recorder.

Two models have been designed. The first, for those possessing a radio set, consists of:

- (1) A wire gauge.
- (2) A tracking device.
- (3) A specially tuned pick-up.
- (4) Track arm.
- (5) Recorder sound box.
- (6) Needles.

The fixing of the track arm to your gramophone (any type is suitable), is only a matter for a few moments. Then turn to your radio programme, select the items you wish to record, plug in the lead from the special pick-up to the loud-speaker terminals of your set, and set the gramophone motor in motion.

Directly the recording has been completed, the record can be played back on the same gramophone.

Just think of the marvellous possibilities of this little contrivance. Records of such favourites as Jack Payne and His B.B.C. Dance Band, Leonard Henry, Mabel Constanduros, and hundreds of other well-known radio artists and programmes can be perfectly and permanently recorded.

This model is retailed at £3 16s. 6d.; records are supplied in two sizes. The popular size, which plays as long as an ordinary 10-inch record, is 6s. per dozen (Double-sided).

The second model is very similar to the above, except that the equipment does not include the special pick-up.

It has been designed primarily for those not possessing radio sets and records speech only.

A small horn is fixed to the special sound box and it is into this that your message is spoken. The resultant recordings are not only of crystal-like clarity, but are exact reproductions of the voice tone.

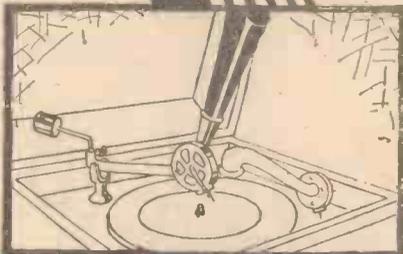
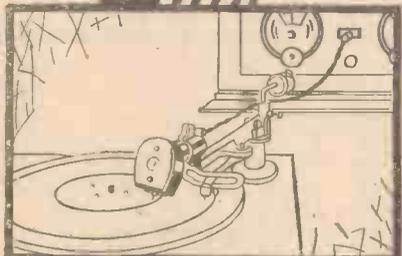
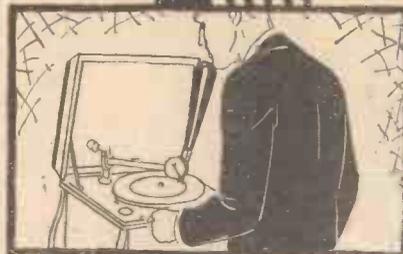
The Kingston Home Recorder is not a gadget, not a toy, but a definite necessity for every home and is the dawning of a new era in home amusement. Just think of the satisfaction of catching the voices of your children and always having them to listen to in the years to come.

This model retails at £2 5s.

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*"The Ear of the World"*

Don't Forget to Say That You Saw it in "A.W."

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**TELSEN H.F. CHOKES.** Designed to cover the whole wave-band range from 18 to 4,000 metres, extremely low self-capacity, shrouded in genuine Bakelite. Inductance 150,000 micro-henries. Resistance 400 ohms. Price 2/8 each.



**TELSEN FIXED (MICA) CONDENSERS.** Shrouded in genuine Bakelite, made in capacities up to .002 mfd. Pro. Pat. No. 20287/30. .0003 supplied complete with Patent Grid Leak Clips to facilitate series or parallel connection. Can be mounted upright or flat. Tested on 500 volts. Price 1/- each.

Your present set may be good, but Telsen Components will make it better!—INFINITELY BETTER! You will get a clearer tone, bigger range, greater power! Efficiency will replace deficiency! Telsen performance is unique because Telsen design embodies many new and exclusive features which cannot be matched! That is why leading technical designers always specify Telsen Components in their new circuits. Make your set 100% more efficient with



**TELSEN FOUR-PIN VALVE HOLDERS.** Price 1/- each.

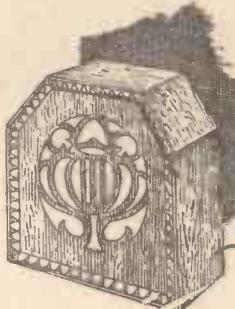
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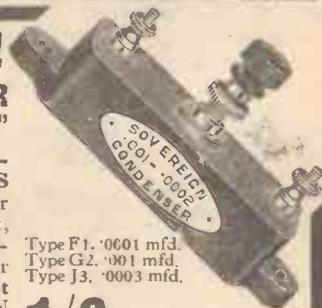


**Everybody's calling for**

Player's Please



**SPECIFIED AGAIN!**  
 IN THIS WEEK'S "A.W." "SUPER HET SHORT-WAVE ADAPTOR"  
 SOVEREIGN COMPRESSION-TYPE (PRE-SET) CONDENSERS (Type J3) are specified for the "Super Het Short-wave Adaptor" this week, thereby proving once more the superiority of Sovereign Components. Other makes will *not* do as well—if you want better results, use SOVEREIGN and be sure.



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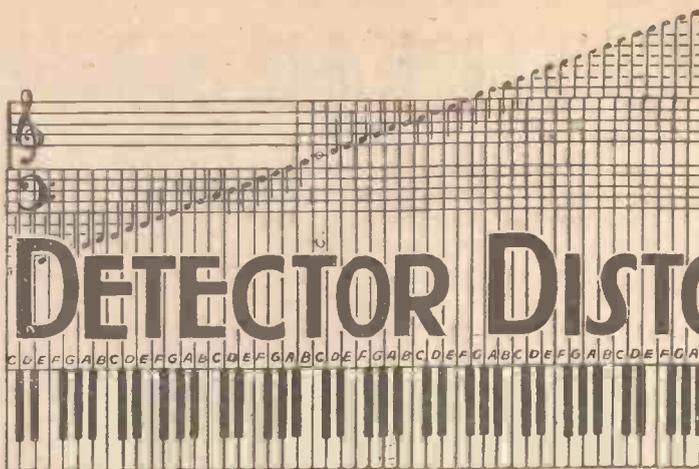
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ANODE-BEND  
OR  
LEAKY-GRID?

THE NEW  
POWER-GRID  
DETECTION

# IS YOUR DETECTOR DISTORTING?



WHEN one realises that the detector valve is usually working as a low-frequency amplifier, in addition to its function as a detector, the question of distortion assumes great importance.

The average amateur has, in the past, regarded anode-bend rectification, as shown by Fig. 1, as the most certain way of avoiding distortion in the detector stage. With a large signal input this form of rectification is certainly good.

But it is not very sensitive to weak signals. And as the impedance of the valve when used for anode-bend is very high, the low-frequency coupling must also have a high impedance, or distortion will be introduced.

### Anode-bend Rectification

Usually the anode-bend valve is followed by a resistance-capacity coupling, because it is easier and cheaper to provide a high anode resistance than a high primary impedance in a transformer. With a high-class transformer, having a large primary impedance, one can fairly safely use anode-bend without distortion.

Almost any valve can be made to work as an anode-bend detector, by suitable adjustment of negative grid bias. But best results are obtained from a "steep-slope" valve. As shown by Fig. 2, the curve of a suitable valve for anode-bend has a sharp bend between minus 4 and minus 6 volts.

### The Most Popular System

Fig. 3 shows the more popular system, the leaky-grid-condenser detector. Most amateurs prefer this system because it is

more sensitive than anode-bend, and because it works well when followed by medium impedance couplings.

But distortion can very easily occur with a leaky-grid detector. It will be seen that the grid leak is connected to the positive side of the filament. Because of this, grid

Lately, we have heard much of power-grid detection. The connections for this are the same as Fig. 3, but the values of the leak and condenser are altered. A .0001-microfarad condenser and a .25-megohm leak are needed, working with a low-impedance valve of say 10,000 ohms.

With power-grid detection it is possible to get better quality than with anode-bend and the sensitivity is considerably greater. The power-grid detector does not easily overload, and, as it can handle large signal voltages, it is now being extensively used in sets preceded by two or more stages of high-frequency amplification.

### The Following Stage

As the anode current of a power-grid detector may easily be as much as 4 or 5 milliamperes, especially with the recommended high anode supply of 150 volts, the transformer following it must be designed so that the primary can carry this current without saturating the core. If that happens the impedance is lowered and distortion is produced.

Fig. 4 shows how power-grid detection can be used with a normal transformer by the resistance feed method. The high-tension current is diverted from the primary of the transformer through a resistance and only the low-frequency signal current passes through the primary.

In the future there is no doubt that power-grid detection will become standard, especially as the tendency is to include more amplification before detection, implying a need for a detector capable of handling large voltages without distortion.

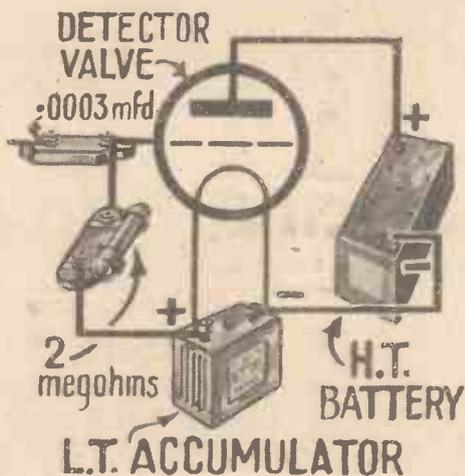


Fig. 3. A pictorial representation of the popular grid-leak system of rectification

current flows. To prevent signal distortion due to this grid current we have to choose with great care the value of the grid leak and grid condenser; .0003-microfarad and 2 megohms is the usual combination, but sometimes better quality can be obtained with a .0002 microfarad condenser or a 1-megohm leak.

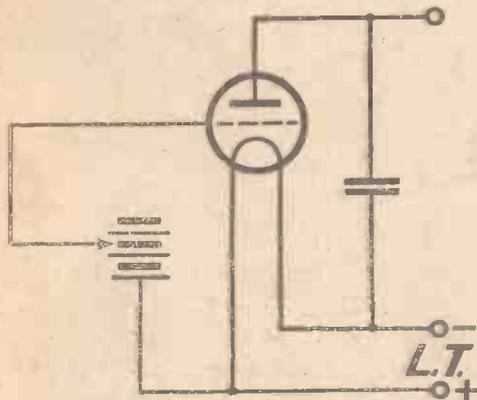


Fig. 1. Anode-bend rectification is good when there is a large signal input

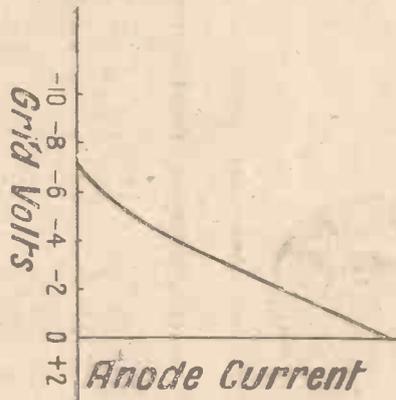


Fig. 2. Curve of suitable valve for anode-bend rectification

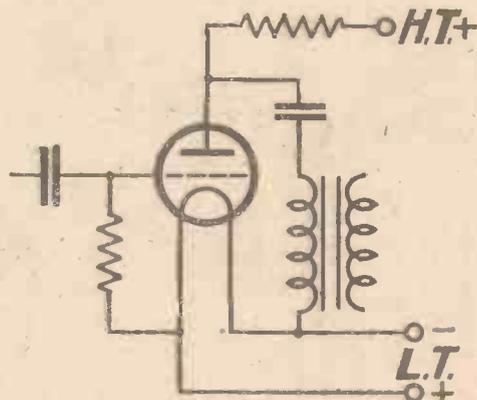
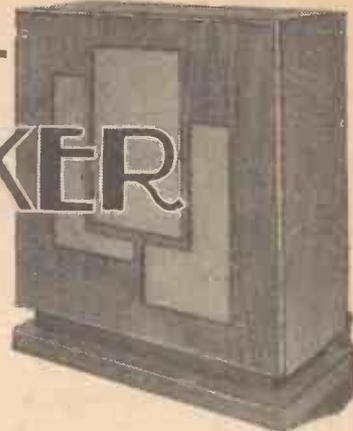


Fig. 4. Circuit for power-grid detection followed by a transformer

# GETTING THE BEST— —FROM YOUR SPEAKER



ACCENTUATING TREBLE OR BASS :: LOUD-SPEAKER  
TYPES :: DUAL WORKING :: BAFFLE BOARDS

**L**ISTENERS divide themselves into two classes: those who listen to local stations and those who *log* distant stations. The local listener soon becomes critical of the reproduction given by the loud-speaker. Whatever the type of loud-speaker in use, the question arises: Am I getting the best from it?

Perhaps the loud-speaker is low-pitched and booms on certain notes. That means that the frequency response of the top notes is weak, so that the low notes are accentuated and that certain low notes are reproduced by the loud-speaker at disproportionate strength. To overcome this fault one can use a pentode power valve, which tends to accentuate the high notes.

On the other hand, some loud-speakers are high-pitched, and while they give clear and crisp reproduction of speech, they are apt to sound shrill during the reproduction of music. One can counteract the absence of bass-note reproduction by modifying the amplifier. But not many listeners would be prepared to do this. Fixed condensers up to .002 microfarad can be shunted across the loud-speaker winding to accentuate bass notes.

### The Most Popular Type

The average loud-speaker in use to-day is a balanced-armature cone. This is by no means the only good type. But one can

understand its popularity, for considerable power can be handled without rattling the unit. Balanced-armature loud-speakers are not critical as regards the power valve. As most units are of high resistance, a valve of 5,000 ohms or less is suitable.

The moving coil is one of the most perfect forms of loud-speaker, but to get good results one must have a good set. A really efficient moving-coil loud-speaker responds equally well to high and low notes, but any deficiency in the frequency response of the amplifier shows up very badly. The greatest disadvantage of the moving coil, namely, the need for an accumulator or mains supply to energise it, has been overcome by the production of the permanent-magnet moving-coil speaker.

### The New Inductor

A variation of the moving-coil principle is the inductor-dynamic loud-speaker. The coil is replaced by a special armature system. The armature is suspended in a magnetic field and moves backwards and forwards horizontally in the gap provided. This new loud-speaker is a strong rival to the moving coil. It works well with any set of average efficiency.

For those listeners desiring crisp and clear reproduction of speech, the linen diaphragm, driven by a balanced-armature movement, is ideal; and the best models

are also capable of giving very fine quality of reproduction of music.

If the listener has more than one loud-speaker, it is a good plan to try working them together. Then if one accentuates the bass notes and the other the high notes, the overall response will sound extremely satisfying. The old-fashioned horn-type loud-speaker has yet to be beaten for the reproduction of clean-cut high notes; this loud-speaker working with a cone that tends to be low-pitched is a surprisingly good asset to quality.

### Baffles

The position of the loud-speaker has a bearing on the quality of reproduction. Different positions in the room should be tried before finally fixing the loud-speaker. Cone loud-speakers that appear to be deficient in bass can often be improved by mounting the cone behind a baffle board. Attractive baffle boards are now available in wood and metal, at moderate prices.

Before finally deciding that the best is being obtained from the loud-speaker, whatever its type, the listener should make sure that the set is offering the loud-speaker every chance to do itself justice

## MR. FLEX MEANS TALKS ON A LOUD-SPEAKER—



## —NOT SHOUTS ON A LOUD-SHOUTER



A Weekly Programme Criticism—By SYDNEY A. MOSELEY.

# Without Fear or Favour



## THE REFERENDUM IDEA

### DANCE BAND SOLOISTS

ONE of my readers at the B.B.C. tells me that I have overlooked the important fact that the referendum idea was first suggested in these columns and that a discussion followed. "There is no doubt," he writes, "that you should claim the credit of being the originator of the scheme. Funny you have overlooked the fact."

But I hadn't overlooked it! The truth is, a good many suggestions made by my readers and myself in the past few years in AMATEUR WIRELESS have been considered on their merits, and in many cases adopted. Such helpfulness is offered with the best possible spirit.

Listeners missed the spectacle of an active photographer "shooting" the singers and orchestra at the Queen's Hall recently. The occasion was the great and magnificent solemn "Mass in D," by Beethoven, a religious work during which intense quiet was maintained throughout. Yet here was this man in the front row of the circle taking photographs, much to the annoyance of the people round him!

Since the audiences are enjoined to be very good on these occasions, one wonders why such an obvious source of distraction was permitted.

I see, incidentally, that *The Times* critic did not think a great deal of the performance, saying it was rather ragged, but to us—inexpert—it was a tip-top performance, and the German conductor had a great ovation, in which the choir and orchestra joined. But the choir itself particularly deserved an ovation, and we gave it, too!

In regard to the Jack Payne controversy, I listened on Saturday evening, and—well, if that was really Jack Payne singing he should be heavily fined and warned, and if the selection of songs were his—"Just a Little Closer, Dear," and other mournful slop—well—

The 6-8 time song, "There's a Good Time Coming," was healthier tripe, anyway; and it gives the "boys" a chance as well, instead of confining the singing to doubtful soloists.

"Don't tell her what happened to me." This is the sort of thing that drives me to chamber music! It actually drove me to the children's birthdays.

And, by the by, it is extraordinary how this birthday stunt persists. It has certainly proved itself. I am glad that the "Hullo, twins!" accompaniment is a wee bit more *pianissimo*. The old way was rather terrifying to us old 'uns who like to think we are young sometimes.

Lest we take these things too much for granted, I would like to say that the alternative programmes, on the whole, are working out well. And with so many fool-proof sets it is possible to choose items from either programme with ease. For instance, in the London Regional programme one night I listened at 6.45 to the Gershom Parkington Quintet, then switched back to the National programme and heard the popular concert from Kingsway Hall with Megan Thomas, F. Hodgkins on the xylophone, and others. Then, later I switched back to hear the B.B.C. Orchestra. Quite a musical day, conforming to my mood.

I went again across Waterloo Bridge, down the dark, dismal steps, within creeping shadows—the latest B.B.C. studio! If ever an eminent artiste disappears unexpectedly you may guess what has happened—he or she has fallen into the murky river, or has been kidnapped



Patrick Waddington  
(An Impression)

## ALTERNATIVE PROGRAMMES

### No. 10 Studio

by the band of exuberant kids from the riverside who know as much about that sort of thing as a Hollywood impressario!

However, the visit is worth all the heart palpitations of the journey. A delightful informality about the studio; conductor and artistes acting naturally. I'm told I missed a treat with one conductor who jumped up and down like a Jack in the Box; but, my, he knew his job!

Herman Scherehen wielded the baton with dignity—in his shirt sleeves. He might have been before a Queen's Hall audience.

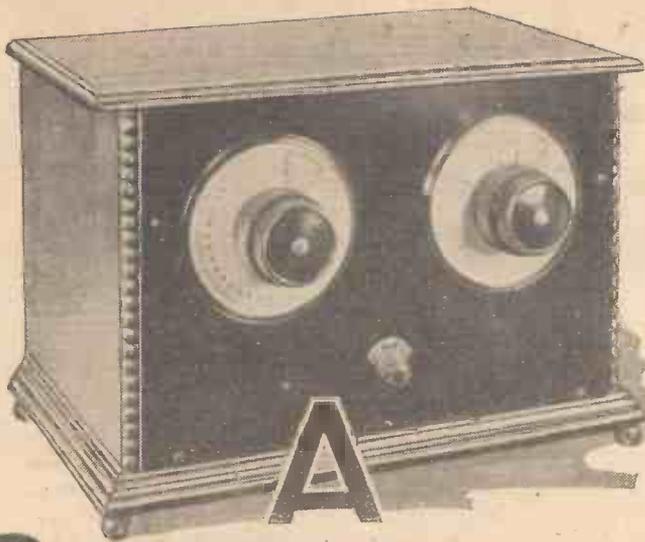
It is always a pleasure to hear Thelma Tuson, although "Caro Nome," from *Rigoletto*, was rather slurred in the difficult turns.

"Cortège on a Ground Bass," by Gerrard Williams, is rather noisy on a peaceful Sunday afternoon.

In an advertisement which I read is a letter addressed to "Jack Payne, Esq., B.B.C., Savoy Hill, W.C.," beginning: "My dear Jack, We want to thank you for discovering a new sensational winner for us in—" (I do not propose to advertise the song). "The song has leapt into instantaneous popularity, and we are certain your record of this will prove a colossal seller, and add yet another to the already imposing list of this season's hit numbers." (Here follows a list of other songs.) "Are pleased you think so highly of — and to know that you will be recording these numbers. All the best, etc."

I should like to see "My dear Jack's" reply to this effusion, and to know why the B.B.C.'s address is used in the advertisement.

It is always a good plan in criticising programmes to hear occasionally what the music-halls put over. With this view in mind, I went into the Coliseum and listened to the comic stuff as given by Jack Barty. Now, this man has a funny face which at once gets a laugh, but his humour was of a sort that would not stand much chance of passing the B.B.C. censors. And this, mark you, at a music-hall where very good care is taken to prevent "broad" jokes!



**A**

# SHORT-WAVE SUPER-HET ADAPTOR FOR YOUR SET

ANY amateur with experience in short-wave reception will tell you that a super-het. set is the easiest type of receiver to work below 100 metres. Both in G.P.O. commercial work and B.B.C. reception of American stations, super-hets. are used for short-wave reception and there is no reason why you should not follow the lead of the experts.

There is no need to have anything elabor-

without the possibility of loss of efficiency) which is handled by the high-frequency valve in the adaptor unit and by the high-frequency stage of your broadcast set. The detector of the broadcast set then rectifies these amplified signals and subsequent amplification is then carried out by the low-frequency stage of your set.

A glance at the circuit diagram will show just how the components of the adaptor

## CONVERTS ANY HIGH-FRE

With this unit you can convert any receiver having short-wave stations can be tuned in with the same It is ea

ate. It is possible to make up a unit which can be added to your set (provided that this latter has at least one high-frequency stage) and which enables the whole to be used as a super-het. on the short waves.

The adaptor unit illustrated here can be used with any receiver having at least one high-frequency screen-grid stage, because one S.G. stage is incorporated in the adaptor itself.

### Super-hets.

It is unnecessary, of course, to go into super-het. theory because it is well known to any amateur with experience of sets of this kind that in a super-het. the signals are first detected, are then heterodyned, producing a third, resultant frequency. It is this frequency (which is considerably lower than the frequency of the received signals, and may therefore be amplified by H.F. valves

are connected. First, there is a normal short-wave detector, a short-wave coil unit with aperiodic aerial coupling being used. Following this is a shunt-fed screen-grid stage, which, as will later be explained, is tuned to 300,000 cycles (that is, 1,000 metres). A shunt-fed arrangement connects the output of this H.F. valve with the grid circuit of the H.F. valve in your present receiver.

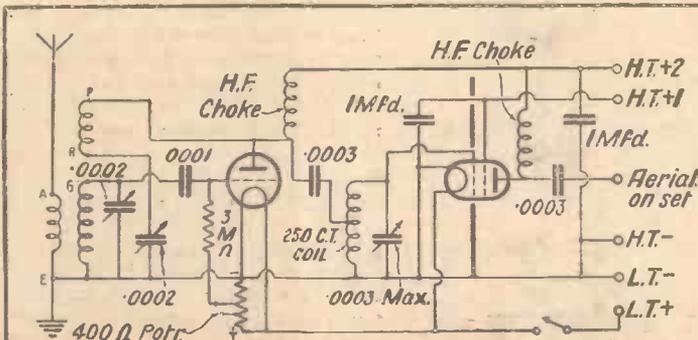
Construction presents no difficulties because there are only two valves in this unit, and it is as easy to make up as any two-valver. A full-size blueprint can be had, price is., post free, from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4. The small reproduction of this given here, together with the photographs, will enable you to get a good idea of the layout of the parts, but it is much easier to work with a full-size print giving the exact drilling centres.

When the panel has been drilled, using the blueprint as a guide, it may be mounted at right-angles to the baseboard, together with the panel brackets, and the two tuning condensers and the low-tension on-off switch may then be mounted. The vertical screen should next be screwed down, for this will serve as a guide to the positions of the other baseboard parts, all of which may be mounted.

Note the way in which the screen-grid valve holder is supported away from the screen, so that the anode terminal of the screen-grid valve projects through the screen to the output side of the unit.

### The Coils

When wiring up, take care to make the connections to the coil holder in conformity with the blueprint. Note, too, the lead connecting the moving vanes and end plates (on the panel side) of the two condensers and also the lead from the fixed condenser on the "output" side to the screen. The screen, of course, is connected to low-tension negative through one of the sup-



This is the circuit of the adaptor. The first valve is the detector-oscillator, and the second valve is in the first intermediate-frequency stage. Note the tapped potentiometer for the detector

### COMPONENTS REQUIRED

- Ebonite panel, 12 in. by 8 in. (Becol, Trelleborg, Lissen).
- Baseboard, 12 in. by 10 in. (Clarion, Camco, Pickett).
- Two .0002-mfd. low-loss variable condensers (Utility, J.B., Formo, Polar Lotus, Ormond).
- Filament switch (Benjamin, Bulgin, Readi-Rad, Lotus, Wearite).
- Panel brackets (Bulgin, Keystone, Readi-Rad).
- Two slow-motion dials (Utility, Ormond, Readi-Rad, Igranic).
- Short-wave inductance unit (Eddy-stone, type 585).
- Valve holder (Benjamin, Clix, Telsen, Lotus, W.B., Wearite).
- Two 1-mfd. fixed condensers (Lissen, T.C.C., Dubilier).
- Two .0003-mfd. fixed condensers (Lissen, T.C.C., Readi-Rad, Telsen, Atlas, Graham-Farish).
- .0001-mfd. fixed condenser (Lissen, T.C.C., Readi-Rad, Telsen, Graham-Farish, Atlas).
- 3 - megohm grid leak (Dubilier).

- Wamel, Graham - Farish).
- Lissen, Grid-leak holder (Lissen, Bulgin).
- Two high-frequency chokes (Telsen, Wearite, Lewcos, Readi-Rad, British General, Igranic, Lissen).
- 400-ohm fixed tapped potentiometer (Lewcos, Polar, Wearite).
- Pro-set condenser, .0003 to .000035 mfd. (Soverign, Formo, Lewcos, Polar, Lissen, Igranic, R.L.).
- Aluminium screen, 8 in. by 7 in., with hole and valve holder for S.G. valve (Wearite, H. & B.).
- Single coil holder (Lotus, Lissen).
- Terminal block (Belling-Lee, Junit).
- Two terminals marked: Aerial and Earth (Belling-Lee, Clix, Burton, Ealex, Igranic).
- Three wander plugs, marked: H.T.-, H.T.+1, H.T.+2 (Belling-Lee, Clix, Burton, Ealex, Igranic).
- Two spade terminals marked: L.T.-, L.T.+ (Belling-Lee, Clix, Ealex, Burton, Igranic).
- Connecting wire (Clazite).
- Three yards of thin flex (Lewcoflex).

# FREQUENCY SET TO A SHORT-WAVE 'SUPER' RECEIVER

at least one high-frequency stage into an efficient short-wave super-het. The advantage of this is that the ease as those on the broadcast band, the super-het. principle being particularly effective on the short waves. easier to make this unit than a complete short-wave receiver.

ports of the screen-grid valve holder. This detail is made quite clear on the blueprint.

Rigid wire is used for most of the connections but flexible leads are provided for connections to the centre tappings on the screen-grid valve grid coil, to the anode of the screen-grid valve, and to the potentiometer.

### Valves

Any standard screen-grid valve may be used in the adaptor, and the detector may be chosen from the following two-volters or their 4-volt and 6-volt equivalents: Mullard PM1HF, Marconi H2, Osram H2, Cossor 210HF, Mazda HL210.

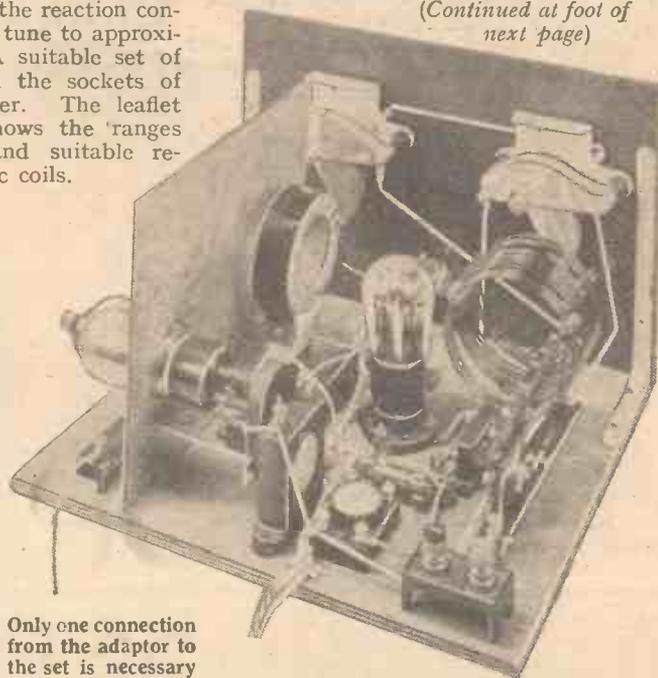
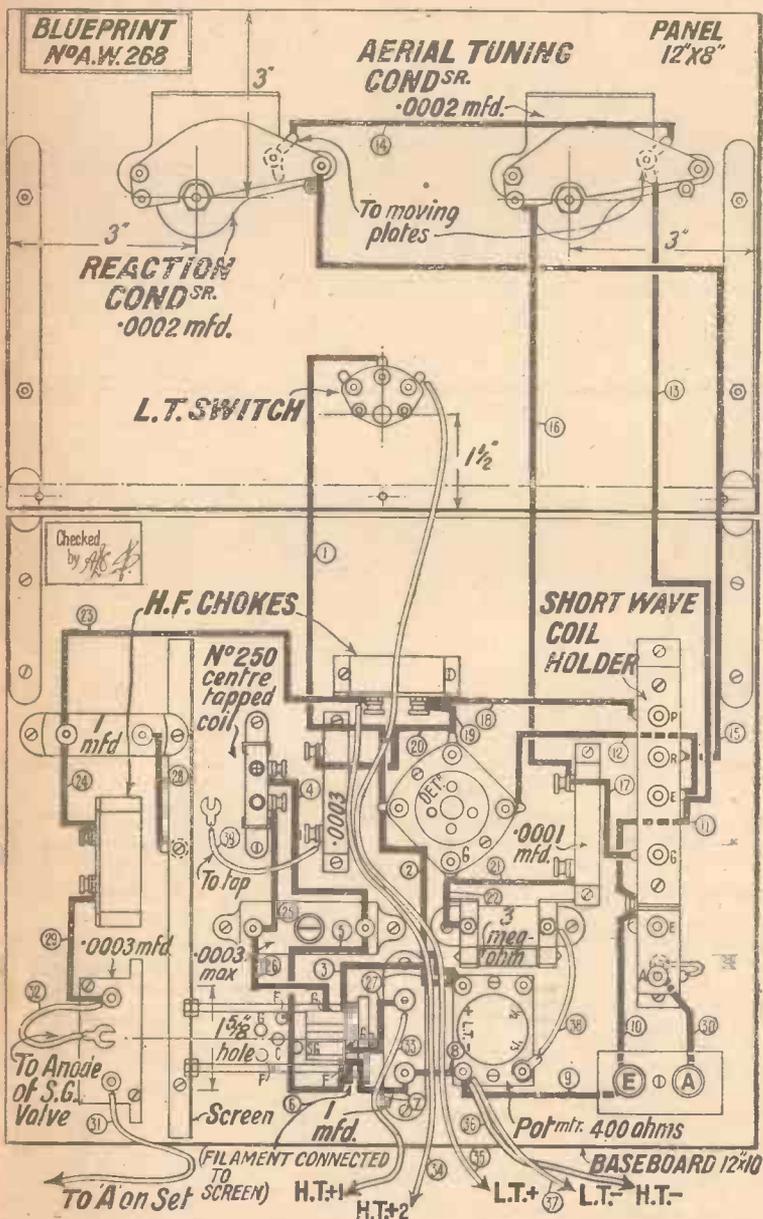
Place the adaptor as close as possible to

the broadcast receiver, so that only a short lead is necessary from the .0003 fixed condenser on the output side of the adaptor to the aerial terminal on the set. By the way, if a pre-set condenser is in the aerial circuit wiring of the receiver then it may be screwed into its maximum value or even short-circuited.

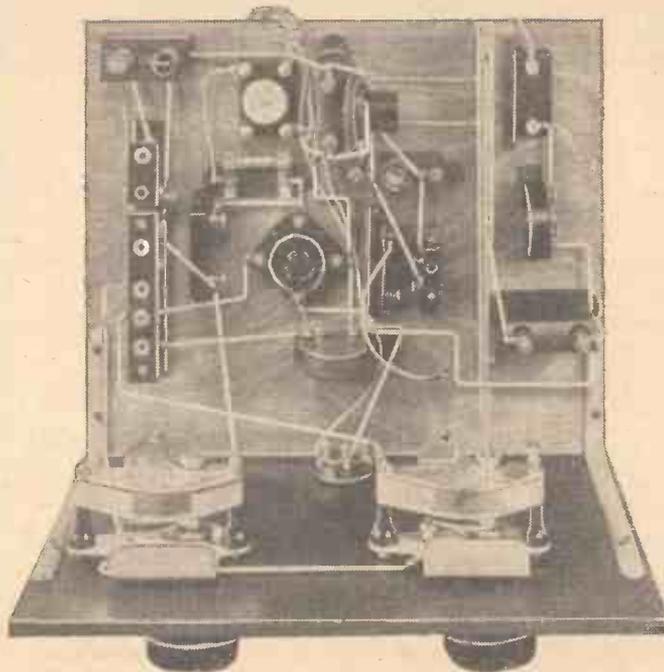
Put a No. 250 centre-tapped plug-in coil in the adaptor and, with the reaction condenser of the set at zero, tune to approximately 1,000 metres. A suitable set of coils should be placed in the sockets of the short-wave coil-holder. The leaflet given with these coils shows the ranges covered by each set, and suitable reaction, grid and aperiodic coils.

Apply a voltage of between 100 to 120 to terminal H.T. plus 2 on the unit and a voltage of between 70 to 90 on the screen-grid tapping, H.T. plus 1. Carefully adjust the pre-set condenser until a hissing sound in the speaker shows that the high-frequency stage of the unit is in tune with the high-frequency stage of the set. It is very important to get this matching of tune quite

(Continued at foot of next page)



Only one connection from the adaptor to the set is necessary



Comparison of this plan view with the layout and wiring diagram will facilitate construction

# PLENTY OF H.T. FOR GOOD QUALITY!



*The importance of an adequate supply of high-tension is not appreciated to the proper extent. In this article Alan Hunter points out how, on the grounds of both economy and quality, there should be no stinting in this respect*

IF I were asked what are the secrets of good quality I should reply: "Take any set, provide it with modern valves, hook on a modern balanced-armature cone or moving-coil loud-speaker, and *insist upon enough high-tension supply.*"

To my mind, the set itself, unless entirely obsolete, does not matter nearly as much as the valves and loud-speaker. But even with good valves and a first-class loud-speaker the quest for quality will be vain unless plenty of high-tension current is available.

Running a set from an inadequate supply is rather like driving a good car on cheap petrol—it simply does not pay. Most listeners start off fairly well with, say, 120-volt high-tension battery, or a mains unit giving 150 volts.

## False Economy

A few months ago I showed what an illusion it was to "economise" in the high-tension battery. To buy a standard-capacity battery to run a set having a total anode current of more than 10 milliamperes is actually more expensive than buying a double-capacity battery.

For example, in a well-known make I find that 320 hours life is claimed for a standard-capacity battery when the current output is 5 milliamperes. But when the current output is doubled to 10 milli-

amperes the life is only 140 hours. In fact, by taking twice the current from the standard battery, we get less than half the possible length of life were the battery delivering current at an economical rate.

550 hours is the life at 5 milliamperes, but only 225 hours at 10 milliamperes; these are figures given by another maker to show the fallacy of over-running a high-tension battery. These figures become significant when one realises the comparative prices of standard and double-capacity batteries. In the example just quoted the standard battery is 10s. 6d. for a 60-volt unit, and a double-capacity 60-volt unit of the same make is 15s. 6d. At 10 milliamperes the double-capacity battery gives 475 hours, compared with the 225 hours of the standard battery.

Reducing figures to a common basis, I find that for a 10-milliamper output the standard-capacity battery costs .6 penny per hour and the double-capacity battery only .4 penny per hour. In other words, it is practically 50 per cent. cheaper to buy the double-capacity battery if 10 milliamperes output is wanted.

I have dealt with the economics of high-tension batteries for a very good reason. Far too many listeners purchase standard batteries for three-valvers requiring double-capacity batteries. As a result, the useful length of life of the battery is short. But

the trouble is that when the battery has passed out of the sphere of usefulness it is retained. The quality deteriorates because the maximum voltage drops.

I do not think it would be an exaggeration to say that half the sets in use to-day are being worked from run-down or running-down batteries. The finest way to ensure long life in a battery, and thereby to maintain good quality, is to buy the right capacity battery, so that in spite of a fairly heavy current drain it will retain its maximum rated voltage.

## Quality or Volume

Good quality can be obtained with low values of anode voltage. But I cannot emphasize too strongly that this condition is subject to the proviso that only moderate volume is wanted. It is absolutely impossible to get good quality with big volume and a small battery. That is why portable sets should be adjusted so that the volume is as small as possible, so that the 108-volt high-tension supply can deliver tolerable quality.

## Quality and Volume

For good quality at big volume one needs at least 200 volts high-tension supply. Or if that is impossible one must turn to push-pull amplification, by means of which one can obtain volume and quality with a supply of 120 volts.

## A SHORT-WAVE SUPER-HET ADAPTOR

(Continued from preceding page)

correct; otherwise the intermediate high-frequency amplification will not be effective.

Now make a preliminary search for a few of the easiest received short-wavers such as Chelmsford 5SW, and PCJ. The reaction condenser of the receiver should be left at zero but the reaction control on the adaptor should be gradually increased until a further hissing background is heard. Tune slowly with the aerial condenser on the adaptor until signals are heard.

It will be noticed that, as with all super-hets, any one station can be received at two points on the tuning dial, and this may be useful in reducing interference. Also if the broadcast-band receiver is made to oscillate by the using of reaction control, then carrier waves will be heard and continuous wave signals may be received.

A little experimenting should be carried out with the two possible positions (half and one-third tap) of the connection to the

potentiometer of the lower end of the grid leak in the first detector. Also the anode and screen-grid voltages, and the relative position of the aperiodic aerial coil may be varied until the best results are obtained.

Do not forget that this short-wave super-het adaptor may be seen this week in the Somerset Street windows of Messrs. Selfridge & Co., Ltd., Oxford Street, London, W.

## DO YOU KNOW—

that although some screen-grid valves have a very high amplification factor, this represents the working of the valve only at zero grid volts, and does not necessarily indicate the ratio of amplification that will be obtained in practice? With careful screening and used in efficient, stable circuits, it is possible to get an actual amplification ratio somewhere approaching that of the magnification factor, but, generally speaking, it is not worth while doing so, for such a stage is rather unstable.

## THE EFFECT OF COIL SCREENS

WHEN a metal casing is placed around a coil carrying high-frequency currents, eddy currents are induced in the casing which are 180 degrees out of phase with those in the coil windings. The two fields, i.e., that from the coil and that from the eddy currents, therefore neutralise each other, so far as the space outside the screen is concerned. At the same time the creation of eddy currents means that energy is being taken from the coil windings and this, of course, increases their effective resistance or damping. This, however, is all to the good, within limits, since it tends to stabilise the set by preventing self-oscillation.

M. B.

The question is asked, "Does it affect reception if the wife hangs washing on the aerial?"

It makes a shirt circuit.

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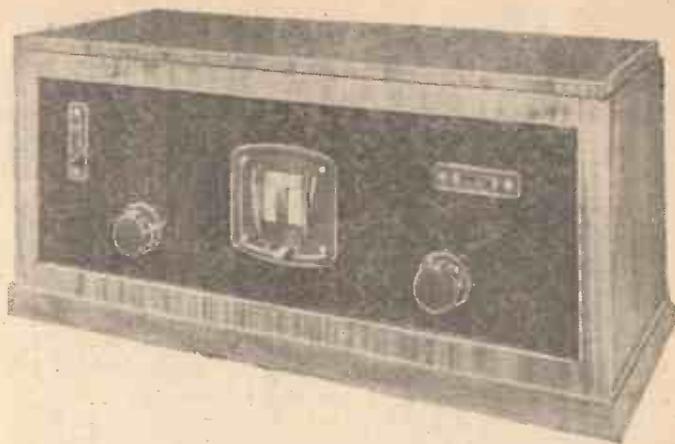
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## SETS OF DISTINCTION

# THE WATES UNIVERSAL A.C. FOUR

Maker : Standard Battery Company. Price £25



SO many three-valve sets have been produced this season that one is tempted to wonder whether any other number of valves is justifiable. The usual sequence is a stage of high-frequency amplification, a detector and a stage of low-frequency amplification. With a good aerial this valve combination undoubtedly meets the needs of a big section of set-buyers.

### A Good Performance

I say this because it must be true that the greater proportion of set-buyers live within cities having a local broadcasting centre. But there are other listeners to be considered. Those, for example, who live in the country, and those who, living in towns, are unable to erect an efficient aerial. Then the need is for something more powerful than the popular three-valver.

Whether the Standard Battery Company

at 20 degrees and 9 degrees. So the spread of the National was only 11 degrees. Quite remarkable. The Regional came and went just as rapidly. Maximum at 47 degrees, it had disappeared at 52 and 40 degrees, a spread of only 12 degrees.

These readings were noted with the knob of the 8-point switch adjusted to point 3. This gave very good selectivity without too much loss of volume. That this set really is selective was proved by the fact that Langenberg at 76 was quite clear of Midland Regional, which came in at 78. Hamburg at 52 was just clear of the London Regional at 47.

On the score of selectivity the makers have certainly justified their sequence of valve amplification. And the sensitivity is, I find, above the average. To some extent this is accounted for by the use of a Mazda screen-grid high-frequency amplifying

valve, and suitable Mazda valves for the detector, low-frequency and power stages. The detector is an AC/HL, the first low-frequency amplifier a similar valve, and the output valve is a B425. A Mullard DW1 valve is used to rectify the A.C. supply.

This set is suitable only for A.C. mains. There is no corresponding model for D.C. mains. The power consumption is only 30 watts.

In the Wates A.C. Four there are two tuning dials mounted side by side in a centre escutcheon plate. To the left is the selectivity control already mentioned and to the right is the reaction control. The master-switch is mounted at the top left-hand corner of the panel and the switch for changing from radio to gramophone reproduction is at the top right-hand corner. None of the controls is difficult to handle.

### Excellent Features

The back of the set is easily removed and exposes the four valves for reception ar-

ranged in a row, with the rectifying valve mounted near the mains input transformer, which has a very accessible voltage connection. The set can be adjusted for different A.C. mains voltages.

Here are some condensed points worthy of note. (1) Good results were obtained by using the mains as an aerial for the reception of local stations. (2) The low-frequency side of the set worked very well as a gramophone amplifier. (3) An external volume control on the pick-up was needed. (4) A guarantee of one year is given with this set. (5) The wavelength range is unusually wide, being 200-700 metres and 700-2,000 metres. (6) Smoothing is good and no hum was heard. (7) There is no output transformer. (8) The instruction booklet is well written.

### A Few Examples

Now for some extracts from my log. The readings refer to the right-hand tuning dial. On the long waves I got six full loud-speaker signals. The first was Kalundborg at 43. Next, Eiffel Tower at 69. Daventry was very strong at 74 and caused some interference with Zeesen logged at 81. Radio Paris at 87 and Huizen at 95 were both well received. A trace of the London Regional station could be heard at the bottom of the long-wave tuning.

On the medium wavelength range I got twenty-six stations at loud-speaker strength. Some of these were not worth listening to, but that is the fault of the European ether and not of the set. This is how the stations came in:—Budapest, 91, good; Vienna, 85, fair; Milan, 82, good; Prague, 79, interfered with by Midland Regional, 78; Langenberg, 76, good; Paris PT, 71, fair; Rome, 70, good; Stockholm, 68, good; Berlin, 65, good; Dublin, 62, fair; Katowice, 59, good; Frankfurt, 57, good; Toulouse, 55, very good; Hamburg, 52, fair and clear of London Regional, 47; Graz, 45, fair; Strasbourg, 43, very good; Brussels, 41, fair; Dresden, 37, very good. Then followed heterodynes until Turin, 27, very good; Kaiserslautern, 24, good; Barcelona, 21, fair; National, 15; Nürnberg, 8, very good; Cologne, 2, very good.

Quality of reproduction was noted with a Wates double-cone loud-speaker. The tone was excellent. This set is suitable for a good cone, either a balanced-armature or a moving-coil. Altogether an A.C. set I can very confidently recommend.

SET TESTER.



Here is a rear view of the Wates A.C. Four with the different stages indicated

reasoned along these lines I do not know. But I do know that in the Wates A.C. Four they have produced a really good set. The four valves are arranged in the sequence of one high-frequency amplifier, detector, resistance-capacity low-frequency amplifier, and transformer-coupled low-frequency amplifier.

The usual objection to the introduction of considerable low-frequency amplification in sets with only two stages of tuning is that selectivity is impaired. But in the Wates A.C. Four is a very fine control of selectivity, by means of an 8-point switch mounted at the bottom left-hand side of the panel.

Using my standard test aerial, I got the National at 15 degrees. It had disappeared

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# IN MY WIRELESS DEN

WEEKLY TIPS—  
CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

## Correct Parts Essential

THERE must be many instances of amateurs who have copied a set and failed to obtain anything like the results which they have heard from the original. They may have used similar components, the same lay-out and have tried to repeat the wiring.

But still the results are not satisfactory. A test shows, in some instances, that the exceptional results are more the outcome of a number of favourable circumstances, rather than of good design.

Some people seem able to extract the utmost from a set of valves. They "tune-up" the set, spending time upon all manner of details and so obtain a fine performance.

This tuning-up process is one difficult to describe. You must have experience to be able to set the various circuits to the best advantage. Much depends upon the valves. They have their little peculiarities, not noticed, probably except by the knowledgeable amateur.

Slight changes in the voltages, especially when there are one or two screen-grid valves, affect the results quite an amount as a rule. Many circuits are so arranged that the best results as regards both sensitivity and selectivity are not obtained until the aerial circuit is practically oscillating with the anode circuits. Needless to say such a state of affairs is only possible with careful tuning.

## A Home-made Set

I have just had the opportunity of looking over an amateur's set.

First of all, the baseboard had a metal sheet over its surface. When I see this I always look for contacts and in this case the terminals of two valve holders were touching the metal. Further examination showed that a terminal on one of the coils was also in contact with the base.

I cannot understand how people will screw parts to a baseboard without first making sure by examining the parts that contacts will not occur. Yet we are always hearing of faults of this description.

The parts are not always as carefully finished as they might be and it may be necessary to place a piece of insulating material below the parts.

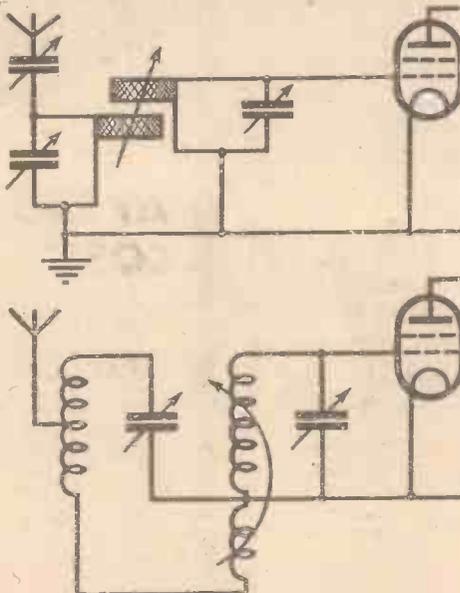
A further fault in this set was that the coils did not match. This was obvious from inspection. Broad tuning is obtained when the coils in a ganged tuning set are out and the magnification is naturally lower than the normal.

Some of the coils sold as matched appear to be a good way out. Accurate tuning with them is not possible. A ganged set

will give results much below what is normal for a separately tuned receiver unless the circuits tune properly over the whole range.

## Getting Selectivity

There is no doubt that the usual standard arrangements are too powerful for the selectivity. With new valves, and with the parts decently arranged, it is possible to obtain considerable magnification from the usual three- and four-valve circuits.



Two selective tuning arrangements, details of which are given in the accompanying paragraph

Band-pass filters, with their advantages and disadvantages, are not for everyone at the moment. The difficulty is one of ganging and of overcoming the effects of reaction into the filter circuit.

Those who do not mind a little trouble can, however, obtain fine results from a loosely-coupled aerial circuit. By adjusting the coupling while listening the selectivity can be made just right. The scheme appeals to those used to operating a number of circuits and it is surprising how soon one becomes used to the coupling adjustment.

The accompanying diagram shows a pair of plug-in coils, the position of one being under the control of the operator. This is not the best arrangement owing to the capacity coupling between the coils.

It is better to have two separate coils and a fairly small coupling coil. The really fine adjustments can be made. A switching arrangement could be included to cover the

two wavebands, and the whole made up neatly. Most people would obtain much better results from this arrangement than the usual band-pass with its fixed coupling.

## Box Resonances

The difficulty of avoiding what we generally call "box resonances" is responsible, I suppose, for many amateurs using a baffle board with their moving-coil or cone loud-speaker instead of a small box.

The box is admittedly neater and, taking less room than the large board, is more easily disposed of. Most of us find that a box does affect the quality, however, and a good large board is, of course, a more effective baffle than a box of the usual dimensions. We obtain better bass and more clear speech when a board is used.

The position is a little different when a large cabinet is used to house the set and loud-speaker, but here again unless care is taken, the results will not be quite as good as when the large baffle board is employed.

Much can be done towards improving the quality by providing holes in the back and sides of the box, but the effective size of the baffle is decreased by doing this. The increased clarity may compensate for a slight loss in the low tones, however, and it is well worth while buying a box having ample spaces. Stout wood must be used in the construction, a good solid arrangement being much better than a box of relatively thin wood not properly put together.

## More New Valves

There are, I notice, more new valves, one of them, the Marconi P2, seems an extraordinarily good example. With its low impedance of 2,150 ohms and its amplification factor of 7.5, the mutual conductance being 3.5 milliamperes per volt, we have a valve suitable for many good battery sets.

Used with a high-tension of 125 volts and a grid bias of negative 9, the anode current is about 12.5 milliamperes. This means that the valve may be run from the larger type of dry batteries. With its low impedance and high amplification factor the valve is capable of delivering an amount of power for a relatively low input.

The valve is sensitive, as it has the high amplification factor of 7.5. It is particularly suitable for use in sets having the power valve connected to the detector and was no doubt developed with this in mind. The power valves of a year or two ago had much smaller slopes.

They were not nearly as sensitive considering the output available and anyone changing from one of these old valves to a new type will notice a great improvement.



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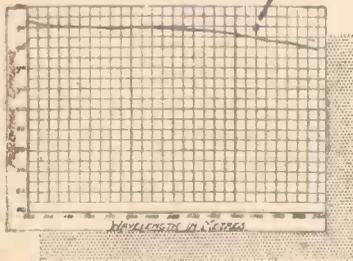
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# A NEW INEXPENSIVE HOME RECORDER

*Details of a Novel System of Particular Simplicity*

By D. SISSON RELPH (Assistant Editor of *Wireless Magazine*)



Making  
a  
Record

**T**HERE can be no doubt that home recording is a development that has come to stay. Most people are interested in making records of themselves and of their friends; and undoubtedly a great deal of fun can be obtained in this way.

In America a number of the best radio gramophones produced commercially are provided with a home-recording attachment as a standard fitting. Here home recording is only in its infancy, but interest in the possibilities is growing apace.

Up till now the home-recording devices that have been available on the English market have all needed electrical amplification. Now, however, there is available for 45s. a simple gadget by means of which good records can be made simply by speaking into a short horn fitted to a special soundbox.

The inventor of this system is Mr. Arthur Kingston, and recently I had the pleasure of spending an afternoon in his laboratory.

## A Simple Arrangement

In the Kingston home recorder there are four main parts; these are (1) a master disc with tracking grooves, and (2) a

Electrical recording is an alternative to acoustic. This picture shows the cutter pick-up for electrical recording



carrier arm for either (3) a special soundbox provided with a short horn for acoustic recording, or (4) a cutter pick-up for electrical recording. The photographs reproduced on this page show clearly the general arrangement of the apparatus.

Of the acoustic and electrical systems, the former is by far the more interesting because of its simplicity and the fact that good speech records can be made with so little trouble. The apparatus can be assembled for acoustic recording in less than five minutes.

I want particularly to emphasise the fact that for acoustic recording with the Kingston system any ordinary gramophone can be used. There is no need for an electrically-driven turntable; in fact, when I was there the inventor made several good speech records in his laboratory with one of the small Columbia Cadet gramophones, which sell at 57s. 6d. This proves that even a small clockwork motor is sufficiently powerful for driving the tracking disc.

One of the photographs on this page shows the sensible wire jig provided with the outfit for positioning the bush that carries the soundbox or cutter pick-up arm. One end of the jig is placed over the motor spindle and the other end gives the exact position of the bush, which can be placed anywhere round the turntable in the most convenient position.

Having fixed the bush, the carrier arm with the soundbox already attached can be slipped in position in a moment. This arm is provided with two needles. On the soundbox there is a special hard-steel cutting needle (painted red) and on the tracking arm there is a needle (painted green) that runs in the tracking grooves on the master disc.

A feature of this system is that the aluminium blanks, which are 6 in. in diameter and held tightly on the master disc by twisting them under three pins that project through three specially-cut slots) are already provided with a coating of lubricant when bought and there is no need to apply any oil.

There is no secret about the lubricant used; it is simply a form of white wax and if the original coating should be rubbed off, a little white boot cream, or even brown boot polish, can be applied.

## Tracking

The tracking arm on the main carrier is pivoted, and is adjusted in relation to the cutting needle so that when the latter is placed on the outside edge of the aluminium blank the tracking needle is near the outside edge of the grooves on the master disc. This will be clear from one of the photographs.

When the relative positions of the two

needles have been adjusted correctly, the acoustic horn should be fixed to the soundbox in a convenient position. It should be as nearly vertical as possible.

To make a record it is then only necessary to start the turntable revolving and carefully place the carrier arm in position so that the cutting needle falls about  $\frac{1}{4}$  in. from the outer edge of the aluminium blank.

One then speaks into the horn, keeping the mouth as close to the opening as possible without actually touching it. This is important, because if one does touch the horn at all the green needle will be



Here are the recording and master tracking discs; note the wire positioning jig for the fixing bush

thrown out of the tracking grooves and the record will be spoilt. It is not necessary to shout in the horn, but it is advisable to speak in a fairly loud voice and not too quickly! The turntable should be run a little faster than usual for the best results.

As soon as the aluminium blank has been filled, the carrier arm should be removed and the turntable stopped. The aluminium record can then be unclipped from the master disc and turned over. The blanks can be used on both sides.

It is essential to use fibre or cactus needles for reproduction. Burmese Electro-colour needles are satisfactory. Before the record is actually played it should be wiped with a cloth to remove the wax lubricant. It is fatal to use ordinary steel needles for reproduction; one playing under these conditions will obliterate everything on the record and completely spoil it.

The amazing thing about this recorder is the quality and volume obtained by such simple means. After a few trial records have been made one soon gets the hang of things and can make really good speech records without any difficulty.

## Electrical Recording

So much for the acoustic recording. The electrical system is just as simple, but in this case one must have a microphone and a good amplifier. The same carrier

arm is used for both systems, but for electrical recording the soundbox is removed and a special cutter pick-up clamped in position. The tracking is arranged in exactly the same way as for acoustic recording.

**Recorder and Reproducer**

Those who have not yet indulged in electrical gramophone reproduction will be interested to learn that the cutter pick-up can be used for playing back records if the steel cutting needle is replaced by a fibre needle. For this purpose the tracking arm is clipped up so that the tracking needle is quite clear of the turntable.

From the photographs it will be seen that on one end of the carrier arm there is a counterbalance weight. For acoustic recording this should be swung round towards the soundbox in order to get the greatest weight on the cutting needle.

It may not be necessary to do this for electrical recording because the cutter pick-up is considerably heavier than the soundbox. In any case, a few minutes experimenting will determine the best position.

**Recording a Broadcast**

Records of broadcast items can be made without the use of a microphone. It is only necessary to connect the cutter pick-up leads to the loud-speaker terminals of the receiver in use.

When I was in his laboratory, Mr. Kingston made several good records of broadcast items by connecting the cutter pick-up to a standard McMichael portable set reproducing at ordinary volume.

The acoustic outfit for 45s. includes the carrier arm and bush for fixing; a special recording soundbox and horn; a master tracking disc and a aluminium blanks; two cutting needles (each good for 40 recordings), and six tracking needles (good for 20 records each).

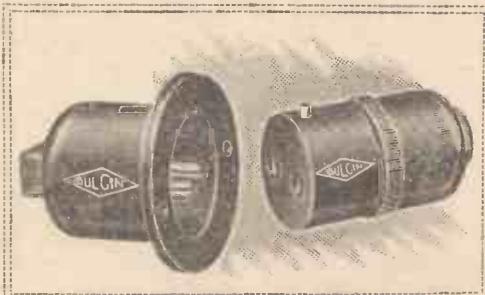
There are also some fibre needles for reproduction; these can be re-sharpened when required by means of a small file or piece of emery paper.

Altogether the outfit is particularly good value for the money, especially in view of the good results obtained without any difficulty on the part of the operator.

A combined acoustic and electrical recording system can be obtained for £3 16s. 6d. This is identical with the 45s. outfit except that a specially-damped cutter pick-up is also provided. Extra aluminium blanks cost 6s. a dozen.

**S.G. VOLTAGE - CONTROL**

**T**HE effect of S.G. voltage on output is often quite marked when going over from short-wave to long-wave reception. It is always advisable, for instance, to try the effect of varying the S.G. plug on the H.T. battery when going over, say, from the medium-wave National to Radio Paris. Signal strength from the more distant station can often be improved in this way. In fact, one of the best methods of controlling volume under ordinary circumstances, i.e., on any given wavelength, is to vary the H.T. voltage applied to the screen grid by means of a potentiometer resistance in the connecting lead to the battery or to the eliminator. B.

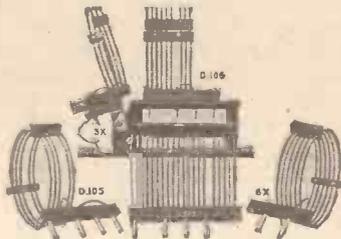


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**SIR WALTER MORLEY FLETCHER**, secretary of the Medical Research Council, will broadcast the next National lecture on "Biology and Statecraft"; but the date has been changed from January 12 to January 23.

A running commentary by Captain H. B. T. Wakelam and Mr. H. B. Brenan on the international Rugby match, England *v.* Wales will be relayed from Twickenham in the National programme on January 17.

Schumann's Piano Concerto in A minor figures in an organ and pianoforte recital to be relayed to Midland listeners from the Albert Hall, Nottingham, on January 4.

Gilbert Mills, who is one of Birmingham's most talented amateur organists, will give another recital from the Church of the Messiah on January 5.

Midland listeners' old friends, "The Babes," will be at Birmingham again this New Year for a burlesque panto-rhyme entitled *The Babes in the Studio*, which is to be broadcast from Midland Regional on January 1.

The programme on January 3 for North Regional listeners is called "Dancing Through the Ages." The Northern Wireless Orchestra will play dances that have been popular from the sixteenth down to the beginning of the present century.

A programme of sea music is to be broadcast from Midland Regional on January 9.

The first performance of some incidental music to Alfred Noyes' poem, *The Barrel Organ*, by Nigel Dallaway, is to be broadcast from the Birmingham studios on January 8.

Every year the Marquess and Marchioness of Bute entertain blind and disabled soldiers and blind workers early in the year, and the annual entertainment will be given this year on January 10 at the City Hall, Cardiff. Part of the concert will be relayed by Cardiff.

Some interesting Spanish and Italian piano music will be heard on the Midland Regional transmitters during a concert by the Studio Orchestra on January 7.

*The Firelighters*, from the volume "Corner Poets," by Laurence Housman, will be relayed from the Little Theatre, Bristol, to Cardiff on January 9.

The French Ministry of Posts and Telegraphs has suspended the broadcasts of the Radio Nord Ouest private transmitter at Caen (Normandy) and, following an order from the Court, has confiscated the entire plant.

The Italian stations now open their transmissions by playing a special gramophone record giving a carillon of bells to the accompaniment of organ and orchestra. Individual interval signals, such as the song of the nightingale, however, are to be adopted for the different transmitters.

Although excellent results were achieved by the use of the Axelborg studio, the Copenhagen authorities have decided that better accommodation is needed for their augmented orchestras and the large audience which usually attends the concerts. A special building is being erected next to the old Royal Theatre, and it is hoped to broadcast a special entertainment to celebrate the official opening of the new headquarters some time in February.

The ultra-short-wave experimental transmitter erected in the neighbourhood of Berlin by the Telefunken Company now broadcasts regularly twice weekly on 7.05 metres. Gramophone records are transmitted every Tuesday and Thursday from 4.30 to 6.30 p.m. G.M.T., and from time to time a relay is carried out of the Berlin programme. The wavelength was chosen after a series of tests, as it was found to be the one most favourable and particularly free from magneto interference.

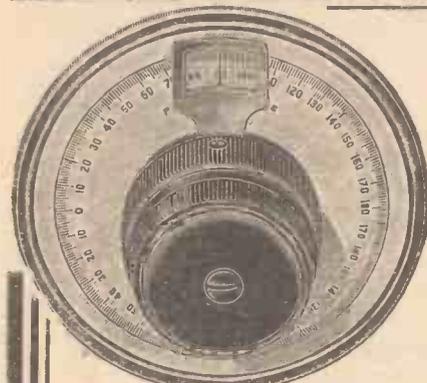
It is reported that the new short-wave station erected in the Vatican City is now nearing completion and that tests will be made towards the beginning of this month. The wavelengths chosen for these transmissions are 50.26 and 19.84 metres, the power, in each case, being 12 kilowatts in the aerial.

PK3AN is the call sign of a powerful short-wave station situated at Chi Hoa (Saigon, Indo-China). Broadcasts are made daily on 49.1 metres (6,122 kilocycles), the call being given out in French, "*Ici Radio Saigon*," although announcements are frequently made in English and Chinese. As an interval signal one stroke on a gong may be heard. The transmission usually closes down with a time signal.

Analysis of figures, recently made public in the United States, indicate that radio distribution follows closely the line of automobile distribution. New York, California, and Illinois, which have the greatest number of automobiles, are credited with the greatest number of radio receiving sets, and Nevada, which has the smallest number of automobiles, has the fewest radio sets.

The power of the Kaiserslautern (Bavaria) station has been doubled; it has also exchanged wavelengths with Augsburg and now works on 269.8 metres (1,112 kilocycles). Both relay the Munich programmes.

The 100-kilowatt transmitting valves of the world's largest broadcasting station at Warsaw, now in course of construction, were designed in Great Britain. They have a life of 4,000 hours and the filament current is well over 200 amperes.



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# OUR LISTENING POST

By JAY COOTE

JUST as it may be difficult for you *not* to hear Mühlacker transmitting the Frankfurt or Stuttgart programmes, so, if you turn your condenser dial to 276 metres you cannot fail to pick up the new Heilsberg 60-kilowatt acting as mouthpiece to the Königsberg studio. It is another giant whose voice after 2 p.m., G.M.T., daily assails the ether. After that time Königsberg simultaneously broadcasts the programme for local listeners on 217.1 metres. Heilsberg has retained the interval signal and between items we hear three bars of three notes regularly repeated.

At odd times, also a metronome (192 beats to the minute) is used. Except for the fact that the newcomer is inclined to swamp Bratislava, the station is welcome, for on most occasions the programmes arranged by Königsberg and Danzig are interesting. Previous to the installation of the super-power transmitter they were neither easy to get nor to hold. Tests are still being carried out with this powerful plant, as you will find on odd nights when other German stations have closed down.

## The Dutch Transmitters

The first day of the New Year again brings for another three months a change-over in the wavelengths of the Dutch transmitters and our old and tried friend Hilversum moves up to 1,875 metres, a position in which its concerts are well heard in the British Isles. It may not be quite as good as the much coveted 1,071-metre channel, but it is infinitely better than the congested corner of the band on which it has been working since last October.

By the way, I am so frequently asked the identity of the Dutchman transmitting on "just over 1,000 metres during the day" that I think some information regarding him may be useful. The broadcast is carried out by Scheveningen-Haven (close to The Hague) on 1,071 metres; it is a commercial station giving out at fixed times news bulletins, commercial reports, stock exchange quotations, and general information of use to business men. Much of the work is done by a woman who spells out all proper names in the usual manner adopted by telephone operators, namely, "A for apple, B for brother," and so on, and the information is read out slowly to allow longhand transcription by the subscribers to the service; if necessary. The station opens up with a long buzz and a hoot, and the time signals are conveyed by chimes.

## Brussels High Power

Have you picked up tests from the new Brussels high-power station? You may do so on most afternoons and, also, now and again, at the end of the evening programme. It is a 15-kilowatt and its signals are very strong. The call may puzzle you; it is "Ici Poste d'Essai S.B.R." (phonetically, "Ess-bay-air") the letters standing for the initials of the Société Belge Radio-Electrique responsible for its construction. The transmitter popularly known as Brussels No. 2, on 338.2 metres, now regu-

larly puts out the Radio Velthem call in French and Flemish. Both, eventually, when tests are complete, will be transferred to a site near Louvain, the studios remaining in the Belgian capital.

## And Belgrade

Do you ever try to listen to Belgrade? Personally, although I use a frame aerial, I find it no easy job when Stockholm is working but, fortunately, the latter station usually shuts down at an early hour. The Swedes are never late birds on the air. However, as an alternative, Ljubljana, on the upper part of the band (574.7 metres), often relays the Yugoslav programmes and, but for spasmodic interruption by ship morse, provides a fairly satisfactory channel. As a matter of fact, on many evenings it gives you an opportunity of tapping entertainments from Zagreb as well.

Immediately below Budapest you will now unearth Kaiserslautern relaying Munich; it has exchanged seats with Augsburg and radiates slightly more energy than it did. Munich, in view of its dismantled aerial towers is still somewhat anaemic and lately, according to my experience, Nürnberg has suffered from fading. It was always one of the most reliable stations to hold.

Anyhow, it is useful to have several strings to one's bow.

## "SHAPING" CIRCUITS

BY using "network" circuits of inductance, capacity and resistance, it is possible to discriminate between the various frequencies in a complex sound, and to accentuate the high notes over the low, or vice versa. Such "shaping" circuits are now being used for regulating and improving the output from a loud-speaker. They are also valuable as a means of correcting inherent defects in a gramophone pick-up, where the lower notes are deficient owing to the limited amplitude of the record track, or when the higher notes are weakened by capacity-losses across the leads or by a blunt needle, or through the record being worn.

B. M.

## When Submitting Queries . . . . .

Please write concisely, giving essential particulars. A Fee of One Shilling (postal order), a stamped addressed envelope, and the coupon on the last page must accompany all letters. The following points should be noted.

The designing of apparatus or receivers cannot be undertaken.

Modifications of a straightforward nature can be made to blueprints, but we reserve to ourselves the right to determine the extent of an alteration to come within the scope of a query.

Queries cannot be answered personally or by telephone.

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M.C.11

# QUALITY & INTER-VALVE COUPLINGS

*In the search for good-quality reproduction, listeners have to ask themselves whether one form of inter-valve coupling is definitely superior to all others. An answer to the question is given in this article together with some useful hints.*

THE "war" between transformer coupling and resistance-capacity coupling has now ceased, because it is generally recognised that under suitable working conditions both couplings can give excellent quality.

Transformer coupling is now almost standard in the average broadcast set. Apart from the fact that transformers have themselves improved greatly during the

side of the condenser going to earth. The poor quality caused by instability is, by this de-coupling arrangement, quite eliminated.

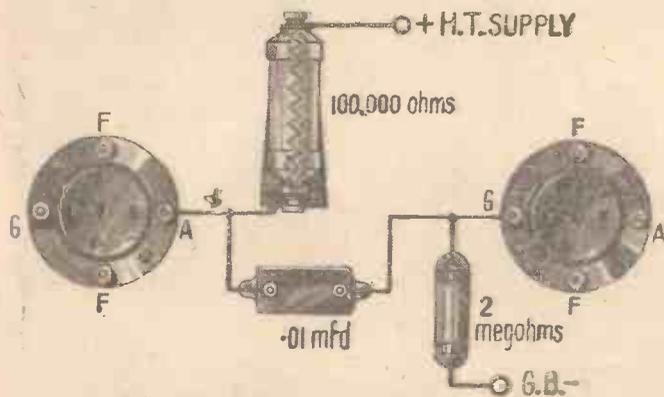
### Push-pull

A variation in the standard transformer connections is the push-pull transformer. Two tapped transformers are required for this system, which has great

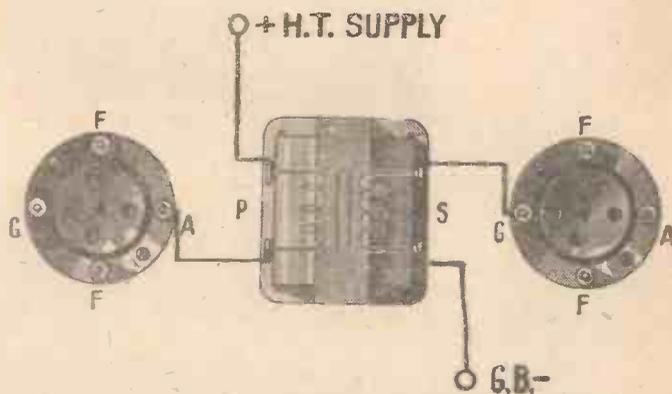
wanted with only a moderate high-tension supply. Two power valves arranged in push-pull can handle twice the signal voltage of one of the valves.

### Impedance Coupling

Apart from transformer coupling, impedance-capacity coupling is sometimes employed. The impedance may be either a low-frequency choke or a high resistance.



With resistance-capacity coupling it is essential to use a fairly high H.T. voltage



Transformer coupling is now almost standard

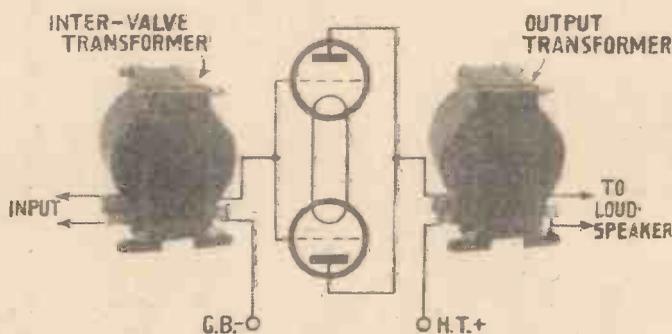
last two years, the increased efficiency of valves must also be taken into account. With a transformer having a primary of a given impedance the best quality of reproduction, by which is meant the most even signal response throughout the audible range, is obtained with a low-impedance valve.

Much of the improvement in valves is reflected in the lowering of their impedance for a given amplification factor. Whereas in the old days a low-impedance valve meant a low amplification factor and so a low overall stage gain, things are now different. For example, a typical 12,000-ohm valve has an amplification factor of 11. This could precede a 5-1 transformer with a moderate primary impedance and the overall stage gain would then be approximately 55.

### The Advantage of De-coupling

With the modern transformer one can achieve a high degree of amplification with excellent frequency response. Now that transformer circuits are de-coupled there is no longer any trouble with instability. One end of the primary winding is taken to the anode of the preceding valve but the other end does not go directly to the high-tension supply. It is connected to the supply through a 20,000-ohm resistance. At the junction between the primary and the resistance is connected one side of the 2-microfarad fixed condenser, the other

advantages where the high-tension supply is limited. The inter-valve push-pull transformer consists of the usual primary winding and a centre-tapped secondary



Push-pull is an advantage where only a moderate H.T. voltage is available

winding. The two ends of the secondary winding go to the grids of two matched valves. The centre-tap goes to the grid-bias voltage, which is applied equally to the two grids. The output push-pull transformer consists of a centre-tapped primary winding and a straightforward secondary.

The two anodes of the matched valves are connected to the ends of the primary winding of the output transformer. The centre-tap goes to the high-tension voltage, which is applied equally to the two anodes. The secondary winding is connected to the loud-speaker.

The expense of the two special transformers is justified where big volume is

Whatever the nature of the impedance, the point to remember is that the overall stage gain is not usually greater than the amplification factor of the valve preceding it. The exception to this is where a tapped impedance is employed.

With resistance-capacity or choke-capacity coupling the impedance rule is more readily adhered to. One can choose a valve with a high magnification factor, say 35, with an impedance of 35,000 ohms. This can be followed by a resistance of 100,000 ohms or more.

Resistance-capacity coupling units are inexpensive and certainly give good-quality reproduction provided that suitable valves are chosen. A point to remember is that across the resistance or choke is an appreciable voltage drop, so a fairly high value of anode voltage is advisable.

### PHOTO-ELECTRIC ACTION

THE number of electrons emitted by a photo-electric metal under the action of light is directly proportional, over a wide range, to the intensity of the incident light-ray. The velocity with which the emitted electrons leave the sensitive surface is not, however, affected by the light-intensity. This is due to the fact that all the electrons, once they are liberated, have an equal content or "quanta" of energy, which is independent of temperature changes.

M. B.

# BROADCAST TELEPHONY

Broadcasting stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is *aerial energy*.

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<b>GREAT BRITAIN</b>								
25.53	11.751 Chelmsford (G5SW)	15.0	316	950 Marseilles (PTT)	1.5	416	721 Radio Maroc (Rabat)	10.0
200	1,500 Leeds	0.16	328.2	914 Grenoble (PTT)	1.2	1,350	222.2 Tunis Kasbah	0.0
242	1,238 Belfast	1.2	329.5	910.3 Poste Parisien	1.2	<b>NORWAY</b>		
261.3	1,148 London Nat.	0.80	345.2	869 Strasbourg (PTT)	12.0	235.5	1,275 Stavanger	0.5
288.5	1,040 Newcastle	1.2	370	810.5 Radio LL (Paris)	0.5	240.0	1,217 Kristianssand	0.5
288.5	1,040 Swansea	0.16	385	779 Radio Toulouse	15.0	364	824 Bergen	1.0
288.5	1,040 Stoke-on-Trent	0.16	447	671 Paris (PTT)	2.0	363.1	824.1 Frederiksstad	0.7
288.5	1,040 Sheffield	0.16	460	644 Lyons (PTT)	2.3	453.2	662 Porsgrund	1.5
288.5	1,040 Plymouth	0.16	1,445.7	207.5 Eiffel Tower	15.0	453.2	662 Nidaros	1.3
288.5	1,040 Liverpool	0.16	1,725	174 Radio Paris	17.0	1,073	279.6 Oslo	75.0
288.5	1,040 Hull	0.16	<b>GERMANY</b>					
288.5	1,040 Edinburgh	0.4	31.38	9,560 Zezen	15.0	234	1,283 Lodz	2.2
288.5	1,040 Dundee	0.16	217	1,387 Konigsberg	1.7	244	1,229 Cracow	1.5
288.5	1,040 Bournemouth	1.2	213	1,373 Hlensburg	0.6	312.8	959 Wilno	0.5
288.5	1,040 Bradford	0.16	227	1,319 Cologne	1.7	338.1	887.1 Poznan	1.9
301	995 Aberdeen	1.2	227	1,319 Münster	0.6	331	788 Lvov	2.2
309.9	968 Cardiff	1.2	227	1,319 Aachen	0.3	409.8	732 Katowice	16.0
356.3	842 London Reg.	45.0	232.2	1,293 Kiel	0.31	1,411	212.5 Warsaw	14.0
376.4	797 Manchester	1.2	239	1,256 Nürnberg	2.3	<b>PORTUGAL</b>		
398.9	752 Glasgow	1.2	246.4	1,277.2 Cassel	0.3	210	1,250 Oporto	0.25
479	626 Midland Reg.	38.0	253.4	1,184 Leipzig	2.3	(Teatro Apollo)		
1,554	193 Daventry (Nat.)	27.0	259.3	1,157 Gleiwitz	5.6	320	937.6 Lisbon (CTIAA)	0.25
<b>AUSTRIA</b>								
218.5	1,372 Salzburg	0.6	269.8	1,172 Augsburg	0.3	<b>ROMANIA</b>		
240	1,220 Linz	0.6	276.5	1,085 Heilsberg	75.0	394	761 Bucharest	16.0
283.6	1,058 Innsbruck	0.6	283.6	1,058 Magdeburg	0.6	<b>RUSSIA</b>		
352	851 Graz	9.5	283.6	1,058 Berlin (E)	0.6	427	702 Kharkov	4.0
453	666 Klagenfurt	0.6	283.6	1,058 Stettin	0.6	720	416.6 Moscow (PTT)	20.0
517	581 Vienna	20.0	316.6	947.6 Bremen	0.3	800	375 Kiev	20.0
<b>BELGIUM</b>								
206	1,456 Verviers	0.3	316.6	947.6 Dresden	0.3	824	364 Sverdlovsk	25.0
206	1,456 Antwerp	0.4	318.8	941 Breslau	1.7	870	344.8 Tiflis	15.0
216	1,391 Chateaufort	0.25	325	923 Muhlacker	75.0	937.5	320 Kharkov (RV20)	25.0
243	1,235 Courtrai	0.1	300	833 Hamburg	1.7	1,000	300 Leningrad	20.0
244.7	1,226 Ghent	0.25	372	806 Frankfurt	1.7	1,103	272 Moscow Popoff	40.0
245.3	1,223 Schaerbeek	0.5	390	770 Berlin	1.7	1,200	250 Kharkov (RV4)	25.0
338.2	857 Veilhem	12.0	418	716 Danzig	0.2	1,304	230 Moscow (Trades' Unions)	100.0
509	598 Brussels (No. 1)	1.2	452.1	662 Langenberg	17.05	1,380	217.5 Bakou	10.0
<b>BULGARIA</b>								
319	941 Sofia	9.0	473	635 Munich	1.7	1,431	202.5 Moscow (Kom)	20.0
<b>CZECHO-SLOVAKIA</b>								
263	1,139 Moravska-Ostrava	11.0	533	563 Kaiserslautern	1.0	<b>SPAIN</b>		
279	1,076 Bratislava	14.0	559.7	536 Hanover	0.3	251	1,193 Barcelona	1.0
294	1,020 Kosice	2.5	570	527 Freiburg	0.33	266.7	1,125 Barcelona	10.0
342	878 Brunn (Brno)	3.0	1,635	183.5 Zezen	35.0	340	860 Barcelona (EAJ1)	8.0
487	617 Prague (Prah)	5.5	1,635	183.5 Norddeich	10.0	368	825 Seville (EAJ3)	1.5
<b>DENMARK</b>								
291	1,067 Copenhagen	1.0	<b>HOLLAND</b>					
1,153	260 Kalundborg	10.0	31.28	9,599 Eindhoven (PCJ)	30.0	340	860 Barcelona (EAJ1)	8.0
<b>ESTONIA</b>								
295	1,013 Reval (Tallinn)	0.7	290	1,004 Huizen	8.5	388	825 Seville (EAJ3)	1.5
<b>FINLAND</b>								
221	1,355 Helsinki	15.0	290	1,004 Radio Idzerda (The Hague)	0.6	425.7	704.7 Madrid (EAJ7)	2.0
291	1,031 Viipuri	15.0	1,071	280 Scheveningen-Haven	5.0	400	652 San Sebastian (EAJ8)	0.5
1,796	167 Lahti	54.0	1,875	160 Hilversum	8.5	<b>SWEDEN</b>		
172.5	1,730 St. Quentin	0.3	210	1,430 Budapest (Csepel)	1.0	230.6	1,301 Malmö	0.75
200	1,500 Radio Roubaix	0.2	550	545 Budapest	23.0	257	1,166 Hörby	15.0
232.9	1,346 Bécamp	1.0	<b>HUNGARY</b>					
235.1	1,275 Nîmes	0.6	210	1,430 Budapest (Csepel)	1.0	302	990 Falun	0.65
240.6	1,247 Béziers	0.6	550	545 Budapest	23.0	322	932 Göteborg	15.0
248.5	1,207.2 Juan-les-Pins	0.5	1,200	250 Reykjavik (shortly testing)	16.0	436	639 Stockholm	75.0
256	1,171 Toulouse (PTT)	1.0	<b>IRISH FREE STATE</b>					
265	1,130 Lille (PTT)	15.0	224.4	1,337 Cork (IFS)	1.5	542	554 Sundsvall	15.0
272	1,103 Rennes	1.2	413	725 Dublin (R2N)	1.5	770	389 Ostersond	0.75
280	1,040 Montpellier	2.0	<b>ITALY</b>					
284.2	1,017.9 Radio Lyons	0.5	80	3,750 Rome (3RO)	9.0	1,224	245 Boden	0.75
296.4	1,012.1 Limoges (PTT)	0.08	296	1,013 Turin (Torino)	8.5	1,348	222.5 Motala	40.0
304	988 Bordeaux (PTT)	35.0	313.2	958 Genoa (Genova)	1.5	<b>SWITZERLAND</b>		
<b>NORTH AFRICA</b>								
363.4	825.3 Algiers (PTT)	13.0	332	905 Naples (Napoli)	1.7	244	1,229 Basle	0.5
<b>LATVIA</b>								
525	572 Riga	12.0	441	680 Rome (Roma)	75.0	403	743 Berne	1.1
<b>LITHUANIA</b>								
1,935	155 Kaunas	7.0	453	663 Bolzano (IBZ)	0.2	459	653 Zurich	0.75
<b>YUGOSLAVIA</b>								
306.8	978 Zagreb (Agram)	0.7	501	599 Milan (Milano)	8.5	678.7	454.6 Lausanne	0.6
430.5	696.8 Belgrade	3.0	<b>LATVIA</b>					
574.7	522 Ljubljana	2.8	525	572 Riga	12.0	760	395 Geneva	1.5
<b>TURKEY</b>								
1,200	250 Istanbul	5.0	<b>LITHUANIA</b>					
1,961	153 Ankara	7.0	1,935	155 Kaunas	7.0	<b>TURKEY</b>		
<b>YUGOSLAVIA</b>								
306.8	978 Zagreb (Agram)	0.7	<b>LITHUANIA</b>					
430.5	696.8 Belgrade	3.0	<b>LITHUANIA</b>					
574.7	522 Ljubljana	2.8	<b>LITHUANIA</b>					

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## THE VARIABLE COLVERSTAT

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All Colverstats are wire wound and absolutely silent in operation. Ideal for voltage regulation and volume control.

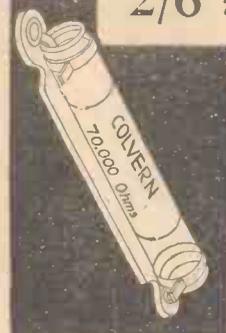
1,000, 5,000, 10,000, 25,000, and 50,000 ohms.

PRICE 5/6

## THE COLVERSTAT

Illustrated here also has a variety of uses—voltage regulator, potential divider, automatic grid bias, etc.—for all of which it gives the same constant dependable performance. Its wire-wound spaced single layer winding on glass gives low capacity and inductance. It dissipates 10 watts and is accurate to within 2%. From 1/100,000 ohms.

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Easy Tune Short-wave 2 (D, Trans) ..	AW242	"A.W." Gramophone Amplifier .. .. .	AW205
Searcher Two (D, Trans) .. .. .	AW245	Beginner's Amplifier (iv.) gd. .. .. .	AW210
Arrow Two (D, Trans) .. .. .	AW249	Brookman's Separator (HF Unit) .. ..	AW212
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Q-coil 2 (D, Trans) .. .. .	WM162	Simple Gramophone Amplifier .. .. .	AW257
Crusader (D, Trans) .. .. .	WM169	Audiot Amplifier .. .. .	WM132
Flat-dweller's 2 (HF, D) .. .. .	WM176	Concentrator (HF, Unit) .. .. .	WM169
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<b>TWO-VALVE SETS (continued)</b>		Britannia (D, RC, Trans) .. .. .	WM167
<b>THREE-VALVE SETS (continued)</b>		All-wave Screened-grid Three (HF, D, Pentode)	WM110
<b>FOUR-VALVE SETS (continued)</b>		Standard Coil Three (HF, D, Trans) ..	WM117
<b>FIVE-VALVE SETS (continued)</b>		Festival Three (D, 2 LF-Dual Imp) .. ..	WM118
<b>SIX-VALVE SETS (continued)</b>		The Q3 (D, RC, Trans) .. .. .	WM124
<b>SEVEN-VALVE SETS (continued)</b>		Lodestone Three (HF, D, Trans) .. .. .	WM129
<b>EIGHT-VALVE SETS (continued)</b>		Simple Screen Three (HF, D, Trans) .. ..	WM131
<b>NINE-VALVE SETS (continued)</b>		Dynamic Three (A.C.—SG, D, Trans) ..	WM136
<b>TEN-VALVE SETS (continued)</b>		Short Wave Link (D, RC, Trans) .. .. .	WM142
<b>ELEVEN-VALVE SETS (continued)</b>		Binowave S.G. Three (SG, D, Trans) ..	WM152
<b>TWELVE-VALVE SETS (continued)</b>		Fanfare (D, 2 Trans) .. .. .	WM157
<b>THIRTEEN-VALVE SETS (continued)</b>		Lodestone Three (SG, D, Trans) .. .. .	WM161
<b>FOURTEEN-VALVE SETS (continued)</b>		Community Three (D, RC, Trans) .. .. .	WM164
<b>FIFTEEN-VALVE SETS (continued)</b>		New Q 3 (SG, D, Pentode) .. .. .	WM167
<b>SIXTEEN-VALVE SETS (continued)</b>		Brookman's Push-Pull Three (SG, D, Trans)	1/6 WM170
<b>SEVENTEEN-VALVE SETS (continued)</b>		Celerity Three (SG, D, Trans) .. .. .	WM173
<b>EIGHTEEN-VALVE SETS (continued)</b>		All-nations Three (D, 2 Trans) .. .. .	WM178
<b>NINETEEN-VALVE SETS (continued)</b>		Inceptordyne (SG, D, Pentode) .. .. .	WM179
<b>TWENTY-VALVE SETS (continued)</b>		Brookman's A.C. Three (SG, D, Trans) 1/6	WM184
<b>TWENTY-ONE VALVE SETS (continued)</b>		Music Marshal (D, 2 Trans) .. .. .	WM190
<b>TWENTY-TWO VALVE SETS (continued)</b>		Gramo-Radio D.C. Three (SG, D, Trans)	WM196
<b>TWENTY-THREE VALVE SETS (continued)</b>		Concert Three (D, 2 Trans) .. .. .	WM199
<b>TWENTY-FOUR VALVE SETS (continued)</b>		New Lodestone Three (HF, D, Trans) ..	WM205
<b>TWENTY-FIVE VALVE SETS (continued)</b>		De-luxe Three (D, RC, Trans) .. .. .	WM209
<b>TWENTY-SIX VALVE SETS (continued)</b>		Five-point Three (SG, D, Trans) .. .. .	WM212
<b>TWENTY-SEVEN VALVE SETS (continued)</b>		Falcon Three (A.C. Set) .. .. .	WM217
<b>TWENTY-EIGHT VALVE SETS (continued)</b>		New Brookman's Three (SG, D, Trans)	WM218
<b>TWENTY-NINE VALVE SETS (continued)</b>		Five-point Short-waver (D, RC, Trans)	WM187
<b>THIRTY VALVE SETS (continued)</b>		<b>FOUR-VALVE SETS (continued)</b>	
<b>THIRTY-ONE VALVE SETS (continued)</b>		<i>All these 1s. 6d. each, post free.</i>	
<b>THIRTY-TWO VALVE SETS (continued)</b>		Facility Four (HF, D, 2 RC—Q-coil) ..	AW154
<b>THIRTY-THREE VALVE SETS (continued)</b>		Broadcast Picture Four (HF, D, 2RC) ..	AW163
<b>THIRTY-FOUR VALVE SETS (continued)</b>		The Orchestra Four (D, RC, Push-pull) ..	AW167
<b>THIRTY-FIVE VALVE SETS (continued)</b>		All Europe Four (2HF, D, Trans) .. ..	AW173
<b>THIRTY-SIX VALVE SETS (continued)</b>		Stability Four (HF, D, RC, Trans) .. ..	AW182
<b>THIRTY-SEVEN VALVE SETS (continued)</b>		Clarion All-electric Three (SG, D, Trans A, C, Rectifier) .. .. .	AW200
<b>THIRTY-EIGHT VALVE SETS (continued)</b>		Music-lover's Gramo-radio (SG, D, RC, Trans) .. .. .	AW202
<b>THIRTY-NINE VALVE SETS (continued)</b>		Horizon Four (SG, D, 2 Trans) .. .. .	AW237
<b>FORTY VALVE SETS (continued)</b>		Challenge Four (2SG, D, Trans) with copy of "A.W." 4d. post free .. .. .	AW251
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<b>FORTY-TWO VALVE SETS (continued)</b>		Challenge Radio Gramophone (SG, D, RC, Trans)	AW265
<b>FORTY-THREE VALVE SETS (continued)</b>		Touchstone (HF, D, RC, Trans) .. .. .	WM100
<b>FORTY-FOUR VALVE SETS (continued)</b>		Standard-coil Four (HF, D, 2RC) .. .. .	WM122
<b>FORTY-FIVE VALVE SETS (continued)</b>		Dominions Four (2SG, D, Trans) .. .. .	WM134
<b>FORTY-SIX VALVE SETS (continued)</b>		Drum Major (HF, D, RC, Trans) .. .. .	WM137
<b>FORTY-SEVEN VALVE SETS (continued)</b>		Music Player (HF, D, RC, Trans) .. .. .	WM144
<b>FORTY-EIGHT VALVE SETS (continued)</b>		Arrow (SG, HF, D, Trans) .. .. .	WM154
<b>FORTY-NINE VALVE SETS (continued)</b>		1930 Monodial (2SG, D, Trans) .. .. .	WM158
<b>FIFTY VALVE SETS (continued)</b>		Electric Four (All AC.—SG, D, RC, Trans)	WM162
<b>FIFTY-ONE VALVE SETS (continued)</b>		Outpost Four (SG, D, 2 Trans) .. .. .	WM165
<b>FIFTY-TWO VALVE SETS (continued)</b>		Brookman's Four (2 SG, D, Trans) .. ..	WM174
<b>FIFTY-THREE VALVE SETS (continued)</b>		Transportable Four (SG, D, 2 RC) .. ..	WM180
<b>FIFTY-FOUR VALVE SETS (continued)</b>		Super Q (SG, D, 2 Trans) .. .. .	WM189
<b>FIFTY-FIVE VALVE SETS (continued)</b>		Lodestone Four (HF, D, RC, Trans) .. ..	WM193
<b>FIFTY-SIX VALVE SETS (continued)</b>		Searcher's Four (SG, D, RC, Trans) .. ..	WM194
<b>FIFTY-SEVEN VALVE SETS (continued)</b>		Invitation Four (SG, D, RC, Trans) .. ..	WM200
<b>FIFTY-EIGHT VALVE SETS (continued)</b>		Regional Band-pass Four (SG, D, RC, Trans)	WM211
<b>FIFTY-NINE VALVE SETS (continued)</b>		Five-Point Four (SG, D, RC, Trans) .. ..	WM216
<b>SIXTY VALVE SETS (continued)</b>		Regional A.C. 4 SG, D, RC, Trans) .. ..	WM221
<b>SIXTY-ONE VALVE SETS (continued)</b>		<b>FIVE-VALVE SETS (continued)</b>	
<b>SIXTY-TWO VALVE SETS (continued)</b>		<i>All these 1s. 6d. each, post free.</i>	
<b>SIXTY-THREE VALVE SETS (continued)</b>		James Quality Five (2 SG, D, RC, Trans)	AW227
<b>SIXTY-FOUR VALVE SETS (continued)</b>		All-wave Lodestone Five (HF, D, RC, Push-pull)	WM146
<b>SIXTY-FIVE VALVE SETS (continued)</b>		1930 Five (2 HF, D, RC, Trans) .. .. .	WM171
<b>SIXTY-SIX VALVE SETS (continued)</b>		Dual-screen Five (2SG, D, RC, Trans) ..	WM185
<b>SIXTY-SEVEN VALVE SETS (continued)</b>		Radio-Record Five (SG, D, Trans-parallel)	WM188
<b>SIXTY-EIGHT VALVE SETS (continued)</b>		Overseas Five (2SG, D, Trans) .. .. .	WM191
<b>SIXTY-NINE VALVE SETS (continued)</b>		Regional A.C. Five (3SG, D, Trans) .. ..	WM224

Copies of "Amateur Wireless" and of "Wireless Magazine" containing descriptions of any of these sets can be obtained at 4d. and 1s. 3d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets.



**"Challenge Three"**

SIR,—I have made up the "Challenge Three Kit Set," and it certainly brings in the stations but many stations seem to come in at the same time! In other words, I seem to get no selectivity. I use a fairly good outdoor aerial and my earth connection is the best to be obtained after repeated trials. Is poor selectivity a feature of this set?  
G. L. (Deptford).

In your locality you should not attempt to use a large outdoor aerial. An aerial of the single-wire vertical type, not exceeding 30 ft. overall length of wire, is the maximum we would advise. Possibly an indoor aerial, consisting of about 15 to 20 ft. of wire, would be quite suitable for good reception and good selectivity. You could also try an indoor counterpoise in place of a direct earth connection. This may consist of about 20 ft. of multi-stranded insulated copper wire stretched across the floor of the room in which the receiver is used. One end should be connected to the earth terminal of the receiver and the other end thoroughly insulated from earthed objects. Your ordinary earth should be disconnected from the set. Your observation of these points should enable you to improve your selectivity.  
—ED.

**Poor Amplification?**

SIR,—I have a three-valve, H.F., detector, S and L.F. set, in which is incorporated a gramophone amplifying arrangement. The radio reproduction is good and gives fair volume, but the gramophone side fails in regard to volume. I am using a well-known make of electric pick-up in conjunction with a volume control, and the latter is seldom used to reduce volume. I have checked over my batteries and valves and these appear to be capable of delivering satisfactory volume, which is proved by the good radio reception. Why is it that I cannot seem to get satisfactory volume from the gramophone pick-up?  
S. F. (London).

We are of the opinion that you have a very insensitive pick-up and that it does not apply sufficient voltage variations to the grid of your first valve to permit of adequate amplification. There are some pick-ups on the market which only permit of an output of about .5 volt either side of the zero line, whilst others are capable of applying 1.3 volts either side of the zero line. If you have one of the former type of pick-ups, it accounts for your trouble.  
—ED.

**Station Identification**

SIR,—I read with interest the article with reference to the tracing of foreign stations by means of a graph.

From my own experience I have come to the conclusion that this method is not quite so successful as one is led to believe.

I am enclosing a graph (not reproduced) that I have prepared from the set I am now using (the "Mullard Orgola III," A.C. mains type) showing the readings of a few of the many stations I have actually identified.

I also tried the same method with the "Clarion III," and the result was the same.

It would be interesting to hear if other readers of AMATEUR WIRELESS have been more successful, as I am sure many would welcome a means of identifying the numerous stations that are receivable.

E. G. S. (Surrey).

**Crackling Noises**

SIR,—My five-valve portable set, which has in the past behaved splendidly, has now developed a crackling noise which I  
(Continued on page 39)

**H & B FOR SUPER COILS**



H & B CHALLENGE COILS are now wound on TRELLEBORGS guaranteed 12,000 volt per M/M. Losses cut to the minimum. PERFECT coils at reasonable prices.

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**AMATEUR WIRELESS NOTEBOOK DIARY for 1931**

This handy and compact reference book, which will be of assistance on many occasions during 1931, should be kept within easy reach by every wireless amateur. Here are some of the contents:—

- Conventional Symbols used in Wireless.
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- Frame Aerials.
- Wavelength Frequency Tables.
- Notes on Accumulator Upkeep.
- Coil-winding Data.
- Useful Formula Section.
- Calculating Condenser Capacities.
- List of World's Short-wave Stations.
- Choosing Your Valves.
- Valve Tables.
- Glossary and Definitions of Wireless Terms.

The "Amateur Wireless" Diary can be obtained at Book-sellers for 1/6 (cloth) and 2/6 (leather), or by post (2d. extra), from "Amateur Wireless," 58-61 Fetter Lane, London, E.C.4

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In this, the leader among British valve holders, the whole platform supporting the valve is sprung. The springing is sensitive enough to damp out vibration and "pong" and yet dead beat enough to avoid any possibility of electro-mechanical resonance. A good job throughout.

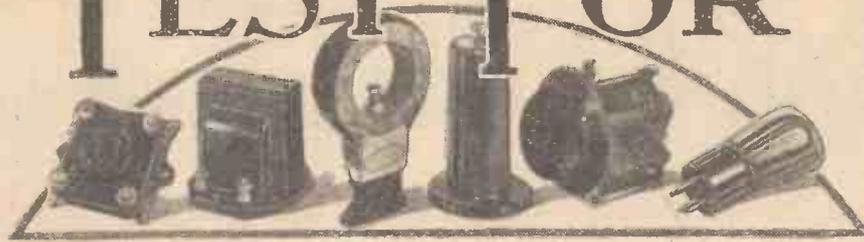
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# WE TEST FOR YOU

A weekly review of  
new components



and tests of  
apparatus.

Conducted by our Technical Editor: J. H. REYNER, B.Sc., A.M.I.E.E.

## Igranic Differential Condenser

THE differential condenser has proved a solution to many problems, in sets that have shown a tendency to be unstable or critical in reaction adjustment.

The new Igranic differential condenser is one that should appeal to the reader, for



Igranic differential condenser

it is a robust and well designed component. The fixed and moving plates are separated by an insulated paper dielectric whilst the fixed insulated end plates hold the moving spindle firmly in position. Electrical connection to the moving plates is by pig-tail, protected by a metal covering, this is certainly a practical refinement.

The capacities between the moving plates and both sets of fixed plates were taken in our laboratories. In one case the maximum was .00015 microfarad, and the minimum .00003 microfarad; in the other case the maximum was .00019 microfarad, and the minimum .00007. One has, therefore, two alternate reaction capacities from which to choose, whilst the fact that these capacities are not identical should have little effect on the differential action of the condenser.

This component can be recommended.

## Philips Moving-coil Speaker

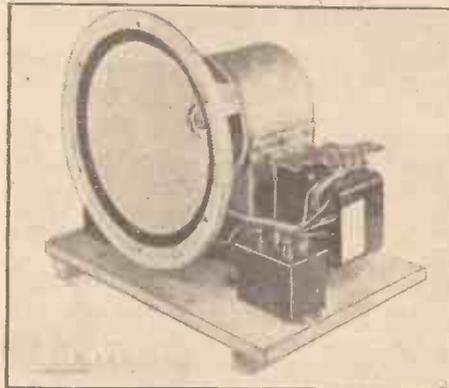
A NEW moving-coil speaker has just been introduced by Messrs. Philips Lamps, Ltd., this being of the low-impedance type, with an externally excited field winding, the current for which is rectified by means of a valve.

The speaker is obtainable with three types of mains input tapped transformer covering all the usual mains supplies and two of these types are tapped so that adjustment may be made. An output transformer is provided which enables the speaker to be used with practically any last stage arrangement. The transformer

ratio can be varied from approximately 9 to 1, to 14 to 1. A filter is provided as a separate component and this can be connected when required by means of a special switch, also supplied with the speaker. The effect of this filter is to eliminate external "mush" which is so often experienced and it is also useful in reducing needle scratch which may be experienced when the speaker is worked with a gramophone amplifier.

When the speaker was received for test it was fitted in a suitable baffle cabinet and advantage was taken of the large pneumatic washer which is provided ensuring a flush fit between the front of the speaker and the baffle. For convenience the filter and switch—both separate components—were mounted in the baffle cabinet, although they, of course, could be incorporated in the receiver. An earthing terminal is provided on the speaker itself.

The speaker was tested both on radio and gramophone outputs, in conjunction with the AMATEUR WIRELESS standard amplifier, and the speaker stood up to this without any sign of overloading. The quality both on speech and music was entirely satisfactory, there being no tendency to "boom," and the sensitivity was well up to the standard of our laboratory instrument. The rectifier arrangements,



New Philips moving-coil speaker

incorporating a Philips 506K rectifying valve, were satisfactory and there is negligible mains hum.

This new addition to the Philips range of speakers should be well suited to the needs of owners of large sets who want something rather exceptional in the way of output volume at excellent quality.

Let "Amateur Wireless"  
solve your problems

## Parmeko L.T. Transformer

THE heaters of A.C. valves are rather critical in their voltage requirements. The standard types are specified as taking 4 volts, and 4 volts they should have. If the voltage is increased above the specified figure there is a serious reduction in the life of the valve.

While it is quite simple to design a transformer to supply 4 volts at a given



Parmeko L.T. transformer

current, difficulty occurs due to the inevitable regulation of the transformer. As the current consumption is increased, the voltage is reduced, and even a transformer of extravagant dimensions will not overcome this difficulty completely. Consequently, it is customary for manufacturers to design their instruments to supply say, 3 amps, knowing that if 2 or 4 amps are required the voltage will not be seriously affected.

Messrs. Partridge and Mee, of Leicester, have conceived the excellent plan of designing a transformer with alternative tappings to be used according to the number of A.C. valves in circuit. This component, made on the robust lines associated with Parmeko products, supplies an output of 4 volts with centre tap. The primary is labelled 200, 220, 240 volts with three additional terminals marked C1A, C3A, and C5A, according to the number of A.C. valves used. One end of the mains is taken to the appropriate tap for the particular voltage, while the other goes to C1A, if one or two valves are used. Connection to C3A is necessary if from three to four valves are employed, and to C5A if there are five or six valves.

On our 240 volts supply, we checked up the voltage figure when supplying up to five valves, and found that by using this tapping scheme, the voltage was correct to within 2 per cent. One may, therefore, rest assured that the efficiency and reliability of the valve is being looked after to the best advantage.

# "Amateur Wireless" HANDBOOKS 2/6

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## Wireless-controlled Mechanism For Amateurs. By Raymond Phillips

This book is an illustrated practical guide to the making and using of short-range wireless control apparatus, and it has been written so simply that it can be understood by any enthusiast possessing an elementary knowledge of wireless.

## The Practical "Super-het" Book

Explains what the Super-het is, what it does, how it works, and how to build up a number of super-het sets made of tested, British-made components.

## The Short-wave Handbook

By Ernest H. Robinson (5YM)

Describes in very simple language the wireless apparatus used in short-wave work, shows how to make it and how to use it, and explains the technical principles with which the beginner will need to become acquainted.

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The intelligent novice and particularly the home constructor and the keen wireless amateur who is always rigging up different circuits and experimenting for progress, will find this Data Book extremely helpful.

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THIS booklet gives complete instructions for building high- and low-tension eliminators; and there are chapters on Alternating Current and Rectification, Types of Electricity Supply, High-Tension Trickle Charging, Low-Tension Trickle Charging, Moving Coil Loud-speakers, General Principles and Methods of Rectification, Smoothing, Transformers for Eliminators, Voltage Doubler Circuit, Voltage Dropping, Types of Rectifiers, etc.

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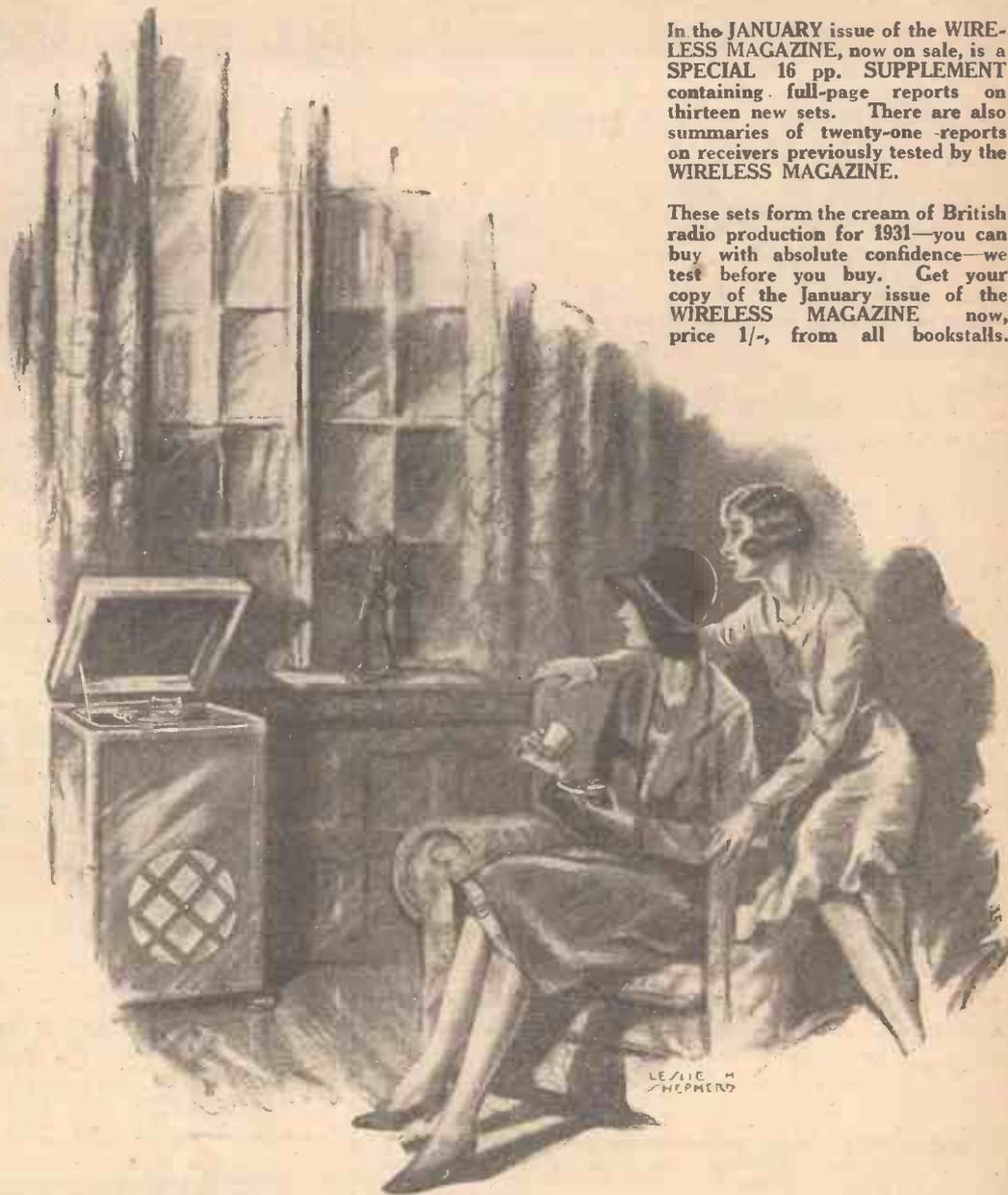
# The PICK of the NEW-YEAR SETS

Other SPECIAL FEATURES CONTAINED IN THE WIRELESS MAGAZINE, JANUARY

Subsidised Opera discussed by Rachmaninoff. What We Need in 1931 by W. James. Home Recording by J. H. Reyner. The Regional A.C. Five—a set with three screened-grid stages—by W. James. The Five-point Short-waver—a powerful three-valver for world-wide reception. Why the Moving Coil is Right by J. H. Reyner. My Radio Resolution for 1931 by 16 well-known personalities, and many other interesting and helpful articles.

In the JANUARY issue of the WIRELESS MAGAZINE, now on sale, is a SPECIAL 16 pp. SUPPLEMENT containing full-page reports on thirteen new sets. There are also summaries of twenty-one reports on receivers previously tested by the WIRELESS MAGAZINE.

These sets form the cream of British radio production for 1931—you can buy with absolute confidence—we test before you buy. Get your copy of the January issue of the WIRELESS MAGAZINE now, price 1/-, from all bookstalls.



## WIRELESS MAGAZINE

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## DOUBLE FAULTS

ONE of the most puzzling combinations of circumstances which one may encounter is that of a set which has more than one fault at the same time. In the course of ordinary testing the other day, I came across a case of this character which was solved fairly quickly by the application of systematic tests. The fault and the method of cure may be of interest.

The receiver was a large multi-valve set, but the fault was confined to the last two valves, and therefore, one may just as easily consider it as occurring on a three-valve H.F., detector, and L.F. set. The first trouble was that no signals at all were obtained. On removing the various valves in turn the usual click in the loud-speaker was not heard. The last valve admittedly gave some sort of click, but it did not seem to be up to the usual standard. An investigation of the circuit was made, but no obvious fault could be found in the last valve circuit, and for the time being I assumed that I was mistaken and that the last valve was in order. No click of any sort, however, was obtained when inserting or removing the detector valve, and after a further check on the circuit it was decided that there was some fault with one of the components.

A milliammeter, therefore, was inserted in the H.T. negative lead. Then, on plugging in the detector valve by itself, no indication was obtained, indicating a break in the circuit. As a matter of fact, however, the last valve was inserted in the circuit. Here a curious thing happened. The current rose at once to a value of several milliamps—not as great as I should have expected for the valve in question, but, nevertheless, a definite indication. The current, however, immediately proceeded to die away almost to nothing. Every time the test was repeated this effect was reproduced, which indicated that the low-tension battery was down.

A check on the voltage indicated that this was the case, and that the battery had inadvertently been allowed to become discharged. It was delivering a voltage on no load, but when current was taken, it rapidly gave up its charge, and the voltage fell to quite a small value.

### Systematic Testing

The fault on the detector circuit, however, still existed, for even on using a new L.T. battery (when the indication received with the last valve was correct) no current was obtained with the detector valve. A voltmeter was then used to test the voltage at all points in the detector circuit from the H.T. up to the anode of the valve, and it was found that there was no connection through the transformer. The H.T. side of the L.F. transformer showed the proper voltage, while the anode side showed no voltage at all, indicating a complete break. The transformer was removed and replaced by another one, when everything was satisfactorily in order.

Both of these faults are comparatively simple ones, and the moral of this article is that the remedies are equally simple, provided one uses a systematic method of investigation in order to locate the source of the trouble.

J. H. R.

## "READERS' IDEAS AND QUESTIONS"

(Continued from page 35)

cannot cure. I have renewed the H.T. batteries, tried an outside speaker, and gone over all connections for a fault. I have even replaced the grid-bias battery, but the crackling still persists.

W. J. (Birmingham).

It appears that the primary winding of one of your L.F. transformers has become broken or fractured. We suggest you replace your L.F. transformers, or have both tested through for continuity. If you have only one transformer and one R.C. coupling for your two L.F. stages, possibly the insulation of the coupling condenser in the R.C. unit may be defective. Suspect the primary winding of your transformer first, however, as the symptoms you describe point to the transformer being the culprit.—ED.

### "Challenge Four"

SIR,—I have made up the "Challenge Four" receiver—except that as I have been unable, so far, to get the volume control Regenstat, I have used a rheostat to control the filament current to the first S.G. valve. My trouble is incessant oscillation as soon as all three circuits are correctly in tune.

S. B. (Middlesex).

The volume control variable resistance not only permits varying the maximum potential that is applied across the grid and filament of the first S.G. valve, but it also gives rise to just sufficient damping in the aerial-grid circuit to prevent this circuit oscillating before the H.F. tuning circuits. If the aerial system oscillates before the other grid circuits, instability is sure to result. We advise you to fit the special volume control Regenstat: perhaps you can order it direct from the manufacturers.—Ed.

### The Regional Scheme

SIR,—I should like to tell you how much I have been pleased at reading Theron's aposite remarks on "The Race for Power" in AMATEUR WIRELESS. I can confirm, as a distant listener (Isle of Man) his testimony as to the inferiority in quality of London Regional compared with 2LO.

I wrote to the B.B.C. about it soon after Brookmans Park transmitter was started up, only to receive a reply that as I was outside the service area I ought to listen to 5XX.

I might, of course, have replied that I could not always get the desired programme, but the tone of the letter was so lofty, I preferred to leave it at that.

S. S. (Castletown).

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2 Terminals marked Aerial and Earth (Belling Lee)	-	-	6
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# Postcard Radio Literature

## For Home Constructors

If you are interested in doing odd practical jobs in the home—and who is not?—and in making up simple things, such as wireless cabinets, then you should certainly get in touch with the Waverley Book Co. Write, through my free catalogue service, for a copy of an interesting booklet describing "The Woodworker." **133**

## Set Makers' Parts

I can thoroughly recommend you to write to Graham Farish, Ltd., for a novel folder just issued of handy parts for the home building of sets. There are some fine tuning condensers with bakelite insulation which take up an extremely small space behind the panel. **134**

## "Everything for Wireless"

The Will Day slogan is "Everything for Wireless," and I think that this is well borne out by a new 104-page catalogue just sent to me. Components and sets of all the leading makes are illustrated and described in this. It is well worth having. **135**

## Clarith Reproducers

I am rather impressed by the new radio gramophone made by Clarith Reproducers, Ltd. This is quite a cheap model, but the radio side does not appear to have been overlooked as it is in some other modest-priced radio gramophones. Full particulars are available. **136**

## A Fine Folder

Celestion do justice to their speakers in a most excellently produced illustrated folder which I have just received, and which gives details of the whole range. The illustrations are so well done that you should

not need further inducement to go out and hear a Celestion speaker for yourself.

## New Igranic Parts

Write to Igranic for the new "pocket edition" of a catalogue of all the new parts for home constructors. You will need this if you are interested in the Igranic Elkon metal rectifiers for home-built mains units, for full details of these rectifiers are given. There are some interesting and inexpensive new Igranic chokes, transformers and switches. **137**

## A Pole Finder

It is often handy to have a little gadget which indicates polarity. The R.C. Pole Finder is just the thing for most jobs. It is fully described in a leaflet which can be obtained free from R.C. Radio, Ltd. **138**

## Futuristic Sets

Have you seen the new Ferranti receivers which have fabric-covered cases? Many people speak highly of the new three-valve, Model 32, full details of which, I see, are given in a folder available. **139**

## For Television Enthusiasts

I see that in the new Peto-Scott "Easy Way" booklet, particulars are given of hire-purchase terms for Baird televisions. This should make a big appeal to television enthusiasts who want to receive the B.B.C. Baird broadcasts without too great a cash outlay. **141**

## Housing the Speaker

If you have a speaker chassis which is rather unsightly, but which gives good performance, then why not house it in one of the new Camco speaker cabinets? In the new Camco booklet I see that they have a pedestal model, the "Regent," and a cabinet model, the "Melodee," both of which are cheap but appear thoroughly well made. **142**

## Power Amplification

If you want to know just what power valves are suitable for your set and the best way to use them, then you should certainly write for the new Osram booklet on power amplification. This can be obtained free through my catalogue service. **143**

## Dubilier Batteries

I see that Dubilier have H.T. batteries both in the standard and triple capacity ranges, while a special 60-volt super-power type is also available. Anything which bears the Dubilier name can be counted as high class, and when you get the new Dubilier catalogue, I advise you to turn to Section 5, where these H.T. batteries are described. Grid bias batteries are also available. **144**

### GET THESE CATALOGUES FREE.

Here "Observer" reviews the latest booklets and folders issued by well-known manufacturers. If you want copies of any or all of them FREE OF CHARGE, just send a postcard giving the index numbers of the catalogues required (shown at the end of each paragraph) to "Postcard Radio Literature," "AMATEUR WIRELESS," 58-61, Fetter Lane, E.C.4. "Observer" will see that you get all the literature you desire.

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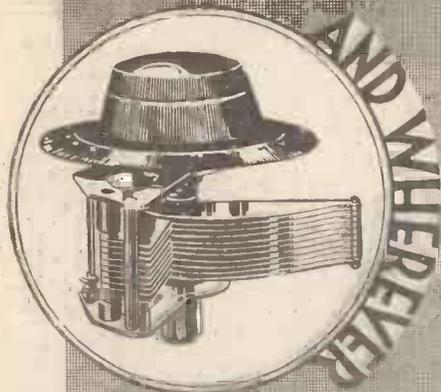
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Set complete. 4 valve  
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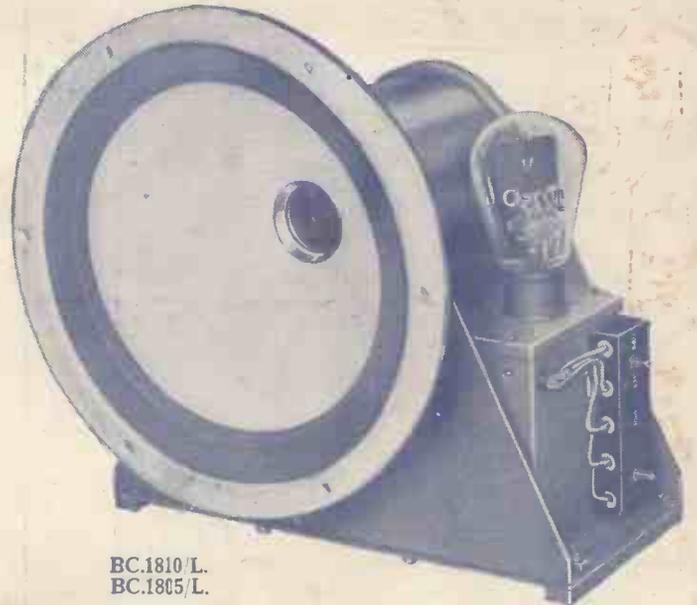
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