BATTERY CATKINS AT LAST :: SHORT-WAVE INTERVAL SIGNALS

Amateur Wireless

and Radiovision

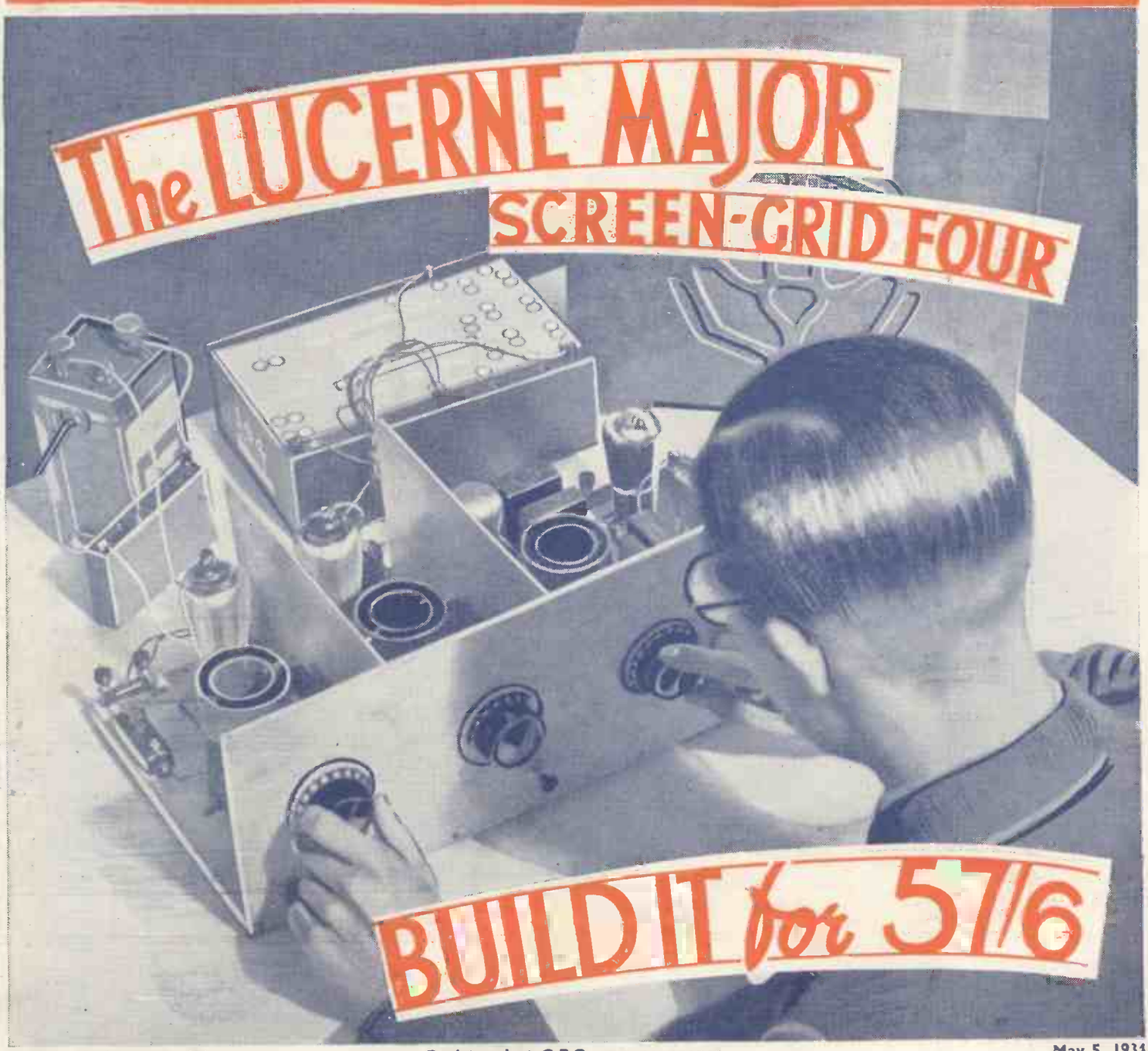
3d Every Wednesday

ALL-MAINS WORKING FOR BATTERY SETS

MAKING A SIMPLE WHISTLE FILTER

TWO SPECIAL TELEVISION ARTICLES

A STRONG CASE for the CRYSTAL SET



The LUCERNE MAJOR SCREEN-GRID FOUR

BUILD IT for 57/6

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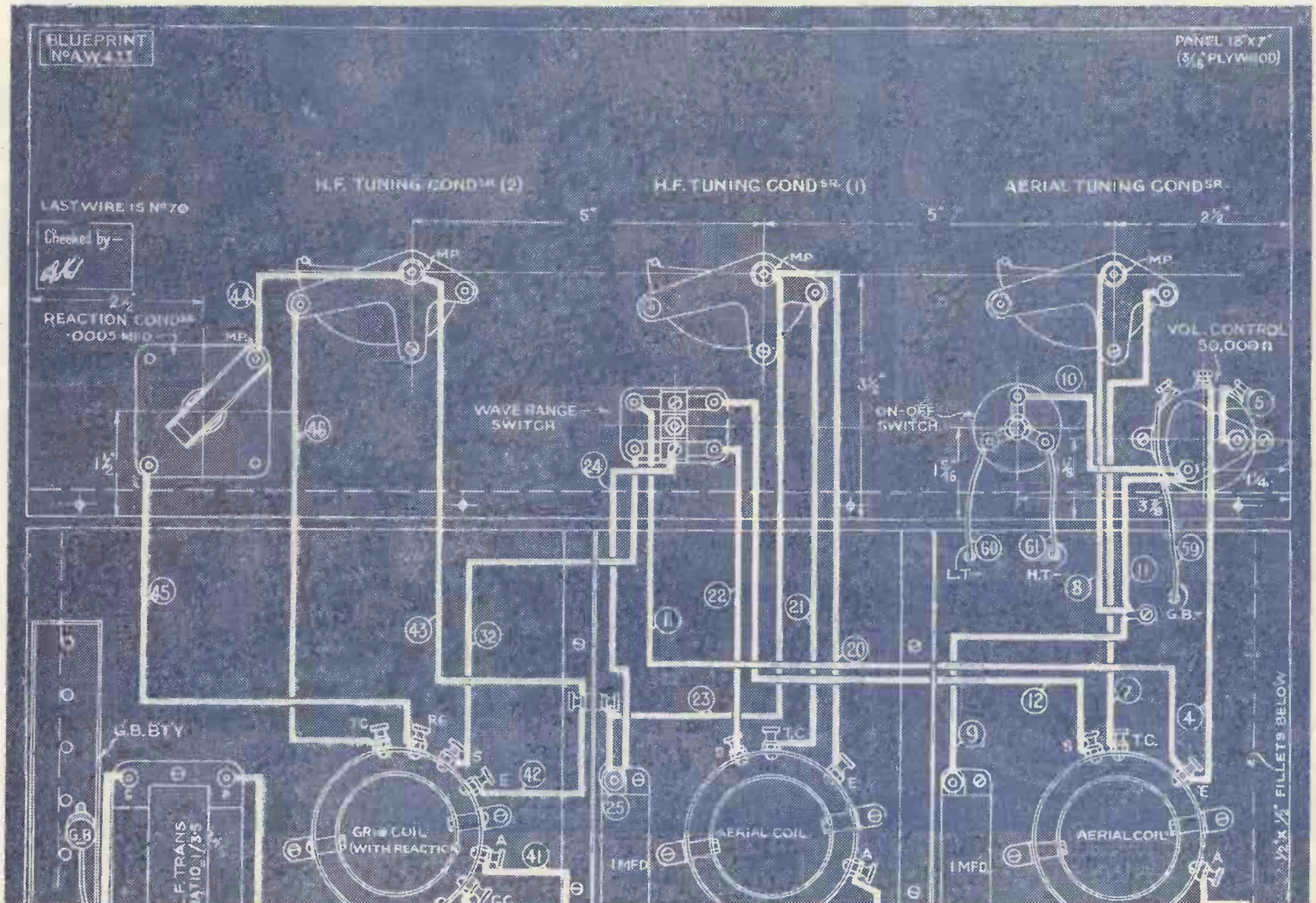
Half-scale Layout and Wiring Guide for the LUCERNE MAJOR



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News and Gossip of the Week

Ambrose and Henry

SATURDAY nights will alternate Henry Hall and Ambrose from the beginning of June, onwards.

Thus is settled a long-standing question. Ambrose is evidently good friends again with the B.B.C. His return to the microphone will be welcomed by his millions of admirers.

Guest Nights

WILL HENRY HALL really keep up these guest nights? There are two sides. Dancers say the comic turns don't mix with the band. Listeners say these turns enliven it.

Ambrose, we imagine, will stick to vocal refrains.

Poland Eavesdropping

WHEN the good Poles want a little of our dance music they just take it—via one of the Empire short-wave stations.

Probably they pick up what is known to Empire listeners as Transmission Five, which is really intended for Canadians.

New B.B.C. Effect

FROM the lazy trickle of a babbling brook to the roar of a Niagara—it is all one to B.B.C. Effects. They have just fitted up a new gadget to cover the water-front.

It consists of a wooden trough inclined over a tank. If the producer asks for a little more water with it they just tilt the trough.

Wimbledon Again

ALL tennis eyes will be on the Centre Court again this year including those of several foreign commentators. They will sit in a stand fitted behind the Royal Box.

Their microphones will be connected to amplifiers and land-lines leading right away back to their home towns on the Continent.

Needless to say, our "O.B." boys will be snugly esconced in their little stand beside Royalty.

That Milan Relay

TALKING of land lines, what did you make of the Milan hook-up? Quite good, wasn't it? For this broadcast the B.B.C. had to make use of certain sections of unscreened line—but they made them good with the usual correction devices.

As soon as Europe generally catches up with us in the laying of high-quality lines we shall be able to take many more musical programmes from various Continental centres.

Connecting Belgium

ON May 20 we shall hear another Continental relay—an orchestral show from the studio of the Brussels station. This will come to us over music lines all the way.

How different from a year or so ago. Then we had to send over our engineers to doctor the lines, which were somewhat ragtime.

Cry from the West

ONCE let a locality voice its grievance against the B.B.C. and agitation grows like a forest fire. So it is with the West Country.

Mr. Bigg-Wither sent a stinger into the B.B.C., pointing out that Devon and Cornwall were not getting a square deal—and demanding a better service.

Now, Lady Astor is to lead a deputation to Sir John Reith on the same subject. Capt. F. E. Guest is among the crusaders.

Wait for Droitwich!

ALL such cries from the heart will, in the end, have to wait upon the opening of Droitwich. Until the B.B.C. knows how far the 150-kilowatt giant will service the country with the National programme it cannot commit itself to any further stations.

We agree that the West has a really just grouse. All very difficult, though—with only eleven wavelengths.

Deadening Drama?

BECAUSE they think the Drama Studios at Broadcasting House are too acoustically lively, engineers have now fitted specially treated screens in front of the walls.

Fancy, now. Only .6 second reverberation period—but too much for Drama. Let's hope only the acoustics will be deadened, Mr. Gielgud!

Dem Bells!

NOW that Mr. J. H. Whitley, the chairman of the B.B.C. governors, is back from his trip abroad, perhaps he will pass judgment on Bow Bells, which he left as a suggestion for an interval signal.

Listeners, as usual, are divided. Some hate dem bells, others love them. We reiterate our own thoughts on the subject. *Cut out the intervals and then the signals problem will disappear.*

Ad Nauseum

BY the way, did you know that an engineer in the London Control Room can automatically bring the Bow Bells record into circuit when needed? He just presses a knob and the electric turntable starts up.

If the interval is very long and the pick-up reaches the end of the record it automatically returns to the beginning again.

And so on!

Many people paused in the Strand last week to glance at the attractive K.B. set in Queensland walnut to be presented to the Duchess of York by the Queensland Government and Kolster-Brandes, Ltd.

For Film Fans

EARLY in the autumn our John Watt will start a new series of popular broadcasts that should add still further to his good name and fame.

He is going to give us "Songs from the Films," featuring all the latest and past theme songs. Ought to be diverting!

"In Town To-night"

NO more popular feature has been introduced by Eric Maschwitz than the "In Town To-night" broadcasts on Saturday nights. Curiously enough, that is why Eric is going to end them in the middle of next month.

This is his avowed policy. When he hits on a good thing, he takes it off before its attraction wanes. But he will bring "In Town To-night" back in the autumn, he says.

Non-stop Musical

FROM Vienna will come Herr Buerger, who will soon be arranging a non-stop musical show for the B.B.C.

It will be called *Holiday in Europe*—and will smack of the Continent.

Here's How!

THIS London show will come to the London studios on May 21, when June, but *not* George Robey, will broadcast with the rest of the cast from the Savile Theatre.

Eric Maschwitz is very keen to tie-up more closely with the film and theatre interests—and *Here's How* is the first result of the new rapprochement.

Dick Sheppard Back

WHILE the popular Rev. Pat McCormick is enjoying a hard-earned holiday, that lovable sky-pilot the Rev. Dick Sheppard will take over the services at St. Martin-in-the-Fields.

Meet the Major!

IN centre pages this week, "The Experimenters" reveal their latest design—the Lucerne Major.

This is a "four" that ought to give a real kick to amateurs—there are no less than *three* tuning knobs to twiddle

There's a Strong Case for the CRYSTAL SET

says GEO. C. SHERRIN

Listening with the crystal set described in AMATEUR WIRELESS *dated March* 31, 1934. *Even with headphones the cost of the complete installation will not exceed* 17s. 6d.

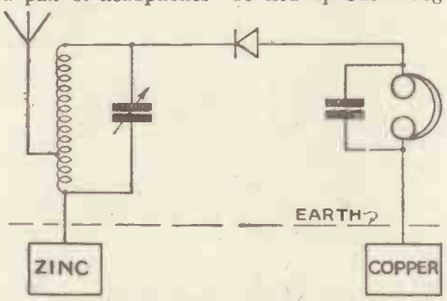
IF one-hundredth part of the ingenuity which has been bestowed upon valve sets and loud-speakers had been given to crystal sets, there would not have been lost to the general public one of the finest and most serviceable broadcast receivers ever invented.

Not only is the crystal receiver neglected, but it has been deliberately ridiculed until it dare not show its face upon the market.

What are the accusations against the crystal set?

Firstly, it cannot work a loud-speaker—but what a blessing!

Secondly, it requires that you should wear a pair of headphones—be tied up like a dog



Using two separate earths to bias a carborundum crystal detector

at the end of a chain—what an absurd analogy!

Thirdly, that it has, or had, in its construction an extraordinary piece of apparatus called the "cat's-whisker" to adjust which required as much patience as to thread a needle, and which at any moment might become unthreaded again.

Upon this last charge no jury could declare otherwise than "guilty."

Fourthly, it is unable to receive anything beyond its local station, and barely that if the station is much over fifty miles away. But surely it is a sufficiently marvellous thing that these invisible broadcasting waves, of which we are not even conscious as we move about, are powerful enough in themselves to be heard in an ordinary pair of telephones without the slightest form of amplification!

Can You Imagine . . . ?

No one is astonished that they become audible after they have been boosted up with three or four valves; but who would imagine that they could be received neat?

But let us see what can be done to clear the crystal set of the charge of having a "cat's-whisker." The cat's-whisker can be, and is, banished for ever by substituting its admirable predecessor, the carborundum detector.

Carborundum is the third hardest material known, and forms a detector when in firm contact with hard steel. Once started, the detector may be relied upon indefinitely, its only enemy being a discharge of lightning through the set, which fuses the steel and crystal together.

The reason why carborundum in the early days gave place to the cat's whisker was that carborundum requires a small battery to bring the detector up to its greatest efficiency, and the battery requires a potentiometer to control the current. When, therefore, the doctors realised the extent to which complications had set in, the case was given up, and the patient died.

But the battery and potentiometer trouble are easily overcome. All that is necessary is to earth the aerial-tuning coil to a zinc earth and to earth the headphones return to an independent copper earth. The system has been published several times.

The zinc and copper earths produce a pressure of about .5 volt across the detector, which does all that the battery and potentiometer did before. After eight years' test these double earths have proved to be constant.

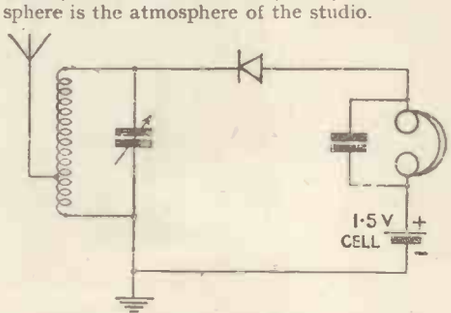
In towns, however, where it is not possible to sink earth tubes, a compromise can be made by inserting a small discharged battery cell in series in the headphones return wire.

So much for the cat's-whisker. What about the crystal set's inability to work a loud-speaker? The writer, while advocating crystal reception, has no prejudice against loud-speakers; the two systems should be considered as *supplementary to one another*.

The weak point of the loud-speaker, however, is that when, in deference to the feelings of others, it cannot be used, the entire household is entirely cut off from the benefit of the broadcasting service, a thing which to anyone who is accustomed to having his headphones continuously working and ready at his side is absolutely unthinkable.

As regards the use of headphones, a good pair of phones, when properly adjusted, especially as to the amount of pressure they should exert on the ears, is no more detrimental to comfort than a properly adjusted pair of spectacles. It is true we should not wear spectacles if we could see perfectly without them, which brings us to an aspect of the crystal receiver which is of the first importance.

With any good pair of headphones the question of quality of tone is absolutely forgotten: they put the listener right into the studio, voices become real voices, the atmosphere is the atmosphere of the studio.



Inserting an old grid cell in the return headphone lead for crystal bias

There is no background; background does not occur to one's mind, still less are there magnified atmospherics, like pistol shots, nor the drumming of valves, nor is the listener kept on tenterhooks lest the reception should suddenly distort. These things cannot happen with crystal and headphones.

Loud-speakers—and Loud-speakers

Of course, there are many loud-speakers which give excellent reproduction; there are also many which do not. There are some which cause their owners the greatest pride and satisfaction, but which cause their sensitive neighbours the utmost misery.

By all means turn on the jazz bands for your friends to dance to: fill your room with the Queen's Hall concerts for the enjoyment of your musical friends, but do not ask them to drink soup to the accompaniment of his lordship, the Bishop, preaching upon the subject of righteousness, nor yet drown with tea-time music their attempts at intelligent conversation.

In my opinion there must be hundreds of people who are tired of the trouble which a valve set causes them—the renewal of parts, re-charging batteries, calling in wireless agents to put the set right when it fails to function. In other words, there is a demand for a foolproof receiver.

Several controversial points are raised in this article, and the Editor invites opinions from readers who are interested in the subject.

The crystal receiver is eminently foolproof. It does not require even to be switched on. Design it properly, instal it with the same thoroughness as the electric light, start it working, and it may be left working for years, or until the B.B.C. changes the wavelength or until the headphone leads are worn out.

And the cost is nothing per year beyond the licence.

One More Point to be Urged

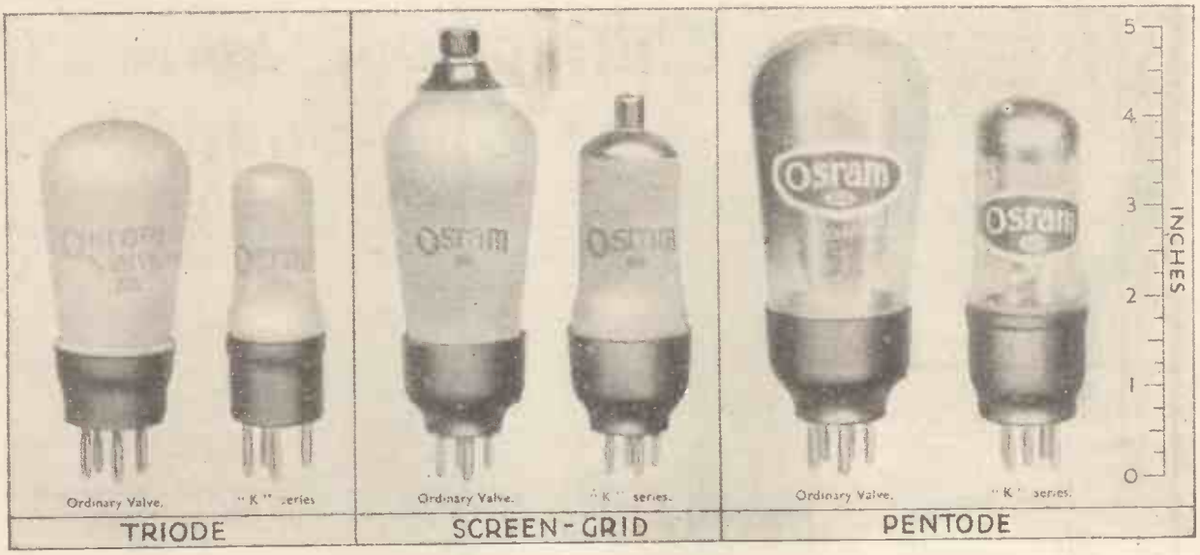
There is one more point to be urged for crystal reception. We are grateful to the B.B.C. for alternative programmes, but its benefit is greatly diminished when members of a household are not all of the same brow, but some high and some low.

With partial duplication in the installation, the set and the aerial, it is possible to have both programmes laid on so that each listener may have the programme of his choice.

To sum up, therefore: Although the crystal sets of ten years ago—many of them, it must be remembered, were made by quite reputable firms—were certainly open to criticism, they were no more *ridiculous* than the early valve sets of the same period.

The fascination produced for the loud-speaker naturally led to the rapid development of the valve sets to the exclusion of crystal sets, a perfectly natural phase, but that the crystal set is therefore a form of receiver to be ridiculed or to be ashamed of merely shows that its wonderful accuracy of reproduction, its simplicity and reliability, to say nothing of its low running cost, have either never been understood or have been forgotten.

From this picture you can see how the new K series of valves compare in size with corresponding types in the ordinary range of battery valves



Battery Catkins at Last!

Small-size K Valves with Very Rigid Electrode Construction

EVER since the famous Catkin series of mains valves was brought out we have waited for similar advantages in battery valves. And now the Marconi Osram Valve Co., Ltd., has done it—has produced what will be known to you very soon as the K series, in both the Osram and the Marconi ranges.

Essential Catkin Features

Except for the air-cooled metal anode, all the essential features of Catkin construction are included in K valves. With battery filaments there is no special need for the air cooling of the anode, as the heat generated is very much less than in mains valves. For this reason a glass bulb is used for the external envelope.

Even so, the K valves are smaller in size than the ordinary battery types—though they must not be confused in any way with the *midget* valves recently introduced by the same people.

No, these K valves are similar in characteristics to the established battery valves, their great merits lying in the special form of Catkin construction—imparting exceptional electrode rigidity and uniformity of production.

From the diagram you will see the main features of the K-type construction. Note especially that the pinch of the glass valve, to which the electrodes are normally joined by numerous welds, has been replaced by a special clamped joint made of stamped steel and mica pieces.

New Circular Seal

A new type of circular seal is used, ensuring maximum distance between the lead-out wires. Improved insulation results, as well as the elimination of strain on the glass. Bends and welds in the electrode-support system are also avoided.

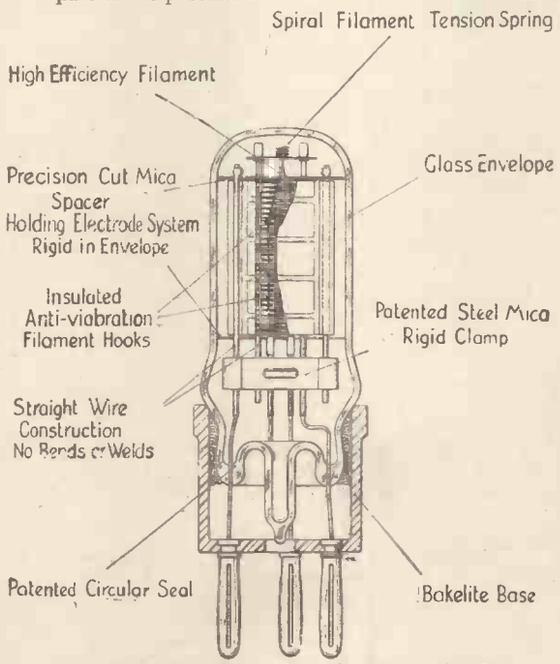
Each electrode is rigidly anchored, not only with respect to the rest of the electrodes, but with respect to the glass container. This is done with accurately stamped and spaced mica pieces.

As a result of this construction, many advantages are claimed. For one thing, the size of the valves is reduced—as you can see by comparing the three new K valves with equivalent valves in the ordinary range.

For small sets and for portables, where size of everything needs to be kept down as much as possible, the K valves offer obvious advantages.

Perhaps the most important single advantage, though, is the possibility of making the range really *uniform* as between valve and valve. Consistency of valve characteristics must inevitably lead to more reliable sets—both home-made and factory built.

Thanks to the abolition of a large number of welds in the electrode assembly, K valves should enjoy exceptional robustness. This is a point that has a special attraction to set makers, as they can send out sets with the valves already in position, thus saving a lot of packing on their part and trouble on the part of the purchaser.



How the Catkin rigid electrode construction has been applied to the K valves for battery operation

Absence of microphonic noises, so great an advantage of the original mains Catkins, is also a feature of the K valves. By the utilisation of straight support wires and the rigid electrode mounting the makers have practically wiped out all chance of any relative movement between the component parts of the valve.

Absence of Microphonicity

Complete absence of microphonicity is claimed, so that the K valves could be worked in a confined space inside the receiver without the development of sound coupling interference.

These K valves can be obtained with the standard four- or five-pin base, according to type. Also the detector and screen-grid types can be had with either plain or metallised bulbs. In the 4-pin base type the metallising is connected to one of the filament pins.

For a start, the K series is limited to three types, but these are of such widespread application that many sets could be made up right away.

First, we have the VS24/K. This is a variable-mu screen-grid valve, intended mainly as a high-frequency amplifier with variable grid-bias control. It can also be used as an intermediate-frequency valve in a super-het.

The filament current is .15 ampere at 2 volts. The anode volts are 150 and the screen grid volts 75. The maximum mutual conductance is 1.5 milliamperes per volt.

Small Anode Current

With 120 to 150 volts high tension, 75 volts on the screen and 1.5 volts negative on the grid, the approximate anode current varies from 2 to 2.3 milliamperes, while the screen current under these conditions is .1 to .3 milliamperes.

Now for the detector valve in the K series. This is known as the HL2/K. It is a high-efficiency triode, for use as a normal detector or as a first-stage of low-frequency amplification.

Filament current is .1 ampere at 2 volts. Anode volts, 150, at which the anode current is 1.8 milliamperes with 3 volts negative on the grid. At 120

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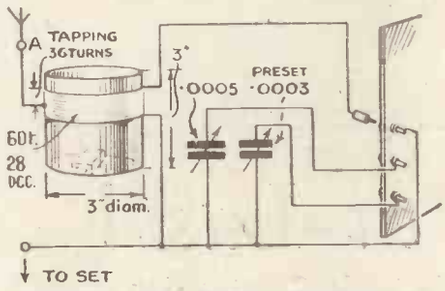
Cutting Out That Second-channel Whistle

By the AMATEUR WIRELESS Technical Staff

Front view of second-channel whistle filter for use with super-het receivers



Theoretical circuit of the whistle filter—which can also be used as a wavetrap

IF you have built or own a relatively simple type of super-het set, with only one stage of tuning in front of the detector-oscillator arrangement, this little unit will help you to cut out second-channel whistles.

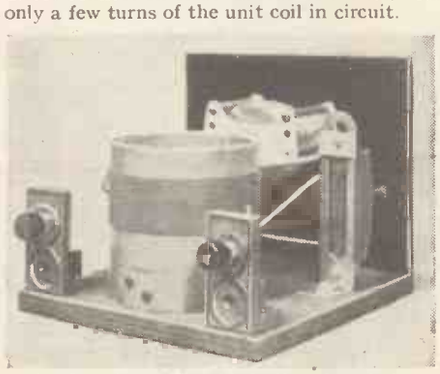
You know the sort of thing that happens. Due to poor selectivity at the input, enough energy from a station out-of-tune trickles through and causes a heterodyne with the station wanted.

This trouble can only be cured really satisfactorily by increasing the selectivity at the input. But with many sets there is not sufficient room to take any further components. Besides, the whole design probably will not permit the internal addition of any components.

Tuned Circuit—with Refinements

So we have to fall back on a unit. Here, then, is the unit to do the trick. Its construction is very simple and cheap, as you will gather from the illustrations. Just a variably tuned circuit—with one or two little refinements to add to its utility.

The basic parts consist of a home-made tuning coil and the usual .0005-microfarad tuning condenser. There is an alternative condenser for tuning—a .0003-microfarad preset type. A plug and three sockets provide the alternative connection to the tuning coil of either the main tuning condenser or the preset condenser. The first socket gives a direct connection of aerial lead to the set, with only a few turns of the unit coil in circuit.



Another view of the whistle filter described on this page

As you can see from the circuit diagram, there is a tapped coil, with the aerial taken to the tapping. The lower end of the winding then goes to the aerial terminal of the super-het. You can leave these two connections in place once the unit has been installed, getting your alternative connections simply by plugging-in to the appropriate socket on the panel.

The .0005-microfarad tuning condenser is connected in parallel with the whole of the coil. Actually one end goes to the tuning coil and the other terminal to the top socket on the panel. The lower socket goes to one terminal of the preset, while the remaining preset terminal goes to the aerial-of-set terminal. The third socket goes also to this terminal—that is the bottom socket.

The end of the coil remote from the tapping point is taken to a short length of flexible wire, which projects through a hole in the panel to the little plug—just to the left of the sockets.

The condenser is mounted in the usual way on the panel, while the preset is mounted on a short metal bracket, with a hole in the panel taking the extension handle for operation.

The terminals for the aerial lead and the lead from the unit to the set are conveniently mounted at the back of the little baseboard.

To make the tuning coil for this unit is quite easy. You need a 3-in. diameter Paxolin former of any convenient length—our coil former is 3 in. On this is wound 60 turns of No. 28 gauge D.C.C. wire, making a total length of winding of about 1⅛ in. A tapping is made at the 36th turn—note that the twenty-four turns must come between the aerial-lead terminal and the terminal that goes to the aerial terminal of the set—to the lower end of the winding as depicted in the theoretical diagram.

From the completed unit you can obtain three separate connections. Top; direct aerial-to-set connection. Middle; parallel .0005-microfarad tuning condenser. Bottom; parallel .0003-microfarad preset.

For the elimination of just one persistent whistle, as on the local station, you can make use of the preset condenser. Adjust it until the whistle is cleared and then lock it at that.

Should you wish to explore the rest of the waveband you can pull out the plug from the bottom socket and put it into the centre socket, thus bringing into circuit the .0005-microfarad condenser, which can be rotated at will to eliminate whistles as you go round the dial—a variable whistle eliminator for every station troubled by second-channel interference.

Note that the unit acts not only as a whistle filter but as a wavetrap. You must be careful not to tune out the wanted station as you rotate the knob to tune out the whistle.

As a matter of fact, apart from its use as a whistle eliminator, both on medium- and on long-wave stations, this unit will serve as a very efficient wavetrap, and can be used as such with straight or super-het sets.

Use as a Wavetrap

Simply rotate the knob until the unwanted station is cut out, or at least reduced in strength. The best procedure is to tune in the unwanted station at full strength on the set, with the plug in the top socket so that the unit is for the moment inoperative. Then plug into either of the other sockets and tune the condenser in circuit until the station is cut out or subdued. After that you can explore the waveband without interference from the unwanted station.

Always remember that a wavetrap confers selectivity only at one point. It eliminates or cuts down the signals from an unwanted station, but cannot increase or affect the overall selectivity of the set's tuning circuits at other settings of the set's condenser dials.

If you want slightly sharper tuning on the unit, for either of the functions explained, you can lower the tap on the coil, so that, say, only twenty turns are included between the aerial tap and the aerial terminal end of the coil.

There is an extension control on the vertically-mounted preset condenser

Battery Catkins at Last!

Continued from preceding page

volts the anode current is 2 milliamperes with 1.5 volts grid bias.

This valve has an impedance of 18,000 ohms and a mutual conductance of 1.5 milliamperes per volt.

Finally, there is the PT2/K, the pentode in the K series. This is suitable for any output stage where a maximum power of not more than 400 milliwatts is wanted. Or it can be used in Q.P.P. circuits, where up to 1,000 milliwatts output can be obtained.

Filament current is .2 ampere at 2 volts. Anode and screen take 150 volts maximum. The mutual conductance is 2.5 milliamperes per volt.

With the maximum anode and screen voltages applied, the PT2/K takes an approximate anode current of 9.5 milliamperes when the grid bias is 4.5 volts, while the screen current is 2 milliamperes.

Reducing the anode voltage to 120 and the screen to 100 volts, the anode current with 3 volts negative grid bias is 4.5 milliamperes, and the screen current .5 milliampere.

Real-quality Series.—8

Coupling the First and Second Low-frequency Valves

By NOEL BONAVIA-HUNT, M.A.

Is this artist as keen about the quality of reproduction from his set as he is about his painting?

AMATEUR: I hope you are feeling better this evening, Professor.

PROFESSOR: I am not aware that I was ill.

AMATEUR: Well, last time you were a bit "nervy," I thought.

PROFESSOR: Tut, tut! I was merely anxious to get certain truths firmly embedded in your head; and I trust I succeeded.

AMATEUR: Can't say. I know that you made me thoroughly excited.

PROFESSOR: What about?

AMATEUR: That special coupling between the first and second low-frequency valves.

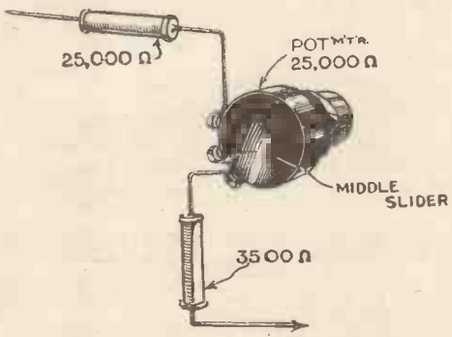


Fig. 1.—Use of three resistances in series, two fixed and one variable

You talked about a spring cleaning.

PROFESSOR: A very appropriate topic, I am sure. I think I tried to show you that the process of amplifying is not all plain sailing, as so many suppose. A point is reached when things become awry. This usually happens after the first low-frequency amplifying valve. If you connect a pair of headphones to the plate and high-tension positive of this particular valve, doubtless the quality of signals appears to be quite reasonably good, though it is not possible to test the frequency response this way.

AMATEUR: Things begin to go wrong after this, then?

A Possible Remedy

PROFESSOR: They do. It's a wicked world. However, we can overcome any tendency in this direction. The great thing is to know that the remedy is needed.

AMATEUR: What precisely have we to do at this stage?

PROFESSOR: On the anode of the first valve we have to place a dual circuit, instead of the usual single circuit. It is customary to employ either a resistance or a coil winding of some sort here, but the trouble is that whatever size is adopted the result comes out wrong. And it is not possible to effect a compromise.

For instance, you can try a resistance of any value you like, from 5,000 up to 500,000 ohms or more, and the result will be that either the bass or the treble response will suffer. The same applies to the use of choke windings, whatever the inductance tried.

AMATEUR: I don't quite follow what you mean by a dual circuit here.

PROFESSOR: I mean that we must provide for both high and low notes. The only satisfactory method of doing this is to have two sub-circuits, one for each, which together form a dual circuit. Two sets of resistances in series with one another, of different values, one for the low notes and the other for the high, will give us what we want.

AMATEUR: Will it? Why should the low and high notes be in each case provided for in this way? I mean, suppose we have two resistances in series and join them together, why not employ one big resistance equal in value to the two combined?

PROFESSOR: I haven't finished the circuit yet. The two resistances I have mentioned must be both joined together and separated. When I say separated, I mean sufficiently so to enable the low notes to be reproduced by the one and the high notes by the other.

This arrangement amounts to two "pockets" of wave-oscillation, or wave-pockets, connected in series on the plate of the valve. As a matter of fact, there must, in the nature of things, be a certain amount of overlap between the two pockets, but it is possible to prevent the overlap from seriously affecting the result desired.

All one has to do is to shunt one of the resistances with a condenser, leaving the other one without any condenser at all. The shunted resistance can be made to pass the lower portion of the musical band of frequencies while the other can be left to deal with the upper portion.

AMATEUR: This is very interesting. The actual values of the resistances are important of course?

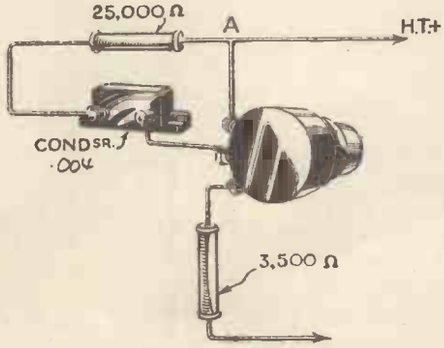


Fig. 2.—Addition of a .004-microfarad by-pass condenser to give mutual balance

PROFESSOR: Yes, very. They must be carefully chosen. The larger one is connected on the high-tension positive end of the circuit, and the smaller one in series with it. The bottom end is connected to the plate of the valve. But, as you say, this is merely connecting a couple of resistances in series, so that our little arrangement cannot stop like this.

What we have to do is to connect three resistances in series; namely, a couple of 25,000-ohm resistances and a 3,500-ohm resistance. The second, or middle, resistance must take the form of a potentiometer. This, as you know, has three terminals. The two 25,000-ohm resistances have to be so treated that they are separated from the 3,500-ohm resistance; at least, in part.

Actual Circuit Arrangement

However, it is very difficult to explain the circuit in so many words, so I will proceed to make a sketch of it. (*See Fig.* 1). Notice, in particular, that the high-tension positive lead is joined to the point where the two 25,000-ohm resistances are connected to each other (*see* A *in Fig.* 2).

Now here (*Fig.* 2) you will see that I have added a fixed condenser of .004 microfarad in parallel with a portion of the potentiometer; in other words, between the top terminal and the middle terminal. This arrangement makes it possible to vary to a small extent the amount of resistance shunted by the condenser, and at the same time alters the amount of unshunted resistance below.

Thus we can adjust the mutual balance between the shunted and unshunted portions of the anode resistance.

AMATEUR: This is all quite clear. What is the point of being able to make these small adjustments?

PROFESSOR: The unshunted portion of the resistance traps the high notes more especially in that part of the musical spectrum in which the "formant bands" are situated. I can assure you that this trapping of the formant bands in the amplifier itself is perhaps the most important discovery associated with low-

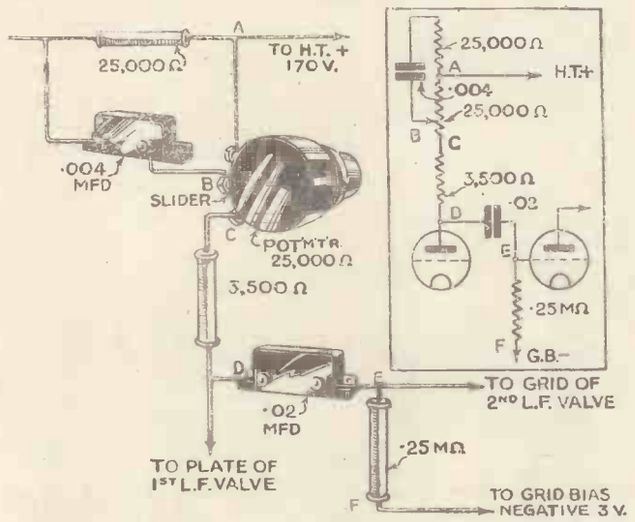


Fig. 3.—Complete circuit of the low-frequency coupling recommended by Noel Bonavia-Hunt

frequency amplification that has been made in the last year or so.

It completely solves one of the most obstinate and trying problems ever brought before the designer of wireless amplifiers. Prior to this momentous discovery, it has been impossible to prevent the low and high registers from overlapping to such an extent that no clearly defined outline was possible in the reproduction of massed combinations of sounds. All the well-known forms of coupling failed in this respect.

Provision for Middle and Low Notes

In the coupling system we are now discussing the low notes and middle notes are provided for in the shunted portion of the anode resistance, while the notes above 500 cycles are provided for in the unshunted portion. There is, of course, a certain degree of overlap, but the intersection is not serious and does not destroy the formation of the two separate wave-pockets.

It is, however, desirable to have some control of this line of intersection, and that is why I have introduced the variable shunt (*see Fig.* 2).

AMATEUR: Really, all this is most thrilling and wonderful. What about the rest of the coupling unit?

PROFESSOR: The next thing is to introduce the usual coupling condenser, which in this case may be .02 microfarad. One made with mica dielectric is advised. Then a grid leak of .25 megohm completes the coupler. Here it is, all drawn out (*Fig.* 3).

AMATEUR: What sort of response curve does this give?

"Spring-cleaning" Effect

PROFESSOR: A rise at each end of the spectrum with a slight droop in the middle. It is this curve that represents the "spring-cleaning" effect I referred to. As we proceed to increase the amplification of the rectified signals the curve tends to "hump" at one particular portion of the frequency spectrum, usually in the lower or the upper middle register, in accordance with the type of coupling adopted.

The choice of valves is also important in this connection. But if we introduce our "clarifying circuit" the registers get properly sorted out, and with a carefully designed third-stage coupling to follow it, the beneficial effect of this clarifying stage is successfully maintained up to the last valve.

AMATEUR: You mentioned just now the question of the choice of valves. What are the most suitable valves to use in the first and second stages of the low-frequency amplifier we are designing?

PROFESSOR: You are referring to the first and second low-frequency valves?

AMATEUR: Yes.

PROFESSOR: Well, we must not forget that the first low-frequency valve becomes the detector when we switch over to leaky-grid rectification. The next valve can only be decided upon in conjunction with the next coupling stage, and this we cannot discuss till next week.

The first valve, which may be either a detector or the first low-frequency amplifying valve, according to the switching arrangement, must have a fairly high amplification factor. We shall do well to avoid too high or too low an amplification factor, while the internal impedance should be not much more than two-thirds of the external resistance in the anode circuit.

Now the external resistance is 28,500 ohms, so that a valve having an internal impedance of 12,000 to 20,000 ohms will work satisfactorily in this position.

AMATEUR: Perhaps you wouldn't mind giving me a list of valves by different makers which would be suitable.

PROFESSOR: Certainly. Here is such a list:—

Marconi HL2, L210.
Mullard PM1HL, PM2DX.
Osram HL2, L210.
Mazda HL210, HL2.
Six-Sixty SS210HL.
Cossor 210HF, 210DET, 210LF.
Micromesh HLB1.
Lissen HL2.
Hivac H210, D210.
Triotron SD2.
Tungsram HR210, L210.
Eta BY1815.
Dario TB282.

AMATEUR: There seem to be two classes of valve in this list. Which of them am I to select?

PROFESSOR: It depends on the amount of amplification you require. If your rectified signals are apt to overload the higher amplification valve, then a slightly lower one is indicated. As a matter of fact, I do not think it matters very much which class you choose, as there is always the volume control to fall back on.

Generally speaking, the L210 type is quite satisfactory with 170 volts high tension (*applied to the point marked* A *in Fig.* 3). The grid-bias negative will be 3 volts maximum.

AMATEUR: What type of resistance is required for the 3,500-ohm and the 25,000-ohm ones respectively?

PROFESSOR: Here is a complete list of the components forming the coupling unit in this second stage —

Potentiometer, 25,000 ohms (Varley CP64).

Fixed resistance, 25,000 ohms (Varley CP202, Dubilier 2 watt, Erie, Bulgin, etc.).

Ditto, 3,500 ohms.

Grid leak, .25 megohm (Dubilier, Graham-Farish, etc.).

Condenser, .004 microfarad (T.C.C., Dubilier, mica, non-inductive).

Ditto, .02 microfarad (ditto, working volts 250).

AMATEUR: What is the point of choosing the Varley CP64 potentiometer?

Watching the Slider

PROFESSOR: Just this, that you can see the slider as it moves along the surface of the resistance bobbin; and therefore can tell at what precise point *off the centre* the particular tapping works best.

AMATEUR: I see. Supposing I were able to use A.C. mains valves, which valve do you recommend in this stage?

PROFESSOR: The Marconi or Osram MHL4 type of valve. This exactly suits the coupling we have discussed.

AMATEUR: I have heard it stated that a grid leak in the low-frequency amplifier is bad, because the signals are not so apt to leak off at the same rate as when a choke coil is used in this position. Is this true?

NEXT WEEK!

A PORTABLE for HIKERS.—Full constructional details of a simple, inexpensive attache-case set that gives good headphone reception with a small aerial. A set that really can be carried about!

OPERATING the LUCERNE MAJOR.—"The Experimenters" will have some more to say about their latest set and tell you how to get the best possible results.

REAL-QUALITY SERIES.—Next week Noel Bonavia-Hunt will take you a step further on the road to quality and discuss the coupling of the second low-frequency and output valves.

Electrode arrangement of Mullard PM1HL valve

PROFESSOR: It is quite true in the case of pure resistance coupling. A grid resistance of more than 50,000 ohms certainly introduces what is called a sluggish time-constant. But in our particular amplifier we can afford to use a .25-megohm leak in view of the rapid time-constant of the other circuits of the amplifier I have outlined.

The transients are so realistic that you need have no fear of the results from this point of view.

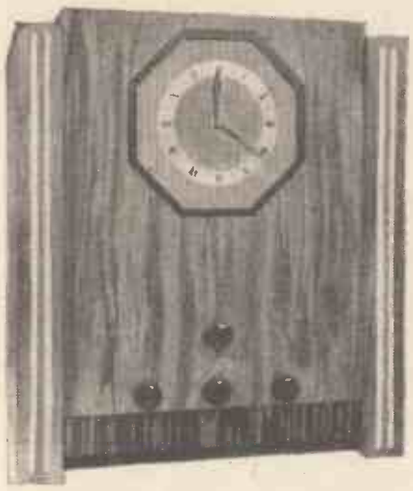
AMATEUR: Is it bad to introduce two grid leaks, that is one in each of the stages of the amplifier?

PROFESSOR: It is very bad indeed. The grid circuit of the succeeding stage must consist of a choke or auto-transformer winding. But we must not discuss this stage to-night.

Having completed our second stage in the low-frequency amplifier, and having introduced a really important coupling unit, which is actually quite an inexpensive one to make up, I think we may call a halt on our little discussion with a keen anticipation of further good things to come at our next interview.

We Want Your Opinion of the PENTA-QUESTER!

Remarkable Response to Our Offer of Free Full-size Blueprints



Clock-face tuning, as you can see from this photograph, is an outstanding feature of the Penter-quester's control

THOUSANDS, literally thousands, of blueprints of the Penta-quester have now been sent to AMATEUR WIRELESS readers. Sent because you readers have responded to our invitation.

We offered to send you a full-size blueprint of the Penta-quester, which normally would cost you 1s., absolutely free of charge. You have responded, as we say, in your thousands.

We hoped you would do that. Some of us went so far as to say that we *knew* you would.

Now, it is obvious that you did not write for these blueprints just for the fun of the thing. No, you are intending constructors of the Penta-quester—which, we hope, you have appreciated as an outstanding three.

In that you are right. It is probably the hottest three in radio history. Its three pentodes give great pep at high frequency, at detection, and at the class-B output.

Very well, then. Assuming that thousands of Penta-questers will shortly come into existence, what then? Our *interest will continue.* You will hear more of the Penta-quester—in developments that will interest a large section of readers.

PENTA-QUESTER FEATURES

April 14

April 21

April 28

A limited number of copies of the above issues of "Amateur Wireless" are available from the Publisher at 58/61 Fetter Lane, London, E.C.4, for 4d. each, post paid.

We want to know just how you are getting along with your Penta-quester. Just as we welcomed your requests for blueprints, which we were pleased to send to you free of charge, so we more than welcome your personal experiences with the Penta-quester.

If you follow our instructions, as fully laid down in the April 14 issue of AMATEUR WIRELESS, there is no reason why you should not produce a working model equal in every respect to our original Penta-quester.

As you know, our model has been tested in various parts of the country. In Yorkshire, in Surrey, in Essex, and in Sussex.

Each test has produced unstinted praise.

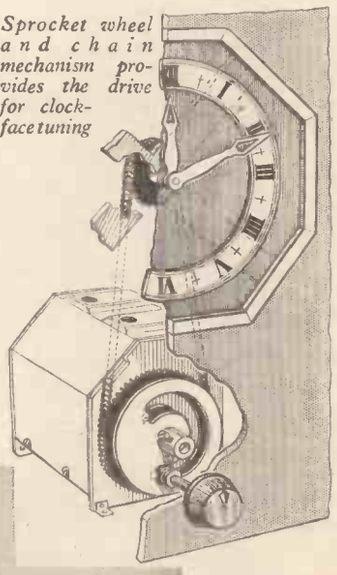
Each county in which the Penta-quester has been tested seems to have been an ideal reception spot—yet obviously the truth is that conditions have varied enormously.

What has been constant over all these tests has been the great *staying power* of the Penta-quester. It is not like an ordinary straight three with definite limitations. Because of its *balanced triple-pentode circuit* it is capable of bringing in the stations no matter how poor are the reception conditions.

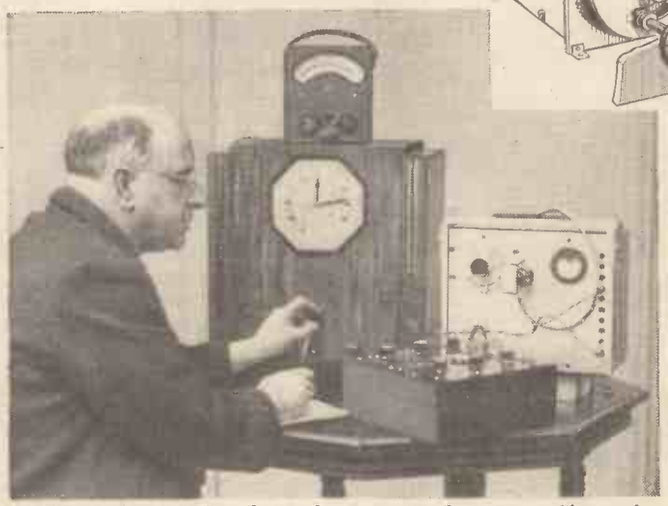
Essex, for example, is by no means an ideal spot for wireless. Nor, for that matter, are the South Downs in Sussex. But both these locations yielded first-class reports—as you will have seen from previous issues of AMATEUR WIRELESS.

While you, in your thousands, are building the Penta-quester, we want these reports from many quarters to re-assure you that you are building something that is going to readjust your ideas on what can be done with three valves.

From that blueprint you will see that there is nothing very difficult in the construction. You are confronted with the assembly of a *wood chassis* set, a set making the most of the chassis principle without any of the drawbacks of working in metal.



Sprocket wheel and chain mechanism provides the drive for clock-face tuning



No set of recent times has undergone more vigorous or widespread tests than the Penter-quester. Here is the original model in the middle of its Cornish tests. Plenty of meters, aren't there?

We do stress this point because it is one of the big features of the Penta-quester's design. The top part of the chassis is quite Spartan in its simplicity. Just the two-gang condenser, the three valve holders, and the pick-up terminal block—everything else is sub-chassis. When you turn the chassis upside down the layout of the components is not a hopeless jumble but quite a straightforward layout of coils, chokes, and so on.

Simple Wiring

With our free blueprint, which is a *full-size* layout of the components and wiring, you can proceed with every assurance. The wiring is particularly simple if you take each lead in turn as numbered on the blueprint.

Look for the lead marked No. 1 and make that in your own model. Then cross off that lead from the blueprint and proceed with lead No. 2. Carry on in this way, transferring the blueprint instructions lead by lead on to your model, until you come to wire No. 60. That is the last wire, and when you have made that you have finished the wiring.

What a comfort to know that, having followed the blueprint sequence, there are no wires left out and no extra wires put in.

When you have built your Penta-quester you will find it an easy set to tune. There is only one knob to operate, stations being logged on the patent clock-face tuning arrangement inset into the loud-speaker fret.

With the hour hand set at 12 o'clock the minute hand turns around the clock face as the capacity of the tuning is varied. Thus a 180-degree variation is interpreted by the clock face dial as a 360-degree variation providing you with a singularly open scale that is very easy to read.

Volume controlling is also simple, but do not forget that it also has a very important function in controlling the selectivity. For maximum station separation you should keep this volume control down to a medium setting, making up the output volume with the reaction.

Don't forget to make use of the tone control at the back of the chassis. It cuts down the top if you like a more mellow tone. Also those chromium bars are meant to be used. With them you certainly ought to be able to bring in your locals at good strength.

Well, that's our side of the story. But the whole story of the Penta-quester cannot be completed without *you*. Build up this hottest of all threes—we want your opinion!

On Your Wavelength

By Thermion

Eighteen O'clock News

IT seems rather queer nowadays to look out for our news bulletins at eighteen o'clock and twenty-one o'clock. I expect, though, we'll soon get used to the twenty-four-hour clock arrangement, which has a whole lot in its favour. You cannot, for instance, possibly mix up an a.m. and a p.m. hour.

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"Endeavour's" Wireless

THE racing yacht *Endeavour*, in which Mr. T. O. M. Sopwith is going to try to wrest the America's Cup from the U.S.A., is being fitted with wireless for her voyage across the Atlantic. One of the difficulties in the path of the challenger is that she has to cross the Atlantic under her own sail.

A three-thousand-mile ocean voyage is not exactly a joke in a small racing boat, and the provision of wireless will be a great boon, since it will enable her crew to keep in touch with both ships and shore stations. I don't yet know what wavelength the *Endeavour* is going to use during her ocean trip, but I expect that when she sails keen amateurs will be on the look out for signals.

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Fluid-light Tuning

THE new fluid-light scheme devised by H.M.V. and Columbia for their latest superhets is an excellent idea. With a superhet, particularly one with self-adjusting volume control, you do want something to tell you when you have reached the point of exact resonance, and that is just what the fluid light does.

Of course, the light isn't really fluid, though it gives you that impression. Behind a small escutcheon is a glass tube containing an illuminated green column, which reminds you rather of a thermometer. As you turn the tuning knob the column of light shortens and lengthens, being at its longest when exact resonance is obtained.

It actually works by means of a moving-iron milliammeter in the plate circuit of the intermediate frequency valve. Attached to the pointer of the instrument is a shutter whose movements cause an apparent expansion or contraction of the green column. Clever, isn't it?

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Summer Wireless

NOW that we have gone over to daylight-saving time, or British Summer Time as it is officially known, the wireless summer season may be said to have begun. There used to be an idea that the summer wasn't much good for wireless, but I don't think that many people believe that now.

With all the high-power stations that are available to-day, we shall probably be able to rely on from a dozen to a score of genuine alternative programmes at any time during broadcasting hours right away through the summer months.

Better Daylight Reception

IT is quite possible that not a few of the Continental stations may be better and better heard as the evenings draw out. I am thinking particularly of those near the bottom of the medium waveband, such as Radio Normandie, Nurnberg, Frankfurt, and Trieste.

If you tune-in Radio Normandie at 10 o'clock in the morning you will find the station positively roaring in and rock steady. After dark—at, say, 22 o'clock (got that?)—it may be fading badly.

In a few weeks it will be quite light at that time, but it seems likely that the transmission may continue to come in without any wobbling or wavering.

Another point about summer-time reception is that lots of the heterodynes, due to small stations working off their wavelengths, disappear. And so it happens that in summer you can often receive clearly and well a big station which in winter time had an accompanying whistle, due to some pestilential little fellow.

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Realistic Antarctic Reception

A READER who saw my note on the reception of Byrd tells of an amusing experience. It may have been due to the vivid description of what it means to live at from 20 to 40 degrees below zero, or possibly to the background of "atmospherics"—which sounded worse than the fiercest blizzards—but whatever it was the reader's hostess suddenly announced that she felt a "deadly" cold coming from the radio set.

This naturally raised a superior grin from the owner of the set, but his wife, walking over to the speaker, declared that she could distinctly feel a stream of cold air coming from it. It was said so convincingly that her husband, somewhat sheepishly, went over to try the effect. His sudden change of expression was definitely dramatic.

They all started to crowd around this latest "wireless marvel," when the son of the house solved the mystery. A casement window had quietly blown open—behind its curtain—and was letting into the room quite a tolerable imitation of an arctic—or antarctic—draught.

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Diodes for Ultra-shorts

LIKE a lot of other old-timers, the diode valve seems to be coming back into fashion. It is building-up a fresh reputation as a quality detector, and is also coming very much to the fore in all the modern schemes for delayed and amplified A.V.C.

Its latest appearance is as a short-wave generator for producing ultra-short waves of the order of centimetres. In one newcomer there are no less than 4 filaments spaced evenly around a central anode—but no grid, the waves being generated by the "dancing" movements of the electron stream inside the glass bulb.

Photopress photo

Will sets of this Lilliputian size become general now that midget valves have come on the market?

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Broadcast "Flops"

THOUGH I am not going to name any names, we have had some pretty awful variety items lately in the home programmes. As you know, I have already held that the B.B.C. programmes were pretty good, taken all round, and I am not one of those who are continually searching for bricks to heave at the Corporation.

I do feel, though, that variety is its weakest department at present, and I cannot, for the life of me, see why this should be so. There is an enormous demand among listeners for broadcasts of this kind, and the B.B.C. has so much money to spend that it should have no difficulty in securing the services of the best of artists.

I know that it is not all plain sailing. The chappie who brings down the house in a music-hall, where the audience sees him in the flesh, may be of little more use than the proverbial sick headache when it comes to microphone work. Still, I really cannot understand why some of the recent variety items were ever passed out after rehearsal as being up to B.B.C. standard.

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Long-wave Folly

ONE of the most amazing instances of international wavelength squabbling is to be found on the long waves at the moment. The Eiffel Tower, which promised a long while ago to close down, is still publishing programmes and announcing its wavelength as 1,395 metres. Motala has been working on 1,389 metres and Warsaw on 1,401 metres.

Marconi photo

This would have meant another broken valve in the old days, but not with this one—it's a Catkin, you see!

Those differences may look fairly substantial in wavelengths, but when we come down to frequencies we find that there is a difference of just 1 kilocycle between the Eiffel Tower and Warsaw, 1 kilocycle between the Eiffel Tower and Motala, and 2 kilocycles between Warsaw and Motala.

During the last few days Motala has dropped down a bit and the Eiffel Tower isn't actually

H.M.V. photo

"It's just the time for dancing"—to the strains of music from the latest super-het. This set has fluid-light tuning!

at work much—in the evenings, at any rate. Still, Motala and Warsaw have been interfering pretty badly with one another.

Neither of these stations, you will remember, agreed to the Lucerne Plan, and at present both are in difficulties simply because they won't come into the scheme. Let's hope that this kind of folly will soon come to an end. There are wavelengths for all under the recently proposed scheme for readjusting the long waves, and squabbles of this kind don't do anybody much good.

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How the Batteries Fare

THE gingering up which the spell of warm weather gave to the depolariser of the 120-volt five-bob batteries continues to show its effects to some extent. These batteries, you may remember, are being run for six hours a day through a fixed resistance, the initial discharge rate having been 7 milliamperes. The test is to last for eleven weeks, since a reader claimed that he had obtained that amount of service from such batteries.

The batteries have now done seven weeks, and here are the figures that they show on the forty-ninth day: Battery A, starting voltage under load 79.2, ending voltage under load 65; Battery B, starting voltage under load 84.4, ending voltage 73.1.

Battery A is now in pretty bad condition, as is shown by the gigantic voltage drop of 14.2 during the day's run. Battery B is only a little better, its fall on the forty-ninth day having been 11.6 volts.

The Big Battery

THE triple-capacity battery which is being run for four hours a day under a nominal 10-milliampere load has now done thirteen weeks. On the ninety-first day its starting voltage under load was 105.6 and it ended four hours later with 99.8.

It is particularly interesting to note that the big battery is still delivering an average of 8½ milliamperes during its four hours, whilst, owing to the low E.M.F. that they have reached, the current taken from the five-bobbers is now only about 4½ milliamperes. Under this very small load they will probably continue to show fairly level voltages for a week or two, but neither of them is really in fit condition now to supply the plate current for a set operating a loud-speaker.

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Is There An Ideal Set?

AT this time of the year, manufacturers are considering their programmes for the coming season. All of them, of course, want to put on the ideal set at the ideal price. Let us see if we can find the kind of thing that we all want—without waking up to find that it is only a beautiful dream.

I believe that the day of the straight set depending mainly on reaction is fast drawing to a close. AMATEUR WIRELESS led the way in showing how the number of valves in a superhet could be cut down to something which a year or two ago would have seemed perfectly absurd. We want superhet selectivity, but we don't want hiss, second channels, or woomphiness. Nor, if the set is battery operated, must running costs be expensive.

There are so many high-power stations nowadays that very great sensitiveness is hardly necessary. Therefore, the number of valves can be kept fairly small in an "economy" set. We are getting on!

We must have self-adjusting volume control, but that does not necessarily mean an extra valve. The Westector is available and it is not expensive. Tone control is also almost essential; to my mind, a superhet without it is a superhet spoilt.

Now, then, can we specify the kind of set that should be on the market next autumn? I think we can. For battery users, a four-valve superhet with S.A.V.C. and tone control, and a high-tension battery of a capacity adequate for giving six months' good service. For the mains man a five-valve superhet, incorporating all the refinements mentioned. Sets of both kinds must be easy to tune and both must have resonance indicators.

And the price? I don't really see why either should cost much more than a £10 note and still be made of good and completely reliable components.

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Jury of Listeners?

UNTIL the applause-meter about which I told you a week or two ago becomes a practical affair, the B.B.C. must always find it hard to discover just what the big body of listeners—and it is a pretty big body nowadays—thinks about the various items of its programmes.

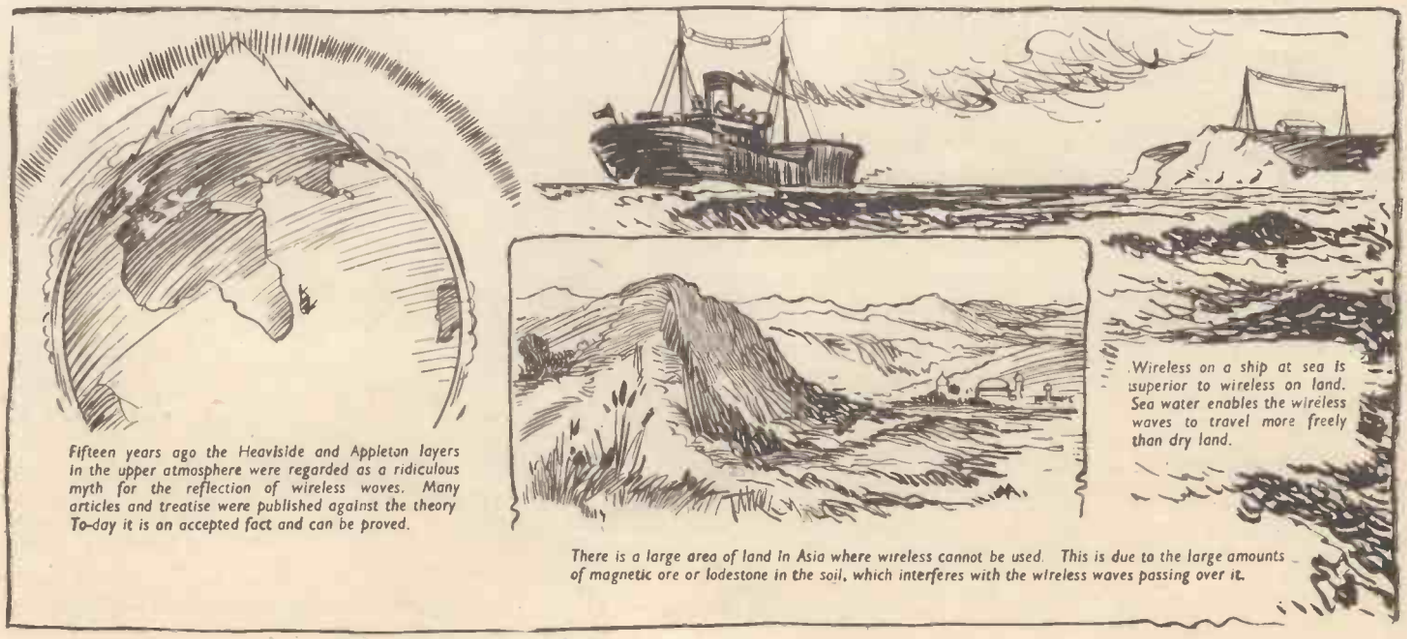
I wonder whether they couldn't submit the proposed items to a kind of jury of listeners before making a final decision to put them into the programmes. It would be no good to make the tests in a studio of the theatre kind, with the jury seeing as well as hearing. Matters would have to be arranged so that the artists were in one room and the jury in another.

Choosing the Jury

HOW would the jury be chosen? That is a bit of a problem, isn't it? You want it to be representative of listeners of all kinds. It would have to be neither too large nor too small. About twenty seems to me a reasonable number. How are you going to find twenty *average* people?

I would suggest that listeners willing to serve on the jury be asked to send in their names, that the letters received be thoroughly mixed, and that twenty be drawn from the pile. In this way you would get a fair sample of normal listeners. I am not proposing a permanent jury. A fresh one might be empanelled for, say, a couple of hours whenever proposed turns were being tried out. What do you think of the idea?

Would You Believe It? . . . . . Asks G. H. DALY



Fifteen years ago the Heaviside and Appleton layers in the upper atmosphere were regarded as a ridiculous myth for the reflection of wireless waves. Many articles and treatise were published against the theory To-day it is an accepted fact and can be proved.

Wireless on a ship at sea is superior to wireless on land. Sea water enables the wireless waves to travel more freely than dry land.

There is a large area of land in Asia where wireless cannot be used. This is due to the large amounts of magnetic ore or lodestone in the soil, which interferes with the wireless waves passing over it.

Two Hours' Adventure with the LUCERNE MAJOR

Results of a Test by Capt. E. H. ROBINSON

THIS gallant little four-valver will be no use to Aunt Matilda. Dear Auntie would be bothered to death with three tuning knobs, a reaction, and a sensitivity control, all of which are intended to be used and must be used if the best is to be got out of a simple but efficient circuit.

This must not be taken to mean that the Lucerne Major is difficult to use. The reverse is the truth. I just mean that it is not a "switch-on-and-the-music-comes" set.

Correct Tuning Method

After about five minutes playing about, I discovered the correct procedure. The aerial-tuning condenser should be set to somewhere near the right place, and then the other tuning knobs can be rotated, more or less in step until the required station is heard.

Then a touch on the fine tuning of one or other circuit and a final adjustment of the aerial circuit will bring in the station. After that, one either uses reaction to bring it up a bit further, or the sensitivity control to reduce volume.

When all the more powerful stations have been logged, searching in between them can be done with the reaction tuner advanced nearly to the oscillating point, which, of course, improves both sensitivity and selectivity. As I have said, five minutes experimenting and a man who is used to knobs knows all about it.

A member of the "A.W." Technical Staff putting the Lucerne Major through its paces

Unfortunately, owing to circumstances beyond my control, I was able to give little more than a couple of hours on a Sunday night to testing this receiver. It happened to be a rather difficult night in my part of the world; but for all that I logged over forty stations on the medium waves and the usual long-wave brigade.

On the long-wave side I found selectivity a little deficient, but this, of course, can be remedied by the recommended procedure with Lucerne coils of removing a few turns from the aerial winding.

I had no time to do this, and after all it didn't much matter because by advancing reaction and reducing selectivity on the bias of the first valve I was able to get all the long-wave stations sufficiently clear of one another for all practical purposes.

There was, of course, the usual mess-up caused by the now out-lawed Eiffel Tower, but no set designer and not the most skilled operator could get over this trouble.

With three separately tuned circuits the problem arises which is the master for calibration purposes. I was at first rather undecided as between the second and third tuners, that is to say the first and second high-frequency coils.

Eventually I fixed on the second high-frequency tuner, that is the third knob counting from the left, and made my initial marks on the tuning chart with Fécamp at 30, London National at 60, Post-Parisien at 80 and London Regional at 95 degrees.

I was lucky enough to strike a silent period in London National almost at the beginning of my tests and got Turin No. 1 at good strength. I immediately tried for Copenhagen, but got, instead, Monte Ceneri. At least, it was not the Copenhagen programme which I heard. Both these stations were swamped when London National started up again.

Higher up the scale I had no difficulty in keeping Scottish National and Bari separate, though Bari was not very strong. Had I been using a few less turns on the aerial coil I don't expect that Poste Parisien would have interfered with Breslau, though I managed to get them quite clear by reducing volume and then bringing it up again a little on the reaction.

It was quite an adventure to be using three tuning knobs again, and took my mind back to the good old days before ganged condensers had been thought of. There is no doubt at all that *separate tuned circuits do enable you to get the last ounce out of a set.* Separate condensers are, as well, considerably cheaper than a ganged assembly.

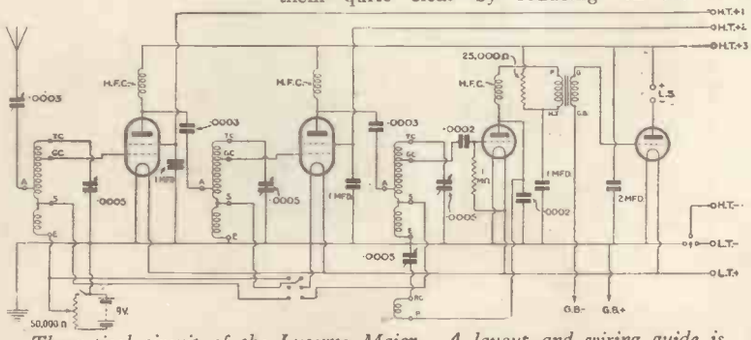
I would not like to put a limit to the number of stations that might be logged by an enthusiast with plenty of time and patience. In the very short time at my disposal I learnt enough to know that I had by no means exhausted the possibilities of the Lucerne Major.

Now a word or two as to the conditions of the test. My station is at Pirbright, nearly half-way between Woking and Aldershot. The aerial is 100 ft. of wire, 40 ft. high, a very severe test for selectivity.

I used 120 volts high tension, with 72 volts on the screen of the first Mullard valve and 63 volts on the screen of the second valve. The screening volt pressures are not exactly critical, but it is as well to change about until you get the best combination. The first valve bias should be 9 volts across the potentiometer

The quality is quite satisfactory when reaction is not pressed, and I had quite good results from a simple moving-iron loud-speaker.

Those who love searching the ether and wish to do so with the smallest possible initial outlay should find this set very much to their liking.



Theoretical circuit of the Lucerne Major. A layout and wiring guide is printed on the inside covers

FULL CONSTRUCTIONAL DETAILS OF THE LUCERNE MAJOR APPEAR IN THE FOLLOWING PAGES AND THERE IS A HALF-SCALE BLUEPRINT ON THE INSIDE COVERS

Log of Stations

(43 medium-wave and 7 long-wavers; *total*, 50.)

Long Waves

Huizen
Radio Paris
Konigswursterhausen
Daventry
Eiffel Tower
Luxembourg
Oslo

Medium Waves

Budapest No. 1
Beromunster (faint)
Athlone
Muhlacker
Vienna
Florence
Brussels No. 1 (faint)
Prague No. 1
Lyons P.T.T.
Langenberg
North Regional
Paris P.T.T.
Stockholm
Rome No. 1
Tallinn (not surely identified)
Munich
Midland Regional
Leipzig
Scottish Regional
Milan
Berlin
Strasbourg
London Regional
Radio Toulouse
Hambourg
Brno
Breslau
Poste Parisien
West Regional
Hilversum
North National
Heilsberg
Bari
Bordeaux
Madona (faint)
Turin
London National
Monte Ceneri (?)
Frankfurt
Trieste
Warsaw No. 2 (faint)
Fecamp
Bordeaux (faint)

For 57/6 You Cannot

Ever since "The Experimenters" announced their intention of producing a set with two screen-grid stages we have been receiving letters and postcards asking when it is coming.

Well, here it is—so you can start right away. A wiring guide appea inside covers, but a full-size blu available for 1s. 6d., post paid; when

Topical photo

WE are playing this week, as always, *to the gallery*. Excuse the phrase. What we mean is that we are appealing to the real backbone of this paper's readerage—to the amateur who loves to fiddle around.

When you have built the Major you will have on hand the sort of set every amateur dreams about—but owing to the need for so often pandering to the family man very seldom seems to get a chance to build.

Right away, family men, don't forget your responsibilities—don't go and build this set, because if you do your non-technical dependents will *not* thank you for putting into their hands a set with no fewer than three tuning controls to twiddle.

A Set for the Fan

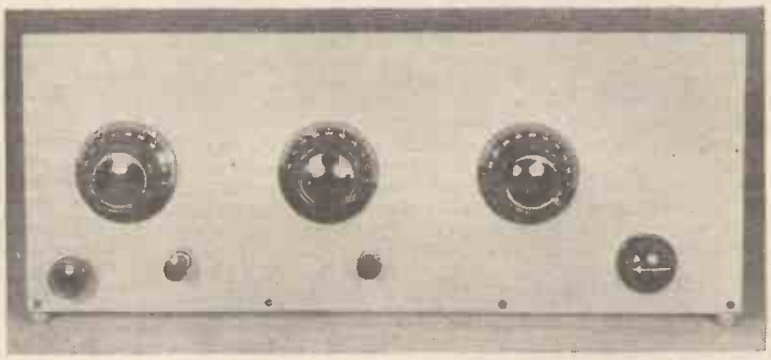
No, let us be fair. This is not a family set. It is a *fan's* set, and as such we have no excuses to offer for its publication. Indeed, we are rather bucked to think that the Editor has been so broadminded as to allow us to put out a design that we feel in our own hearts is the sort of thing amateurs really want.

Well, that's quite enough blah-blah. Suppose we get on with the story? It is the story of a set built very largely from home-made parts—which in itself is a great attraction for the real fan.

If we begin the story in the logical place we shall tell you first of the set's origin. We go right back, then, to the January 27 issue of AMATEUR WIRELESS, when there burst upon a wondering world what have since become famous as the Lucerne coils.

We admit, without blushing, that we capitalised a unique moment in broadcasting history. We designed those coils to meet an extraordinary contingency. Hundreds of thousands of listeners in all parts of the country were bewildered at the upheaval in the ether brought about by the coming of the Lucerne Plan of wavelength distribution.

Two coils were designed and produced; a simple coil without reaction for use in aerial circuits; a similar coil, only with a reaction winding, for use in detector circuits. We told you how to make these coils in that issue of AMATEUR WIRELESS.



On the Lucerne Major you will be able to use three of those .0005-microfarad tuning condensers stored away in your cupboard

So great was the interest taken in the home construction of the coils that we realised we might extend the idea, introducing the home building of a selection of simple parts.

There followed details of how to make your own high-frequency chokes, in the issue dated February 3. Then we brought out in AMATEUR WIRELESS dated February 10 a design for a cheap but efficient low-frequency transformer. Although not relevant to this article, we later on brought on mains-unit components.

But the important truth that came to light was the vast interest in home building of components. With coils for modern conditions, high-frequency chokes and a low-frequency transformer—all built at home—readers were in a fair way to making up a *real* constructor set.

So out came the Lucerne Ranger in the March 3 issue. A straight screen-grid three for under £2. That set used one of each type of Lucerne coil, two high-frequency chokes and the low-frequency transformer. It was a nice clean little layout—very simple to build, with practically no wires crossing. People are still building this set, which we really do think is an efficient family job.

No sooner had we brought out the Ranger than we were asked for other types of sets with Lucerne coils. So for a start we designed the Minor, a two-valver for local work, with a Lucerne coil fitted with reaction. See AMATEUR WIRELESS for March 24.

At the same time many readers were asking whether a Ranger with two screen-grid stages would be practicable. We did not know at the time, but we certainly saw no reason why it should not work.

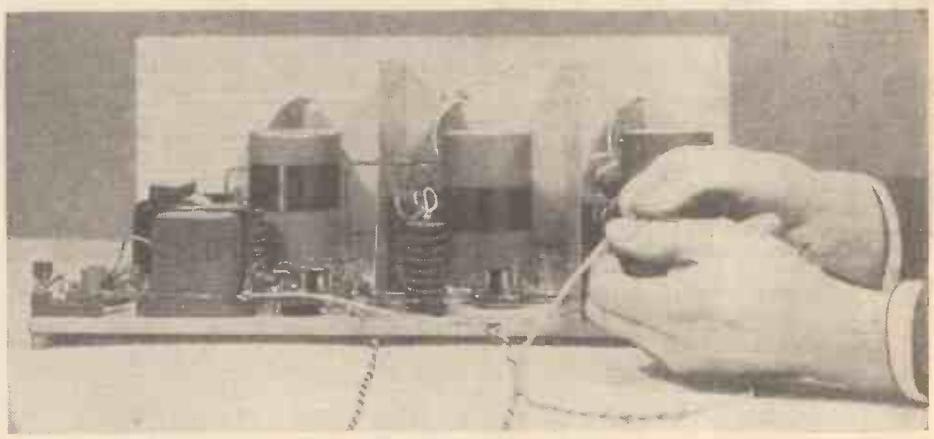
We have therefore spent some time on such a set—and the Major presented in all its glory this week is the result. Rather a long history—but we think it was necessary to explain how it came about.

Its past history accounts for its somewhat unorthodox design—particularly the use of three tuning condenser controls.

As with preceding Lucerne sets, the heart of the design is the coil. Now we cannot stress too much that this coil is very much what you make it—even if you buy it. Which is not meant to be funny, really.

What we mean is simply this: the standard windings are arranged to suit *average* conditions, a fair compromise between selectivity and volume requirements.

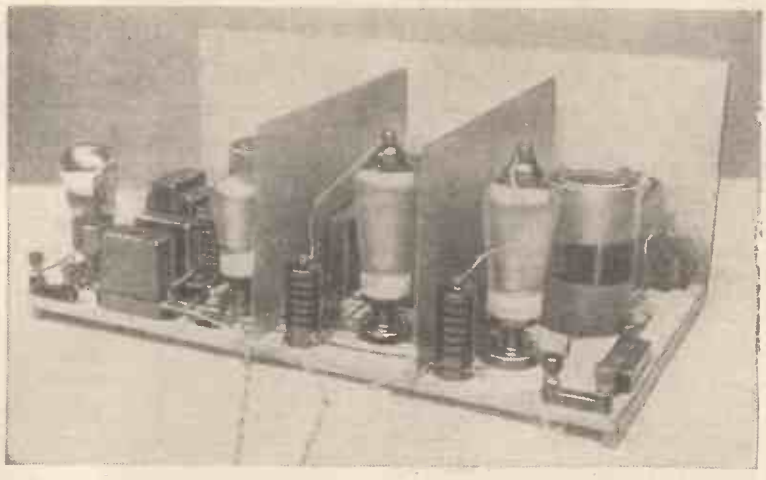
If, though, you live quite a long way from a broadcasting station, or conditions locally are poor for radio reception, you must be prepared to lose some selectivity in order to gain the essential output volume. Even by adapting the coil slightly to this need, you will not



Twisting the battery leads of the Lucerne Major four-valver into a single cable for the sake of neatness—a point of importance to many constructors

Beat the LUCERNE MAJOR!

building it ars on the ueprint is ordering, | ask for No. AW433. The set has not been designed for simple operation—but rather for maximum station-getting possibilities in the cheapest way. A set for fans!



Here is a set for the real radio fan. Home-made components and two screen-grid stages—the Lucerne Major

suffer station jamming—the coil is inherently selective.

The very simple process involved in obtaining greater volume than the coil normally gives is to add on 2 to 5 turns of winding to the aerial-coupling portion of the complete coil—the winding terminating at the aerial terminal.

Increasing the Selectivity

On the other hand, you may live in a district that needs very little sensitivity but a good degree of selectivity. Then what you do is even simpler—take off from 2 to 5 turns of the existing aerial coupling winding.

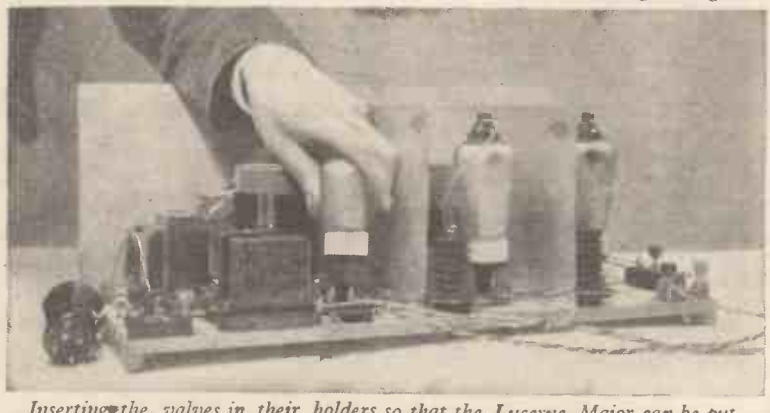
Naturally, in this putting on or taking off we want you to experiment gradually, adding or subtracting one turn at a time. Only in that way can you get really first-rate results from our coils—indeed we might add from almost any coil.

There is something rather final about altering turns, and if you are not certain right down to a single turn that you have the right compromise you can leave this vexed point to be settled by that very useful little component, the aerial series preset condenser.

Of course, this condenser adjustment for coupling applies only to the aerial circuit. There are two further tuning circuits between the high-frequency valves to be considered. We hope that you will be sufficiently keen to play when you come to do it. But what a difference it makes to results!

So much for the essential introduction to the Major. It is, as you will have gathered from our last week's, er, blurb, a four-valver with two screen-grid stages, detector and triode power output.

Looking at the practical diagrams it will immediately strike you that there is something familiar about



Inserting the valves in their holders so that the Lucerne Major can be put into operation. See if you can beat Capt. Robinson's bag of stations

pot for volume control, with switch included, a preset condenser for the aerial circuit, an extra high-frequency choke, a valve holder and a .003-microfarad fixed condenser.

As you can imagine, we have had to alter the switching arrangements a little. There is in the Major a three-point switch for cutting off the low- and high-tension batteries, and a four-point switch for wave-changing.

Controls on the front from left to right are as follows: (1) volume control, with integral switch at minimum setting to cut out the grid-bias battery; (2) aerial-tuning condenser; (3) on-off switch; (4) second tuning condenser; (5) wave-change switch, making or breaking three coils circuit at one go; (6) tuning condenser for grid circuit of detector; and (7) the reaction condenser.

We are not proposing to go into a lot of boring flapdoodle on constructing this set—if you have eyes you can see the layout from the blueprint reproduction on the inside cover and from the various illustrations.

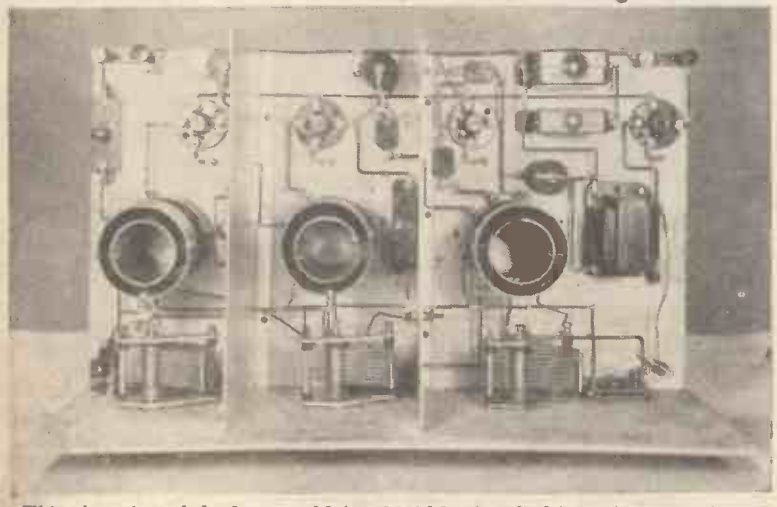
Handy Blueprint

AMATEUR WIRELESS draughtsmen have taken the Major in hand and have produced a natty blueprint that not only gives all the layout details but also the point-to-point wiring—all leads being numbered in sequence from No. 1 to No. 70.

Looking over the set we really don't think there is anything else that need be said about the construction. As a matter of fact, the really inside dope needed is on how to work this set—how to adjust the voltages on the valves and so on. All this we will give you next week.

Oh, by the way, the output stage in the standard Major is a normal triode, but next week we will show you how to put in a pentode if you prefer it.

Like the brook, we could go on for ever, but for some reason best known to himself the Editor thinks we have said enough for one week. Perhaps one day we'll get a whole issue to ourselves—and then there will be some real fun. Can't you imagine it?



This plan view of the Lucerne Major should be consulted in conjunction with the wiring guide on the inside covers

adjust each circuit's coil in turn—so that after say half an hour's careful work you will have a real world-beater.

You will certainly have a set with amazingly good selectivity and plenty of punch to bring in even the weak stations.

For the love of Mike don't imagine that this coil adjusting is *difficult*. It is sheer kid's

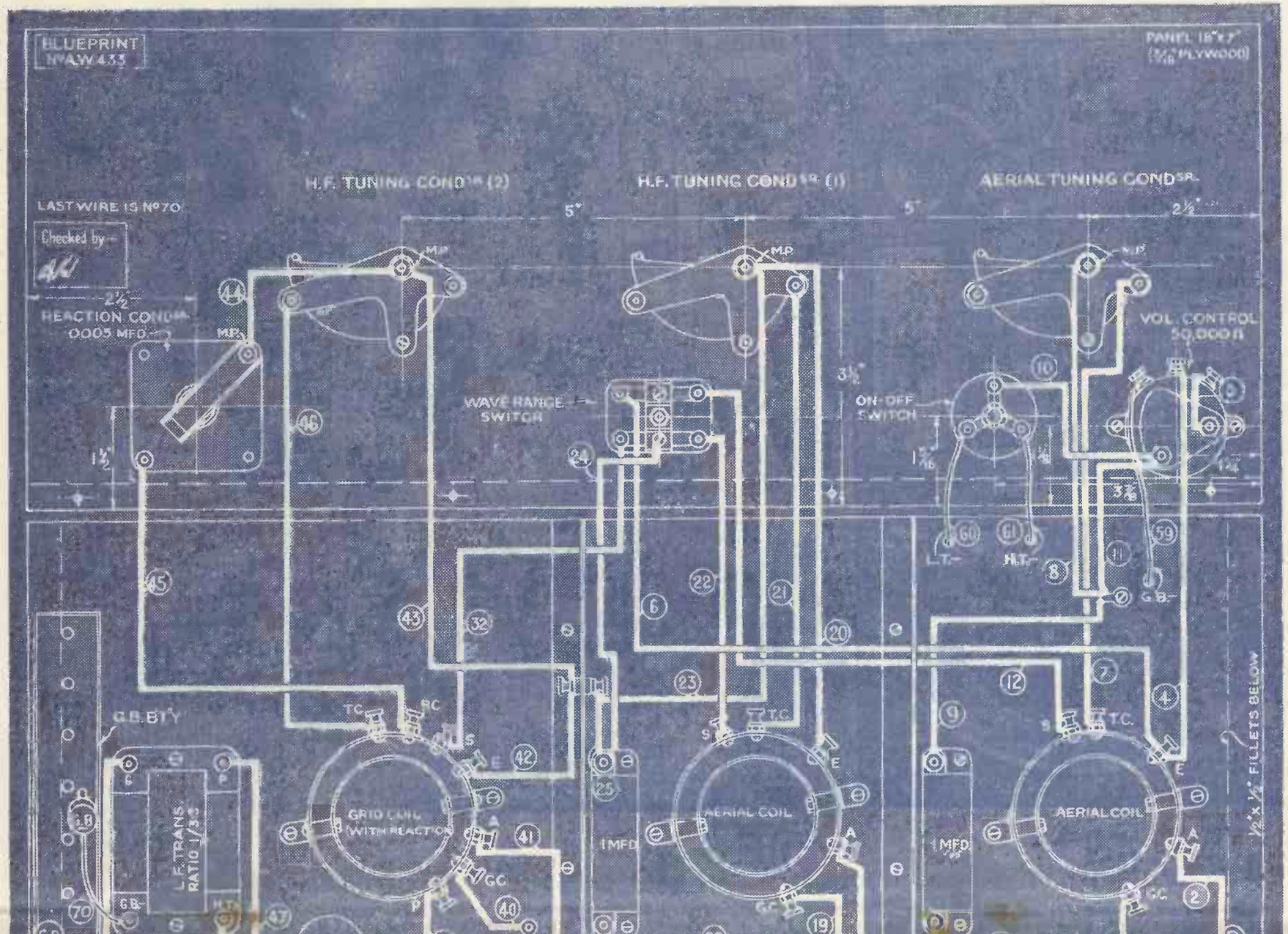
the layout. Of course there is—it is the Lucerne Ranger layout in every detail, plus the extra components for the additional high-frequency stage.

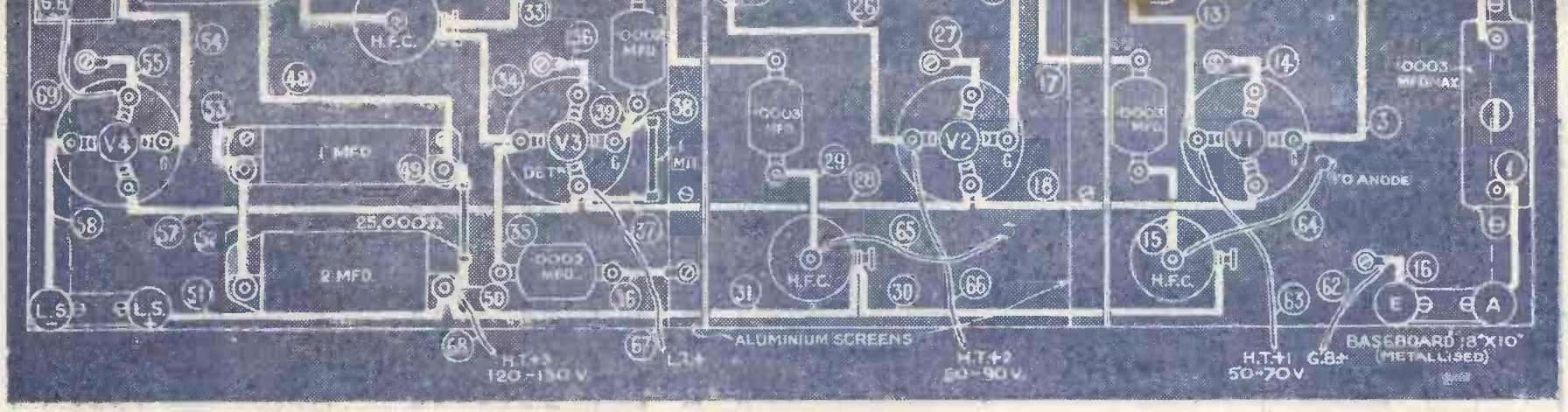
The model photographed is actually a completely new set—but it is made up from all the parts used in our original Ranger. There is absolutely no deviation whatever in this part of the Major.

Naturally, the wood panel and metallised wood baseboard are new, being of a size suitable to take the additional tuning condenser on the panel and high-frequency amplifier components behind.

There is now an additional vertical screen, this being between the first and second high-frequency stages. Then another aerial coil and tuning condenser are used, a 50,000-ohm

Half-scale Layout and Wiring Guide for the LUCERNE MAJOR





Components Needed for the LUCERNE MAJOR

BASEBOARD — £ s. d.

1—18 in. by 10 in. metallised ... 2 0

CHOKES, HIGH-FREQUENCY

3—As described in "A.W." for February 3 ... ... 4 6

COILS

3—Lucerne (types: aerial (2) and grid) as described in "A.W." for January 27 ... ... 7 6

CONDENSERS, FIXED

2—.0002-microfarad 1 0
2—.0003-microfarad 1 0
3—1-microfarad... ... ... 4 6
1—2-microfarad... ... ... 2 0

CONDENSERS, VARIABLE

3—.0005-microfarad, air dielectric, with slow-motion drives ... 13 6
1—.0005-microfarad, reaction type ... 2 0
1—.0003-microfarad, type preset ... 9

HOLDERS, VALVE

4—Four-pin 1 6

PLUGS, TERMINALS, ETC. — £ s. d.

8—Wander plugs 8
2—Spade terminals, marked: LT+, LT— 4
2—Terminal blocks 1 0

RESISTANCES, FIXED

1—25,000-ohm 7½
1—1-megohm 7½

RESISTANCE, VARIABLE

1—50,000-ohm with combined switch 5 0

SUNDRIES

4 yd. thin flex ... ...
15 ft. connecting wire ... ...
8 bolts and terminals ... ... } say 3 4½
1—Aluminium sheet, 12 in. by 10 in.
Wood for panel 18 in. by 7 in. ...

SWITCHES

1—Three-point push-pull shorting ... 10½
1—Four-point push-pull shorting ... 1 3

Suitable Valves

Make	Variable-mu high-frequen.	Screen-grid	Detector	Power	Price £ s. d.
Cossor* ...	220VS	215SG	210Det	220PA	2 6 9
Dario	TB452	TB422	PB172	TB062	1 12 0
Hivac	VS210	SG210	D210	P220	1 1 6
Lissen	SG2V	SG215	L2	P220	2 6 9
Marconi* ...	VS2	S23	L210	LP2	2 6 9
Mazda* ...	SG215VM	S215B	L2	P215	2 6 9
Mullard* ...	PM12M	PM12A	PM2DX	PM2A	2 6 9
Osram* ...	VS2	S23	L210	LP2	2 6 9
Triotron ...	S208	S215	SD2	ZD2	1 12 6
Tungsram ...	SE220	S220	LD210	P215	1 17 6
362	VS2	SG2	L2	LP2	1 2 6

*Indicates B.V.A. Valves

TRANSFORMER, LOW-FREQUENCY

1—As described in "A.W." for February 10 ... ... £ s. d. 3 6

Accessories

BATTERIES

1—120-volt high-tension 1 4 0
2—9-volt grid-bias 2 0
1—2-volt accumulator 8 6

For Full Constructional Details see Pages 472-473 of This Issue

All-mains Working for Battery Sets

An Inexpensive Change-over System Explained

by PERCY W. HARRIS, M.Inst.Rad.E

RADIO-SET users can be divided into three classes—those who have no mains in the house and therefore are dependent entirely upon batteries; those who have mains in the house and who derive their high-tension current from mains units of "high-tension eliminators," depending upon accumulators for filament current; and users of sets worked entirely from the mains.

In this article I want to talk about the second class—a very large one to judge by the sale of high-tension mains units—and to show how at a very low cost such users can in most cases convert their sets to all-mains working, and thus save themselves the trouble which comes from battery changing, battery charging, and the like.

Analytical Viewpoint

Those of you who do me the honour of reading my articles regularly know that I am in the habit of tackling problems of this kind from an analytical viewpoint. What, then, is the difference between a battery set, working with a high-tension mains unit, and an all-mains set?

Every self-contained set consists of the receiver itself, the high-tension supply, and the low-tension supply. There is not a great deal of difference between a battery set and a mains set, so far as the chief parts are concerned, but as the valves in a mains set are of what is called the "indirectly-heated type" in which instead of a filament there is both a heater *and* a source of electrons, the heating portion and the electron emitting surface being separate, certain modifications are necessary in a mains set.

Automatic or Free Bias

Furthermore, as the mains set does not have a grid-bias battery, various resistances are included so as to give what is sometimes called "automatic" or "free" grid bias from the mains. So far as a high-tension supply is concerned, there is no difference between the high-tension unit you purchase separately and the one that is built into a mains set, except in the latter case the output is often higher. The principle is the same, however, as is the method of working.

Now, mains valves are much more efficient than battery valves, generally speaking, but they are much more extravagant of current. This does not matter when one is working from the mains, for a very tiny current at mains voltage can be transformed to quite a heavy current at the 4 volts used, and the cost of this is negligible.

Put into figures, the heater consumption of each mains valve is about 4 watts, so that a three-valve set is taking, so far as the heater current is concerned, about a fifth of the power required to operate a 60-watt lamp! Actually the set would work every bit as well if you ran the heaters of the mains valves from 4-volt accumulators, but this would be much too extravagant for these days, although it is no more than we used to use in the pioneer days of wireless, for then our battery valves took just as much current at the same voltage!

Now there is a scheme, very little known at present, and worthy of much wider adoption, which consists in taking a battery set, substituting mains valves for the battery valves at present in use, using the same high-tension unit as you have at present, and operating the heaters of the mains valves from a simple and inexpensive transformer designed to step down the mains voltage to exactly the four volts required.

The cost of converting your set is merely the cost of three new mains valve holders, three mains valves, and a 4-volt transformer, a good example of which can be obtained, sufficiently large to supply even a four-valve mains set, for about 10s. 6d. The cost, therefore, apart from the cost of the new valves (you would have to buy new valves sooner or later in any case) is approximately 13s., for which price you are completely delivered from all battery troubles for evermore!

You will notice that I have not mentioned the question of grid bias, which can be made automatic if you desire, but on the other hand the substitution of resistances with shunting condensers to effect the automatic bias will add to the cost and give you a little further conversion trouble and personally I prefer in such a case to use a grid-bias battery as before. Such batteries cost only a few pence each and last about a year and, therefore, cannot, by the most pessimistic person, be called a bother or trouble.

The scheme I have just outlined of substituting mains valves for battery valves, operating the heaters from a 4-volt transformer, is practical, economical, and gives a minimum of alteration to the set, and changing your grid-bias battery once a year is the only remaining thing you have to do.

There are certain limitations to this scheme which must be carefully considered, chief of which is the actual output of the mains unit. You must choose mains valves so that the total high-tension current consumption at the operating voltage of your high-tension mains unit does not exceed the figure for which the unit is designed. A list of suitable valves for such a conversion is given in the table opposite.

Gaining Efficiency

If you are fortunate enough to have a mains unit giving very high output, then there is no reason whatever why you should not use much larger output valves, but in any case you are going to gain in efficiency by the change, as well as save yourself a good deal of inconvenience and be sure of having your set in best working condition all the time.

The actual wiring alterations are very small and are shown in the accompanying diagram. (Fig. 1.) In a battery set the negative battery lead is earthed, and to this come the various return leads such as positive of grid bias, the earth side of coil, condenser, and so forth. With the mains valve conversion, the valve holder has an additional pin for the cathode. The heater leads are connected to what are normally the filament terminals, and these two terminals must therefore go to the transformer.

Three Transformer Terminals

The 4-volt transformer (see Fig. 2) has three terminals, one of which is the centre tapping of the 4-volt winding. To make your conversion join the cathode pins of the new valve holders together and to earth, and bringing all the connections which usually go to the negative filament to this common cathode lead. The leads which normally would go to the battery, both positive and negative, now go to the outer terminals of the 4-volt winding (it does not matter which goes to which) and the centre tap is now joined to earth and cathodes. The high-tension negative also goes to the earthed lead. Grid-bias positive goes to the common cathode lead and the other grid bias arrangements remain as for a battery set.

You will have to cut out the usual on-off switch as the heater current will be turned off from the mains. The best thing to do is to short-circuit it behind the panel so that it does not matter whether the switch is in or out. You could, of course, bring a mains switch into the set to this point, but I do not recommend you to do this, and the ordinary type of battery switch must not in any case be used for mains.

Remember, Q.P.P. and class-B sets do not generally work efficiently from mains units, but this should not worry you, as you have probably not been using a mains unit with such sets in any case. I mention this in case users of such receivers should contemplate purchasing a mains unit and converting a set according to the scheme I have outlined.

Think about it! The cost is small, and the additional current taken from the mains to operate this transformer is so small as to be practically negligible so far as cost of running is concerned.

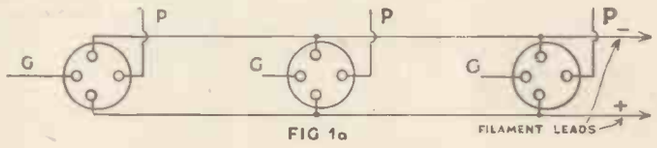


FIG 1a

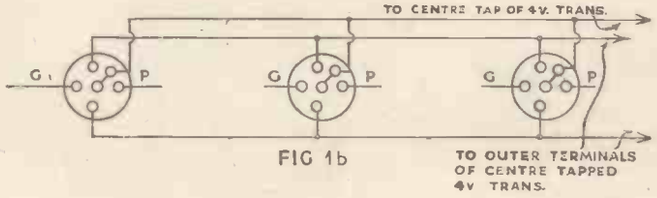


FIG 1b

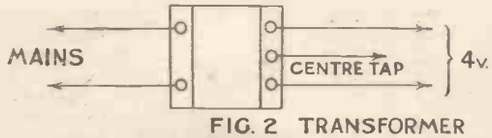


FIG. 2 TRANSFORMER

Figs. 1a and 1b show the alterations needed to go from battery to mains heated valves. Fig. 2 shows the connections for the filament transformer

Criticisms by WHITAKER-WILSON

My Broadcasting Diary

Monday

THE Kentucky Minstrels suit me. I like their traditional style. Hope they will never change it.

Bones fascinates me. I like his voice and fat laugh. His stump speech at the end was really brilliant. Wonder if anyone has settled his question as to which is preferable—a wife who can't cook but will, or one who can and won't.

[Collins photo
Sheila Borrett

Greatly tickled at Freddie Grisewood's speed in reading over the names in the cast at the end. Time and pips wait for no man—not even an announcer.

◆ ◆ ◆

Boris Godounov successfully cut and well presented. Strong cast, too.

Tuesday

LIKED a good deal of Lord Dunsany's play, but the production of it was a mess. Far too much shuffling about; also too much echo.

Ernest Milton began splendidly and gave quite a good idea of old Monsieur le Patron. By the time he had finished I thought he had entirely overdone the part. Sheila Borrett made a good Madame Blanc, but I thought her a little too quick here and there. An attractive voice, though.

Altogether a good play spoilt by emphasis where emphasis was not required. The play was interesting, but in its weaker moments seemed to be trying to out-Barrie Barrie.

Wednesday

WONDER why they did the Schubert *Unfinished* at the last Symphony concert? Think it can be scrapped except for lighter programmes. No one loves it more than I, but it is out of place at Queen's Hall. Sunday nights, perhaps.

◆ ◆ ◆

The vaudeville irritated me. Nobody very good until we got to Will Fyffe, who was really funny.

Thought Hughie Green quite clever as an imitator but am definitely opposed to a child of fourteen being asked to compère a show with known actors in it. Having said that, I add that at least a dozen opinions came my way and everyone of them agreed. "Impertinent" was a term used quite freely.

The B.B.C. ought to take care in that sort of thing. The child was, frankly speaking, precocious and silly as a compère, though—to be quite fair to him—clever in his imitations of Gracie Fields. I imagine there have been a few letters at Broadcasting House. Hope it will not happen again. Bad judgment.

Thursday

THE Dorsetshire Labourers interested me. A ring of truth in it. A very good production. Congratulations to Mr. Inglis. I do not remember having listened to one of his productions before—at least not to have known it was his. He has imagination. I recognised Philip Leaver's voice as the Vicar and also, slightly disguised, in a minor part later on. He is a good microphone actor.

[Photopress photo
Freddie Grisewood

◆ ◆ ◆

Tweet-Tweet not nearly tweet-tweetish enough. Some poor dialogue, in other words. Surprised at Leslie Sarony. He and Leslie Holmes calling each other "my dear old kitchen fender," and "my dear old pan-cake" nearly made me switch off. Can't stand baby-rot of that sort.

Thought the dance number silly. The lady may have wanted "to do a little dance that goes like this," but there was no sense in her doing it for wireless.

Again, Doris Palmer and the "Jellied Eels" business weak in the extreme. I liked "Coom, Pretty One." I did when Leslie Sarony sang it one night in the "In Town" series. He had then just written it. Suggest he writes more like that.

Definitely, this show disappointed me. Still, I retain my faith in Leslie and shall expect something really brilliant next time.

Friday

GOT in just in time to hear Backhaus play Chopin. Haven't enjoyed anything more for a long time. Glad he played the A flat waltz for his encore. Brought back memories to me. Heard him play it thirty years ago in Chester.

Saturday

IN TOWN TO-NIGHT one of the best ever. Bad start with Mr. Freeman impersonating Pepys, though. Didn't come off. Must be written. Can't visualise the quaint spelling.

[Studio Portraits
André Charlot

The Zeebrugge incident diverting. Thought Corporal Moyse gave a clear account.

Miss Baxter—the Silver Lady—the best turn. Vivid view of the Embankment at night. What a work of mercy!

I liked the American clairvoyant. So Harry Roy is to be married twice? Get on with it, Harry. Time you began, surely?

And André Charlot is to have success? Recognised his voice in a moment. Hope he has the success. When he's got a promising radio show ready he can just come and broadcast it.

◆ ◆ ◆

Heard about forty minutes of Mrs. Hylton and was greatly entertained. Plenty of spirit in her orchestra. Liked the saxophone interlude in one of the numbers.

Harry Roy

◆ ◆ ◆

Afraid I had to switch Mr. J. H. Thomas off. Disappointed, because I wanted to hear him. He spoke so slowly that he got me down altogether. Why on earth didn't someone ask him to read at microphone speed? That was House of Commons speed.

Mains Valves Suitable for Converting Most Battery Sets

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 200 volts
A.C. THREE-ELECTRODE VALVES					
Mullard	904V	34,000	74	2.2	1.8
Cossor	41MRC	19,500	50	2.6	2.7
Cossor	41MH	18,000	72	4.0	3.2
Cossor	41MHF	14,500	41	2.8	3.0
Ferranti	D4	12,500	40	3.0	3.0
Mullard	354V	12,000	36	3.0	4.0
Lissen	AC/HL	11,700	35	3.0	6.0
Mazda	AC/HL	11,700	35	3.0	3.0
Cossor	41MHL	11,500	52	4.5	4.0
Mazda	AC2HL	11,500	75	6.5	3.5
Marconi	MH4	11,100	40	3.6	4.75
Osram	MH4	11,100	40	3.6	4.75
Marconi	MHL4	8,000	20	2.5	10.0
Osram	MHL4	8,000	20	2.5	10.0
Cossor	41MLF	7,900	15	1.9	9.0
Mullard	164V	4,850	16	3.3	8.5
Mullard	104V	3,000	12	4.0	17.0
Osram	ML4	2,860	12	4.2	25.0
Marconi	ML4	2,860	12	4.2	25.0
Mullard	AC104	2,850	10	3.5	11.0
Lissen	AC/P	2,800	10	3.6	20.0
Mazda	AC/P	2,650	10	3.75	13.0
Cossor	41MP	2,550	18.7	7.5	24.0
Mullard	AC064	2,000	6	3.0	20.0
Cossor	41MXP	1,500	11.2	7.5	40.0
Mazda	PP5/400	1,500	9	6.0	26.0
Mazda	AC/P1	1,450	5.4	3.7	20.0
Marconi	PX25	1,265	9	8.0	—
Osram	PX25	1,265	9	8.0	—
Mullard	O54V	1,250	5	4.0	30.0
Mazda	PP3,250	1,000	6.5	6.5	40.0
Mullard	AC044	950	6.4	6.8	48.0
Ferranti	LP4	870	4.7	5.4	47.0
Marconi	PX4	830	5	6.0	35.0
Osram	PX4	830	5	6.0	35.0
A.C. SCREEN-GRID VALVES					
Mullard	S4V	909,000	1,000	1.1	2.5
Mazda	AC/S2	600,000	3,000	5.0	4.0
Cossor	MSG/HA	500,000	1,000	2.0	2.1
Marconi	MS4	500,000	500	1.1	2.5
Osram	MS4	500,000	550	1.1	2.5
Mullard	S4VA	—	1,000	2.0	4.5
Cossor	41MSG	400,000	1,000	2.5	1.0
Mazda	AC/SG	400,000	1,700	3.0	4.0
Marconi	MS4B	350,000	1,120	3.2	3.5
Osram	MS4B	350,000	1,100	3.25	3.5
Lissen	AC/SG	340,000	1,100	4.0	8.0
Mullard	S4VB	300,000	750	2.5	7.5
Cossor	MSGLA	200,000	750	3.73	5.2
A.C. VARIABLE-MU VALVES					
Lissen	AC/SGV	300,000	1,000	3.25	8.0
Cossor	MVSG	200,000	—	2.5	7.8
Marconi	VMS4	—	—	2.4	—
Mazda	AC/SG.VM	—	—	3.0	—
Mazda	AC/S1.VM	—	—	1.4	—
Mullard	MM4V	—	—	2.5	8.0
Mullard	VM4V	—	—	1.2	8.2
Osram	VMS4	—	—	2.4	—
Osram	VMS4B	—	—	2.9	8.0
Marconi	VMS4B	—	—	2.9	8.0
A.C. PENTODE VALVES					
Marconi	PT4	42,000	120	2.85	32.0
Osram	PT4	42,000	120	2.85	32.0
Marconi	MPT4	33,000	100	3.0	32.0
Osram	MPT4	33,000	100	3.0	32.0
Cossor	MS.Pen.A	—	—	3.5	9.0
Cossor	MP.Pen.	—	—	4.0	30.0
Mazda	AC/Pen	—	—	2.5	30.0
Mullard	Pen.V4	—	—	3.0	—
Mullard	Pen.4VA	—	—	3.5	—
Lissen	AC/PT	—	—	3.25	20.0
Cossor	PT41	—	—	3.0	30.0
Cossor	PT41B	—	—	2.25	30.0
Mullard	PM24A	—	—	2.0	20.0
Mullard	PM24B	—	—	2.1	30.0
Mullard	PM24C	—	—	3.0	30.0
Mullard	PM24M	—	—	3.0	30.0
Mullard	PM24D	—	—	4.0	—
Marconi	PT16	—	—	4.8	—
Osram	PT16	—	—	4.8	—

Securing Steady Pictures

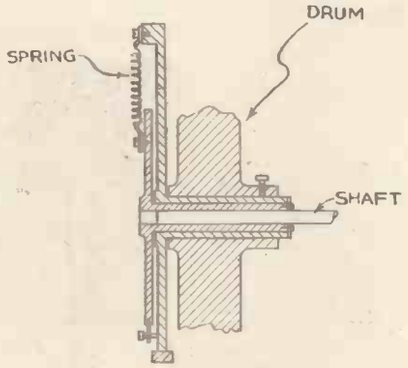


Fig. 1.—Here is a simple type of mechanical filter of the kind used by the Baird Co.

ANYONE who has operated a mechanical television receiver of whatever type will have appreciated that one of the greatest difficulties at present is that of keeping the picture steady. Under some circumstances there will be a gentle swaying motion up and down.

If the amplitude of the swing is quite small and slow this can be endured, but usually when this swing starts the amplitude gradually becomes greater and greater until the frame swings out altogether, and then the pictures race past and finally dissolve into a meaningless jumble with all semblance of a picture gone.

It has to be admitted that the solution of the problem of synchronism is not entirely solved, though with well constructed apparatus it is often possible to keep the picture quite steady for twenty minutes or so.

The average experience of the writer is that the picture goes out perhaps twice during the whole half-hour's reception. This, it should be stated, is with synchronising gear and a mechanical filter fitted; those who are working without either of these devices, of course, will not be able to attain such results, though if certain matters are given attention, they should find it possible to keep the picture steady for periods ranging from five to ten minutes.

When a motor is running at an approximate speed of 750 revolutions per minute it might be thought that small variations would not be likely to occur, but experience shows that this is by no means the case, and that the speed can vary at a fairly quick rate which would not be appreciable under ordinary conditions of use.

Motor Adjustments

How can this liability of the motor to vary its speed be lessened? There are two predisposing causes—mains variation and mechanical defects. The former we cannot control, of course, but much can be done in the latter respect, and the remedy amounts to putting the motor in as good mechanical condition as possible.

The first requirement is that the motor spindle should be absolutely free, and this can best be tested by removing the brushes and then turning the armature and noting whether there is the slightest trace of lumpiness. Most of these small motors are fitted with ball bearings, and the merest trace of grit will be sufficient to cause uneven running.

If it is suspected that there is any dirt in the bearings then they should be washed with petrol or paraffin after which they should be dried and re-oiled with light machine oil.

Attend to Commutator

Attention should next be given to the commutator, and if there is the slightest roughness on this, it should be smoothed with fine glass paper held lightly against it whilst the motor is running. Be careful not to allow any oil to get on to the commutator. One of the commonest causes of sparking and irregular running is high insulation between the commutator segments which results in the brushes jumping.

In the case of a small motor, this can be removed with a razor blade which should be held at a tangent to the surface of the commutator; the insulation should be cut to about 1/50 inch below the surface of the metal.

Finally the carbon brushes should receive attention. These must bed well down, and if they do not do so a piece of fine glass paper should be wrapped round the commutator and the latter either turned round or rocked to and fro, the brush meanwhile being pressed firmly into contact. Adjustment of the brush pressure will sometimes be found desirable; often this is too great, and can with advantage be reduced by removing a coil from the spring.

Mechanical Filters

Mention was made earlier of the mechanical filter. This is a very simple device which is quite effective, and it is rather surprising that it is not more used for the simple type of television receiver. Actually it only consists of a flexible coupling between the motor and the disc or mirror drum as the case may be. The simplest form it can take is belt drive, using a rubber belt.

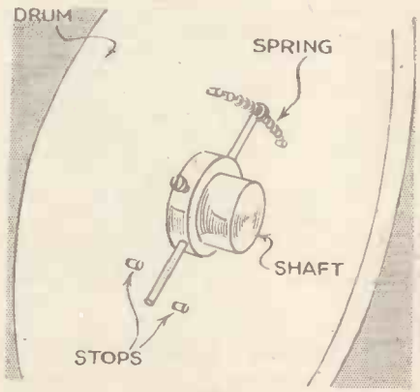


Fig. 2.—The movement of the drum or visor is controlled by two tension springs attached to an arm on the centre boss

It will be understood that any small irregularities of the motor under such conditions will not be transmitted to the disc or drum. Most visors, however, are driven directly, that is they are mounted on the motor shaft, and in this case a flexible arrangement is interposed between the shaft and the driven member.

Fig. 1 is a sketch of an arrangement used by the Baird Co. for their mirror-drum receiver. It will be seen that a boss is secured to the shaft of the motor and the actual drum is on this boss and free to turn round.

On the boss there is a pin, and there is another pin on one of the spokes of the wheel; between these two pins there is a small spring so that the drive takes place through the latter. Stop pins are fitted in order to restrict the total amount of movement possible.

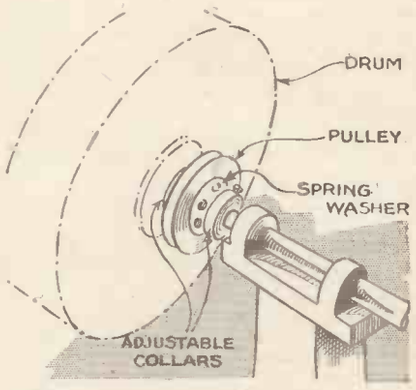


Fig. 3.—A type of mechanical filter favoured in Germany; it employs a slipping clutch

Another form of flexible drive of the same type makes use of a spiral spring, the driving and driven members again being free except for the stops, which restrict the amount of movement.

Fig. 2 shows another simple arrangement in which an arm is fitted to the fixed boss; to the end of these are secured two small springs which are anchored at their outer ends to pins on the disc or drum. Pins are also fitted on this arrangement for limiting the amount of movement possible. If preferred, small rubber bands can take the place of the springs.

German Method

A method favoured in Germany employs a slipping clutch (Fig. 3) which merely consists of a small circular spring plate between the driving and driven members. To be effective, this device must be very accurately made, and there must be provision for altering the frictional effect so that it can be adjusted to a nicety.

It does not require much ingenuity to fit a device such as those outlined, and it will be found that the little trouble entailed is quite worth while in making for a steadier picture.

H.C.

In the New Television Studio

A Peep Behind the Scenes at Portland Place

By ALAN HUNTER

TAKING advantage of Eustace Robb's kind invitation, I stepped along last Friday morning to the new television studio at No. 16 Portland Place.

Here in a converted Regency drawing-room I found all the "televisionaries" of the B.B.C. busily preparing for the 11-o'clock broadcast.

It was a specially interesting programme they were preparing. Members of the famous Budo Kwai Club were to illustrate a talk on ju-jutsu and kendo by the well-known Irish novelist, Shaw Desmond.

Ready for Their Bout

I found Professor Tani and Mr. Otani quite ready for their bout of ju-jutsu exhibitions. Very competent they looked, in their loose-fitting dress.

Imperturbability is a Japanese characteristic, of course. Even so, the way these ju-jutsu exponents took all the preparations for the television broadcast for granted seemed a little odd to me. I know I should have been bubbling over with excitement had I been one of the performers.

For it is an eerie business, being televised. The scanning light, with its rushing spots of illumination flickering across the back cloth, takes some getting used to, although there is never any physical discomfort for the artists.

Taking a Look Round

While Mr. Robb and his men were putting the final touches to the show, I had a good look around, keeping as much out of their way as possible—treading especially gingerly as I brushed by the ju-jutsu exponents.

An ample studio, I thought. It measures, they tell me, 26 ft. long by 28 ft. wide. This is about 10 feet wider than the BB studio inside the tower of the "Big House." Length is slightly less—but after all it was *width* they wanted. The new place gives more scope for trick cyclists, ballet dancers—*and* ju-jutsu scrappers.

Tcteno cnd Tricker, experts in the art of kendo, or Japanese swordsmanship, "doing their stuff" during the recent illustrated television lecture by Shaw Desmond

A sort of dressed-stone effect has been obtained on the walls, which for acoustic needs have been covered with big chunks of what I believe is known as building board.

The back-cloth, against which the performers are focused by the projector, hides the windows looking on to Portland Place—but these windows can be opened to let the air in.

Eustace Robb has developed the back-cloth idea since he left his old home in studio BB. He now has installed a large and thick white screen on rollers, which can be raised or lowered in a few seconds. In this way he can build up pretty scenes behind the white screen, thus giving lookers a greater variety than was possible before.

I noticed that there were two microphones in the new studio. These go to a mixing panel in the adjoining control room, and then through the usual A amplifier. These two microphones thus enable the artist's sounds to be picked up no matter how much he or she dashes about in the studio.

Then I glanced at the projector. It looks quite simple—but what a difficult process it has to perform! Just think a moment of what has to happen. To scan the artist—that is to explore each part with a spot of light—an amazing sequence of operations must take place *in one second.*

The whole of the background screen must be explored by the light spot, so that the variations of light and shade of the televised object will be reflected on to the light-sensitive photo-cells above.

The spot of light must traverse the screen from the bottom to the top, at one side, after which a second spot must move up in the same way, only this time displaced by the exact width of the spot. And so on until thirty traversals of spot light have been made across the screen.

But that is not all. In order to give continuity of action to the picture this 30-line process must be repeated at a uniform rate of 12.5 times per second.

Is it any wonder that television has its snags? The marvel is, I always think, that we see anything at all. Yet on the check television set you can see a picture that retains all the essential "life" of the original.

So it was with these ju-jutsu people. I dashed to and fro from the studio to the adjoining control room, marvelling each time I compared the original to the picture as it had passed over the apparatus.

Ju-jutsu as performed by Professor Tani and Mr. Otani, head and pupil of the Budo Kwai Club, in the new B.B.C. television studio at No. 16 Portland Place

While I was peeping into the control room I believe someone did phone up to ask what the deuce it was being televised—but even that did not disillusion me, for I know how tricky television reception can be.

No matter how rapidly these Budo Kwai exponents threw each other, the television process followed them. Believe me, those of you who have never seen real action on the television "set" have missed a real thrill.

Future Possibilities

When Eustace Robb had a spare moment, I got him to talk about this new studio. He is full of boundless enthusiasm for future possibilities.

"The extra width is a great boon," he remarked. "It gives us a chance to put the orchestra behind a curtain. That curtain is very important, by the way.

"In the old studio we found that the musicians turning over their white sheets of music reflected light every now and then and caused a complete blot-out of the picture. Now six of them can play behind the curtain to accompany the artists without any interference.

Four People at a Time

"Can we get any more people into the picture? Well, not without a slight loss of detail, of course. But whereas in studio BB we could manage only three people with comfort, we can now squeeze in four."

And so, slowly, but I think surely, this television technique progresses. Whatever may be the outcome of the present controversy over 30-line medium-wave television and high-definition ultra-short-wave television, the artistic side will be ready.

Sets of the Season Tested

Kolster Brandes Hika

This photograph shows the simple nature of the Kolster Brandes Hika assembly

BY a strange coincidence during the period we had the K.B. Hika for test the weather was really fine, so that we were able to give it a good outdoor test. The nice hot sunny days tempted us to spend a lot of time out doors when a portable—if it really is a portable—can be very useful.

This K.B. product is a straight four-valver of conventional design. It is supplied all complete and ready to switch on in a walnut cabinet of medium tone. A turntable is, of course, fitted to the base, so that one can take full advantage of the directional properties of the frame aerial. There is also a flexible handle fitted to the cabinet, which lays flat when not in use.

Small Weight and Bulk

Although some portable sets are quite light, the advantage of weight is lost should the cabinet be bulky. The Hika is 15 in. wide, 18 in. high with a width of 9½ in., while the total weight is only about 30 lb.

There are three major controls, all of which are quite simple to operate. First in importance comes the tuner which drives a scale, graduated in degrees from zero to 100, past a hairline. Concentric with this knob is the trimmer which balances up a two-gang condenser, so as to obtain maximum signal strength. On the left-hand side is a combined switch. The positions for this are "off," "medium waves," and "long waves," in that order.

The reaction control is on the right-hand side and works in a clockwise direction. This is very smooth in operation for it enables one to push the reaction to the maximum if required.

A refinement not usual on a portable receiver is the local-distance switch, which is fitted just below the tuning knob. That a control of this kind has been fitted at all will make you realise that the volume is above the average. When this switch is set to the "local" position, it is not possible to overload the detector valve and so cause bad quality.

Long- and medium-wave frame aerials are wound around the chassis and tapped so that in exceptional circumstances an external and indoor aerial can be used as well. Sockets have been provided for gramophone pick-up, the receiver being really versatile. It is quite as useful as the average family set, with the advantage that you can take it from room to room or out of the house if necessary.

A combined high-tension and grid-bias battery is housed behind the loud-speaker (a balanced-armature unit, by the way) and will last for about three or four months with average use. A 2-volt accumulator will last about 35 or 40 hours at one charge, a useful performance considering the size and weight of the whole set.

Contrary to usual portable practice, the chassis is entirely metal screened, so that all you can see externally are the valves and batteries. There are no wires to come off or get in the way and once the set has been connected no amount of shaking seems to affect it. We took it around in a car all over the countryside without noticing any ill effects.

It is perhaps the simple circuit that accounts for the sensitivity, so here are a few details for you to consider. A simple frame aerial feeds straight into a screen-grid valve, which is in turn coupled to a leaky-grid detector. Resistance-capacity coupling between the detector and triode low-frequency valves preserves quality while transformer coupling to a pentode output valve steps up the volume.

We are quite used to a restricted wave range with a frame aerial, but with the Hika the whole of the medium waveband between 200 and 500 metres was covered with ease. On long waves the range covered was 1,000 to 2,000 metres.

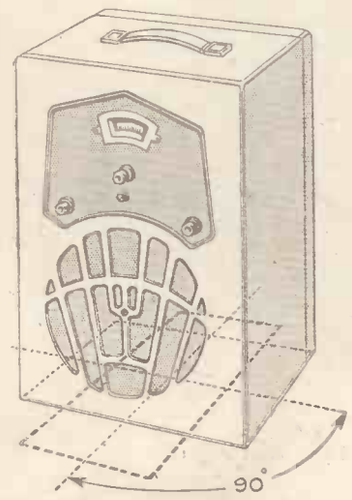
On test we found that all the stations we wanted to hear in the usual way were available. Of course some of the feeble Continentals wanted an external aerial to boost the volume. In daylight we could always depend upon five or six long-wave stations, whether we were in a good area or not. After dark the number of stations depended upon how much one used the controls.

Stations on similar wavelengths could often be separated if they were not in the same direction. Good examples were Daventry and Berlin on the long waves. These could not be separated on a normal four-valver, but on the portable a turn of the frame aerial cut out 90 per cent. of the signals, so that Berlin could be heard without any trouble.

On the average we feel quite sure that one could always hear thirty or forty stations on the loud-speaker and if an aerial were draped somewhere near the cabinet, the log of stations would rise to somewhere over fifty.

As regards running costs, no complaints could be made about the high-tension consumption. With the 100-volt high-tension battery supplied the average anode current was 8 milliamperes, which means that the battery was working well within its rated capacity and would have a long life.

For those who want a cheap and efficient portable that will give a large number of stations with good quality, this set should be given very careful consideration.



After the set has been tuned, it should be rotated through an arc of 90 degrees in order to find the position of maximum sensitivity

IN A NUTSHELL

Makers : Kolster-Brandes, Ltd.

Model : 337 Hika Portable.

Price : £10 10s.

Valve Specification : High-frequency stage with fixed grid base screen-grid valve (Cossor 220VS), triode detector (Mullard PM1HL), first low-frequency amplifier (Mullard PM1HL), pentode output stage (Mullard PM22).

Power Supply : Internal combined dry high-tension and grid-bias battery with unspillable low-tension accumulator.

Type : Self-contained portable.

The Kolster Brandes Hika is attractive in appearance and efficient in performance

Post Office Radio

THE success of a single-channel two-way service between South Wales and Somerset across the Bristol Channel has encouraged the Post Office to experiment further in wireless telephony.

Since its introduction two years ago, the ultra short-wave service has been in regular use as a normal junction circuit speeding up telephone communication across the Bristol Channel.

Six two-way channels will soon be operated simultaneously on a series of advanced tests.

The economy value of the scheme is shown by the fact that the radio link is only twelve miles long, whereas a cable under the Severn Tunnel covers a distance of nearly seventy miles.

A new wireless direction-finding apparatus for submarines has been introduced by the Marconi Co. The aerial used is of telescopic formation, the actual aerial loops folding into the telescope tube when the apparatus is not in use. The accuracy with which readings can be taken, even when submerged to a depth of 35 ft., is equal to that on a normal vessel.

LUCERNE MAJOR

PENTA—QUESTER • LUCERNE RANGER

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LUCERNE MAJOR

KIT "A"

Cash or C.O.D., Carr. Paid **57/6**

or 12 monthly payments of 5/9.

KIT "A" Author's Kit of **First Specified** Parts, including Metallised Baseboard and Wood for Panel. Less Valves and Cabinet. Cash or C.O.D. Carriage Paid, £2/17/6. Or 12 monthly payments of 5/9.

KIT "B" as Kit "A," but with set of specified Valves. Cash or C.O.D. Carriage Paid, **£5 4 3**

Or 12 monthly payments of 10/9.

KIT "C" as Kit "A," but with Valves and Peto-Scott Universal Table Cabinet, 18 in. by 7 in. by 10 in. Cash or C.O.D. Carr. Paid, **£6 0 0**

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If Ready-wound Lucerne Coils, Chokes and Transformer, are required, add 6/- to Cash or C.O.D. prices or 7d. to deposit and each monthly payment.

LUCERNE RANGER

(For detailed list of Parts see our previous advertisement)

KIT "A" *CASH OR C.O.D. Carriage Paid.* **39/-**

Comprises the Kit of Parts as detailed, less Valves, Cabinet and Speaker. Cash or C.O.D. Carriage Paid, £1/19/0. Balance in 11 m'thly payments of 3/6. YOURS FOR **5/-** DOWN

KIT "B"

As for Kit "A," but with Valves only. Cash or C.O.D. Carriage Paid, £3/10/3. Balance in 11 monthly payments of 6/6. Send only **6/6**

KIT "C"

As for Kit "A," but with Valves and Peto-Scott Lucerne Cabinet. Complete with B.A. Cone Speaker. Cash or C.O.D. Carriage Paid. £4/12/6. Balance in 11 monthly payments of 8/6. Send only **8/6**

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CONVERT your LUCERNE RANGER to the LUCERNE MAJOR. Complete Kit of all necessary components for conversion of the **Lucerne Ranger** to the new **LUCERNE MAJOR, including specified Baseboard, H.F. Choke, Coil Kit, 4 specified Condensers, 4-pin Valve-holder, Volume Control with Switch, Wander Plugs, Aluminium Sheet, 12 in. by 10 in.; plain Wood Panel, 18 in. by 7 in., Screws, Wires, Flex, etc., Assembly Instructions and Diagrams.** Cash or C.O.D., £1/1/0.

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Complete kit comprising 2 ready-drilled Formers, 2 Reels of enamelled Wire, 6 B.A. Terminals, Nuts and Screws. Exact to specification for Aerial or Grid Coil. Postage 6d. extra. **2/6**

2 Complete Kits for both Aerial and Grid Coils, 5/-. Postage 6d. extra

Ready Wound

LUCERNE AERIAL COIL OR GRID COIL Each

Wound exactly to 'Amateur Wireless' specification. Manufactured, Tested and Guaranteed by Peto-Scott. **3/-**

Postage 6d. Extra 6/6 Per Pair Pcs: Free

H. F. CHOKE PETO-SCOTT KIT, comprising machined and slotted ebonite former, ready drilled, complete with terminals, fixing screw and 44 enamelled wire to "Amateur Wireless" specification. **1/6** Postage 6d. extra.

Ready assembled and tested by Peto-Scott, 2/6, postage 6d. extra.

L.F. TRANSFORMER PETO-SCOTT KIT, comprising moulded bakelite case, ready-drilled and completed with ready-wound bobbin, 25 pairs of laminations and terminals, to "Amateur Wireless" specification. Postage 6d. extra. **3/6**

Ready assembled and tested by Peto-Scott. 5/-. postage 6d. extra.

PENTA—QUESTER

(For detailed list of parts see our previous advertisement.)

Cash or C.O.D., Carriage Paid, **£4:7:6**

KIT "A" Author's Kit of First Specified parts, including ready-drilled METAPLEX Chassis, but less Valves and Cabinet. Cash or C.O.D. Carriage Paid, £4/7/6

Or yours for **8/-**

Balance in 11 monthly payments of 8/-.

KIT "B"

As for Kit "A," but with set of Valves only. Cash or C.O.D. Carriage Paid, £7/1/0. *Or 12 monthly payments of* 13/-.

KIT "C"

As for Kit "A," but with Valves and Peto-Scott type PQ Cabinet. Cash or C.O.D. Carriage Paid, £8/16/0. *Or 12 monthly payments of* 16/-.

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ANY ITEM SUPPLIED SEPARATELY—ORDERS OVER 10/-

SENT C.O.D. CARRIAGE AND POST CHARGES PAID

Converts your present Battery Set to Class "B" Amplification. Complete with all necessary components, **including driver transformer, Class "B" output choke, W.B. 7-pin valve-holder, B.V.A. 240B valve,** wire and screws, etc. **Full-size Blueprint,** assembly instructions and diagrams. **Cash or C.O.D., 37/6.** Balance in 7 monthly payments of 5/6.

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Please Mention A.W. When Replying to this Advertisement

Readers' Views on This and That

Listeners' Letters

LUCERNE RANGER RESULTS

To the Editor, AMATEUR WIRELESS.

I AM writing to tell you how pleased I am with my Lucerne Ranger, which I have had going about a week. I can get all the English stations except the Midland Regional, and all the main Continentals come in at full loud-speaker strength. There is no interference at all.

Even giving these good results, I doubt if the set is going all out, as I am using a 1 : 3 transformer and a set of Cossor valves *three* years old, one being the 210HL instead of the Det210, the valves being taken from a 1931 Cossor Melody Maker.

It is the best screen-grid three I have seen for a long time.

G. P. BROOKS.

Cerne Abbas, Dorset. [1066

I HAVE recently built The Experimenters' screen-grid three, and I am very pleased indeed with it and hope to follow up these smart "it" boys.

A short time after trying out this set it developed crackling, which drowned the signal. After a couple of hours' search I discovered that I had, in my eagerness to get it running, omitted to wipe the spirits of salts off the low-tension positive side of the detector valve after soldering the lead and the flux had crept to the valve-holder fixing screws and so shorted the low-tension via the metal base.

I thought this may be a hint to some reader in the same boat as myself.

In closing, may I wish you every success.

NINETEEN YEARS OLD.

Wallasey. [1067

APPRECIATION!

I HAVE not written to you before, but I was rather stirred by the letter of "Anonymous" in this week's issue *re* the issue for schoolboys. Surely "Anonymous" is not so mean as to deny the schoolboys one issue a year? After all, they are the coming generation, and their interest in wireless surely ought to be encouraged.

I would like to thank you for these issues, and for keeping up a standard higher than any other paper. Keep it up!

Turning to other matters, I will be as brief as possible. I think The Experimenters are fine, and am sincerely disappointed when an issue appears without them. I have greatly enjoyed the "how to make" series, and hope more are forthcoming.

I have seen grumbles, and I have a small one which is rather similar to one published before in your paper. Last summer, while staying at the seaside, I decided to build a set for a friend. I ordered a three-gang coil unit and several small components from a well-known manufacturer. After one week my dealer received a letter to say that it was such a trivial order that I would have to wait, which I duly did for over another week.

This was very jolly, holding me up, but that was not all. When they arrived I assembled the set all correctly, as it proved, and the fuse blew immediately.

Well, I tested everything as far as my knowledge went, and could find nothing wrong, so I handed it over to my dealer to examine. After making rude remarks about my wiring and saying that there must be a short with the metal foil baseboard, he rebuilt it, with the same results as I had had. At last he discovered the trouble. All three coils were wound wrong, and there was a dead short through one. Surely this is not good enough, after a fortnight's wait?

My dealer, without my permission, re-wound the coils and coolly charged me 30s. for his services. I know mine is not an isolated case, as I have heard of several others. The reason why people buy manufactured sets in preference to making their own is entirely due to the bad service given by some of our component manufacturers, in that their components are unreliable.

I much appreciate "Old Thermion," but not too much high-tension battery stuff.

Hoping you will continue the best of wireless papers as at present.

JOHN WAINWRIGHT.

London, N.W.3. [1068

P.S.—I wish to goodness the papers would leave the B.B.C. alone. The composition of their programmes is *splendid*. Please encourage the schoolboys. Don't be put off by "Anonymous": you will get plenty of schoolboy readers for the loss of one "Anonymous."

£5 5s. S.G. 3

PLEASE accept these few lines from one of the regular readers of AMATEUR WIRELESS for the Christmas number. I built up that fine little receiver, the £5 5s. S.G.3. That was the only set I could find to meet my pocket at that time of the year.

I must say it is a set that no family man should be without. I had never tackled the job of building up a set before, but three hours after receiving the parts from Peto-Scott I was receiving good reception from twenty to thirty stations.

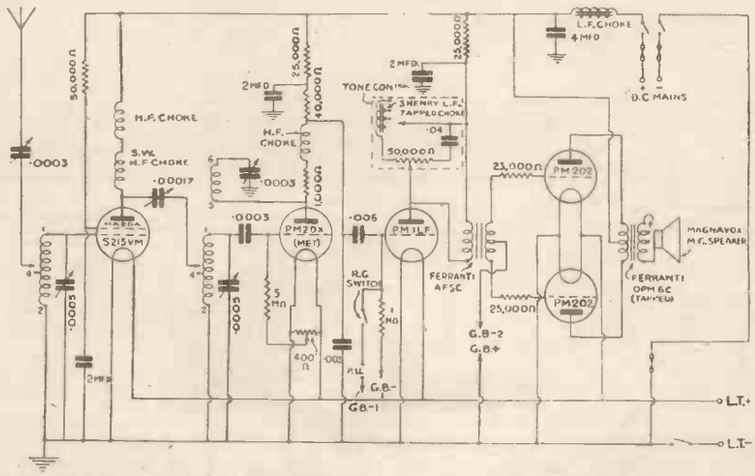
I must also say that your blueprints are so *easy* to build from. The numbers of all the wires make it so simple.

I expect I am one of many readers who have built this little wonder set.

C. GIBBONS.

Chester. [1069

[The AMATEUR WIRELESS laboratory is at present working on a revised edition of this set, and details will be published shortly.—ED.]



The Melody Ranger circuit as adapted by a Bengal reader of AMATEUR WIRELESS. *For reception results see letter No.* 1071

MORE CONGRATULATIONS

CONGRATULATIONS for your most excellent paper. The Schoolboy's Number was excellent, and Mr. Bonavia-Hunt's real-quality series is even better.

"On Your Wavelength" by Thermion is very interesting, especially his reports of high-tension batteries. I regularly look forward to Kenneth Jowers' short-wave notes. I am just constructing a short-waver (one-valve).

TEN-YEAR-OLD.

Acton, W.3. [1070

MELODY RANGER IN INDIA

I AM taking the liberty of enclosing a copy of my Melody Ranger circuit adapted for high tension from the D.C. mains.

I have converted the variable-mu stage into a straight screen-grid, as I had considerable difficulty in getting this stage to give of its best. The pre-detector volume control is not so essential for us out here, as stations are thousands of miles away, and I tone down the local (Calcutta, 3 miles distant) by detuning either via the aerial-series or intervalve condenser.

I have added a 400-ohm potentiometer as this improves reaction control on the shortest waveband, on which tuning is rather tricky.

The tone control is decidedly an asset to the set, a very fine tone balance being obtainable. The choke and condenser are fitted under the baseboard, and the control is on the right side of the cabinet.

The set is absolutely devoid of all hum, and I pick up the Empire broadcasts on GSA and GSB regularly every evening. Conditions, of course, vary a great deal, but on good nights I get full loud-speaker reception (on two loud-speakers), and have received stations on all wavelengths.

There are several Melody Rangers in Bengal.

I will conclude by thanking you not only for the pleasure I derive from this wonderful set, but also for the many interesting hours I spend with your valued paper.

A. F. TAYLOR.

Bengal, India. [1071

A READER SINCE 1927

I HAVE been a reader of "A.W." since 1927; I prefer your paper to any other, for the following reasons:

It gives all the latest facts about wireless in general without any sensationalism (which is detestable to me in anything), such as other journals indulge in.

Thermion's pages are greatly appreciated by me.

And now for some grouses. Broadcasting in general is a curse to the majority of people, for the simple reason that they do not know how to use it. Instead of switching on when something is on in which they are interested, they have it on at every possible opportunity. They have it on so much that they get fed up with it, and so it becomes a curse instead of a pleasure.

A member of my family is an instance of this; he has no thought for anybody who may want to have a quiet read. Not only that, but when we do want to hear a special programme he has the inside out of the set.

I despise the average listener; wireless is abused instead of used. You might ask in what aspect of wireless I myself am interested. Well, mainly experimenting and short-wave listening.

E. E. NASH.

London, N.16. [1072

For the Short-wave Fan

By J. GODCHAUX ABRAHAMS

Short-wave Interval Signals

MUCH has been written regarding musical and kindred signals used by Continental and other foreign stations during the intervals in their programmes, but so far little mention has been made of the fact that many of the short-wave transmitters, copying their big brothers, have also adopted similar devices to make their presence on the ether known to listeners.

The interval signal *per se* possesses the advantage of attracting the attention of the DX searcher quicker than would an ordinary verbal call; moreover, as a rule, it acts as a preliminary warning and impels one to wait for the station call which usually follows it.

How the Signals Began

At the outset it was used solely by stations effecting the relay, on short waves, of programmes broadcast on longer channels for local or national consumption, but during the past year it appears to have been adopted by some commercial transmitters and in some instances by stations carrying out a public wireless-telephony service.

As an example, if you care to tune in to PMC or PLF, Bandoeng, on respectively 16.56 and 16.81 metres, you will pick up, previous to scrambled speech or an operator's call, the sound of notes somewhat reminiscent of a melodious three-note motor-horn (F, D, C).

They are repeated *ad lib*, and it may be your ill-luck to be compelled to wait some few minutes before you actually hear speech. The signal, however, is a useful one, inasmuch as it permits undoubted identification of the station.

In the same way the FW group of transmitters at St. Assise (France) working telephony with Rabat (Morocco), Buenos Aires (Argentine) preface the transmission with a morse letter F, followed at intervals by three notes (A, F, D). ISY, Buenos Aires, will be found to give out on 16.55, 16.70 metres and 14.47 metres four notes (E, E, G sharp, B), as if played on a vibraphone.

DFB, Nauen (Germany) in daily touch with Maracaibo (Venezuela) and Buenos Aires (Argentine) on 17.12 metres, announces itself by a three-tone whistle (D, C, G).

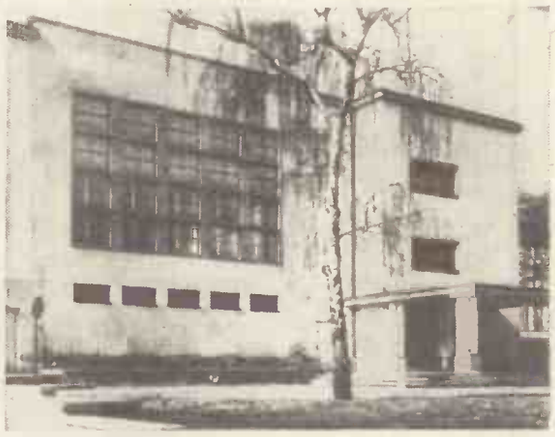
A careful search will reveal many more commercial stations with distinctive signals which, when identified, clearly establish the wavelength to which the receiver is tuned, and thus greatly assist in the search for wanted broadcasts.

It must be borne in mind, however, that definite bands of frequencies have been allotted to the various classes of transmitters or, in other words, you will not find commercial morse or telephony transmitters in the same section as experimental short-wave broadcasters; amateur experimenters also have specified channels to which they are restricted. The international wavebands conceded for broadcasts on short waves are as under :—

11.27-11.7 metres (26,600-25,600 kilocycles); 13.9-14 metres (21,550-21,450 kilocycles); 16.85-16.9 metres (17,800-17,750 kilocycles); 19.55-19.85 metres (15,350-15,110 kilocycles); 25.2-25.6 metres (11,900-11,700 kilocycles); 31.2-31.6 metres (9,600-9,500 kilocycles); and 48.8-50 metres (6,150-6,000 kilocycles). It is within these limits that searches should be carried out for broadcasts of radio entertainment from any part of the world.

From Europe alone we may hear a number of transmissions on short waves; namely, from Daventry (Great Britain), Zeesen (Germany), Radio Colonial (Paris), Skamlebaek (Denmark), Vienna (Austria), Jelöy (Norway), Rome (Italy) Madrid (Spain), Moscow (U.S.S.R.), Huizen (Holland), Poznan (Poland), Budapest (Hungary).

Continued on page 483



[Photopress photo

This attractive building houses the Frankfort-am-Main short-wave transmitter

How the Command Performance is Broadcast

At home with Sir Henry Wood

Secrets of the B.B.C. Post Bag

Full page portrait of Anona Winn

These are just a few of the splendid features in this week's issue. Get your copy on Friday, May 4.

RADIO PICTORIAL
ON SALE Friday, May 4 — 2d.

Broadcast Wavelengths

This week we give details of the principal short-wavers and the European long-wave stations. Next week we shall publish a list of medium-wave transmitters.

Principal Short-wavers

Metres	Kilocycles	Station and Call Sign	Country
16.86	17,790	Daventry (GSG)	Great Britain
16.878	17,772	Boundbrook (W3XAL) NJ	United States
16.89	17,760	Zeesen (DJE)	Germany
19.55	15,340	Schenectady (W2XAD)	United States
19.67	15,242	Boston (WIXAL)	United States
19.68	15,234	Paris (Colonial) (FYA)	France
19.71	15,210	East Pittsburgh (W8XK)	United States
19.73	15,200	Zeesen (DJB)	Germany
19.82	15,140	Daventry (GSF)	Great Britain
19.84	15,120	Vatican (HVJ)	Italy
24.53	12,230	Lisbon (Eddystone)	Portugal
25.00	12,000	Moscow (RNE)	U.S.S.R.
25.25	11,880	Paris (FYA)	France
25.25	11,870	E. Pittsburgh (W8XK)	United States
25.28	11,865	Daventry (GSE)	Great Britain
25.32	11,840	Wayne (W2XE)	United States
25.40	11,810	Rome (2RO)	Italy
25.45	11,780	Boston (WIXHL)	United States
25.53	11,750	Daventry (GSD)	Great Britain
25.57	11,730	Huizen (PHI)	Holland
25.58	11,720	Middlechurch (VE9JR)	Canada
25.63	11,705	Paris (Colonial)	France
30.0	10,000	Madrid (EAQ)	Spain
31.25	9,600	Lisbon (CTIAA)	Portugal
31.26	9,590	Philadelphia (W3XAU)	United States
31.26	9,590	Sydney (VK2ME)	New South Wales
31.297	9,585	Daventry (GSC)	Great Britain
31.33	9,570	Boston (WIXAZ)	United States
31.38	9,560	Zeesen (DJA)	Germany
31.46	9,530	Schenectady (W2XAF)	United States
31.545	9,510	Daventry (GSB)	Great Britain
31.55	9,510	Caracas (YV3BC)	Venezuela
37.33	8,035	Rabat (CNR)	Morocco
38.47	7,797	Radio Nations (H8P)	Switzerland
42.92	6,880	Oslo (LCL)	Norway
43.86	6,840	Budapest (HAT2)	Hungary
45.38	6,610	Moscow (RW72)	U.S.S.R.
46.53	6,447	Barranquilla (HJIABB)	Colombia
46.66	6,425	Boundbrook (W3XL)	United States
48.86	6,140	Pittsburgh (W8XK)	United States
49.02	6,120	Wayne (W2XE)	United States
49.07	6,110	Halifax (VE9HX)	Nova Scotia
49.08	6,112	Caracas (YV1BC)	Venezuela
49.15	6,110	Chicago (W9XF)	United States
49.15	6,110	Boundbrook (W3XAL)	United States
49.19	6,095	Bowmanville (VE9GW)	Canada
49.23	6,090	St. John (NB) VE9BJ	Canada
49.31	6,080	Chicago (W9XAA)	United States
49.39	6,070	Vancouver (VE9CS)	Brit. Columbia
49.39	6,070	Maracaibo (YU5BMO)	Venezuela
49.4	6,073	Skamlebaek (OXY)	Denmark
49.47	6,065	Nairobi (VQ7LO)	Kenya Colony
49.48	6,060	Byberry (W3XAV)	United States
49.48	6,060	Mason (W8XAL)	United States
49.5	6,060	La Paz (CP5)	Bolivia
49.59	6,050	Daventry (GSA)	Great Britain
49.83	6,020	Zeesen (DJC)	Germany
49.93	6,005	Montreal (VE9DR)	Canada
50.0	6,000	Moscow (RNE)	U.S.S.R.
50.26	5,969	Vatican (HVJ)	Italy

Long-wave Stations

Metres	Kilocycles	Station and Call Sign	Country	Power (Kw.)
1,107	271	Moscow (RCZ)	U.S.S.R.	100
1,186	253	Oslo *	Norway	600
1,224	245	Leningrad *	U.S.S.R.	10.0
1,250	240	Vienna (Exp)	Austria	3.0
1,261	238	Kalundborg	Denmark	30
1,304	230	Radio Luxembourg	Grand Duchy	200.0
1,345	223	Kharkov *	U.S.S.R.	35.0
1,389	216	Motala	Sweden	30
1,395	215	Eiffel Tower (Paris)	France	8.0
1,402	214	Warsaw *	Poland	120
1,442	208	Minsk	U.S.S.R.	35.0
1,500	200	Daventry National	Great Britain	30
1,554	193	Ankara	Turkey	7
1,570.7	191	Deutschlandsender	Germany	60
1,621	185	Istanbul	Turkey	5.0
1,639	183	Reykjavik	Iceland	21
1,648.3	182	Radio Paris	France	50.0
1,724.1	174	Moscow (1)	U.S.S.R.	500
1,807.2	166	Lahti	Finland	40
1,875	160	Kootwijk (Huizen prog.)	Holland	50
1,875	160	Brasov	Roumania	20.0
1,935	155	Kaunas	Lithuania	7

* Will probably be heard testing on another wavelength after broadcasting hours.

Full details of a portable for hikers in next week's "A.W."

Notes and Jottings

TO illustrate a test report in our issue of April 21 on a non-terminal version of the new Clix nine-pin chassis-mounting valve holder, we inadvertently used a photograph of a Benjamin nine-pin holder of similar type.

We take this opportunity of pointing out

Clix nine-pin chassis-mounting valve holder

Benjamin nine-pin chassis-mounting valve holder

that Clix valve holders are still made in the familiar style adopted some years ago.

The Benjamin nine-pin valve holder is available to constructors at 10d.

◆ ◆ ◆

The Hull Short-wave Radio Society had an attendance of twenty-one members at the fourth meeting. All newcomers are welcomed, and may attend the lectures without obligation to join the society. Morse classes are held once a week, and during the summer season field days are to be held. Any reader interested should communicate with the Hon. Secretary, R. G. Drewery, of 274 Park Avenue, Hull.

◆ ◆ ◆

Please send us your report on the Pentaquester as soon as you have built the set up and got it going—we shall be interested in your results.

Short-wave Interval Signals

Continued from page 481

The British station usually opens the broadcast with a high-pitched whistle and for the present, at least, uses the same signal as the London studios; namely, a gramophone record of the chimes of Bow Bells.

The German Kurzwellensender, at Zeesen, does not appear to possess a distinctive signature tune; but takes that of the Deutschlandsender, Berlin, or any of the other Reichssenders from which a concert is relayed.

Skamlebaek, in its turn, solely relying on Copenhagen, gives the identical musical-box melody, a Danish folk song of the twelfth century; and Jelöy, the short tune familiar to all listeners to Oslo.

Call of the Cuckoo

Poznan (Poland) retains the tick-tock of the metronome; CNR, Rabat, also makes use of a similar instrument, but CT1AA Lisbon shows more originality with its cuckoo call. HVJ, Vatican, on both channels used for broadcasts, is quickly recognised by the fact that there continuously exists the ticking of the studio clock as a background to the speech heard.

So far, the others do not seem to have adopted any individual signal; PHI, Huizen, however, also uses a metronome and from Moscow you are given the *Internationale* at the beginning and end of the broadcast.

If we turn to the United States, we find that all stations taking the N.B.C. programme—such as the Saxonburg, Schenectady, Boundbrook, and Millis transmitters—give the same three xylophone-like notes; you will also pick them up through W9XAA (Chicago), W9XF (Downer's Grove), and W8XAL (Mason).

From the Columbia system, according to my log, I cannot find any special musical call.

Some of the Canadian studios have adopted a similar idea. VE9JR, Middlechurch, on 25.58 metres, which takes its broadcasts from CJRC, Fleming (Sask.), sometimes opens up by playing *O Canada*, and between items strikes a gong four times. VE9HX, on 49.07 metres, relaying CHNS, Halifax, precedes its announcements by four strokes on a similar instrument. VE9CS, on 49.39 metres, as the short-wave mouthpiece of CKFC, Vancouver, uses two bells for the same purpose.

Of late the South American studios, whose broadcasts are also transmitted on short waves, have offered us a number of diverse signals. HCJB, Quito (Ecuador), on 73 metres, gives its calls in Spanish and English, punctuating them with a two-tone chime; HKB, Tegucigalpa (Honduras), when working on 49.96 metres, emits a cuckoo calls, three times, somewhat similar to that heard from Ljubljana on medium waves; YV5BMO, Maracaibo (Venezuela), on 49.39 metres, strikes a gong before announcing and YV1BC, Caracas (49.08 metres), gives four chimes every fifteen minutes.

Bugle Call—And Bells

A bugle call has been adopted by HKC, Bogota (Columbia), on 48.33 metres; and from the Radio Club of Brazil for its transmission on 36.65 metres you will hear three bells.

Finally, VK2ME, Sydney (31.28 metres), is easily identified by the peculiar cry of the kookaburra bird, or laughing jackass; sometimes when distorted it might be taken for the yapping of a small dog; VK3ME, Melbourne, has no particular signal, but opens its broadcast by relaying clock chimes.

With the steady growth of regular transmissions on wavelengths below 100 metres, we shall probably see a wider adoption of the interval signal, as has been the case with European broadcasts on the medium and long-wavebands. Undoubtedly, they afford considerable help in logging a station as in most instances musical notes, such as bells, gongs, or chimes, are very clearly received, even when speech is either distorted or approaching inaudibility.

French Grievances

By JAY COOTE

IN these notes on previous occasions I have frequently forecast that France would not give up the Eiffel Tower channel without a hefty struggle, and recent articles in the Paris press tend to show that we may expect some trouble from that quarter.

The argument is that the existence of this station is threatened by its decrease in power and proposed change to a low wavelength. French listeners generally consider that the Lucerne Plan did not offer sufficient compensation for the withdrawal of this famous transmitter from the long waveband.

The associations responsible for broadcast from that station have appealed to the authorities to grant a channel in the region of 500 metres, and to permit the Eiffel Tower, to work at its normal power.

In the meantime, be it said, Radio Agen, dissatisfied with its lot, has jumped the Riga channel; namely, 514.6 metres, and the state authorities do not appear to have raised any objection. This is the third private transmitter which has arbitrarily chosen its own wavelength in France.

The true grievance of the French listener lies in the fact that, although the French state did exceptionally well at Lucerne, so far none of the high-power transmitters are yet on the air and consequently envious eyes are cast on the stations in neighbouring countries. So long as these proposed transmitters are not working, France cannot reap the full advantage of the channels allotted to her by the Lucerne Plan.

But if the Eiffel Tower is not definitely withdrawn in June, no improvement can be carried out on the long waveband, and that's that.

◆ ◆ ◆

The Russian stations—in particular, Moscow and Leningrad—are usually solely associated with propaganda talks in various languages, with, as a fill-up, balalaika orchestras. This idea, however, is incorrect, as from both on many nights I have received excellent concerts.

The period May 20-30 this year is to be devoted at Leningrad to a musical festival in which a specially augmented symphony orchestra will take part. As the concerts are to be directed by not only the best Russian, but also some of the most renowned foreign conductors, it may be worth while noting the date in your diary.

Most of the performances will be broadcast through the Moscow high-power transmitter.

All the German Reichssender, with the exception of Frankfurt-am-Main, are to be increased in power to 100 kilowatts this year. Berlin, Hamburg, Leipzig, Munich, and Stuttgart (Mühlacker) are already in that class. Langenberg, now styled Reichssender Coln, is to be provided with a new aerial and converted without delay; similar work on Breslau has already been started and Königsberg (Heilsberg) will follow suit.

This year also the Deutschlandsender will blossom out as a 100-kilowatter. The power of Cassel, Hanover, and Bremen has already been increased; similar improvements are to be carried out at Stettin and Königsberg, and the construction of the new relay at Coblence on the Rhine is already in hand.

◆ ◆ ◆

If you care to tune in to 476.9 metres—namely, between Prague (1) and Brussels (1)—at about 11 p.m. (23.00), you should pick up tests by Lisbon's new transmitter.

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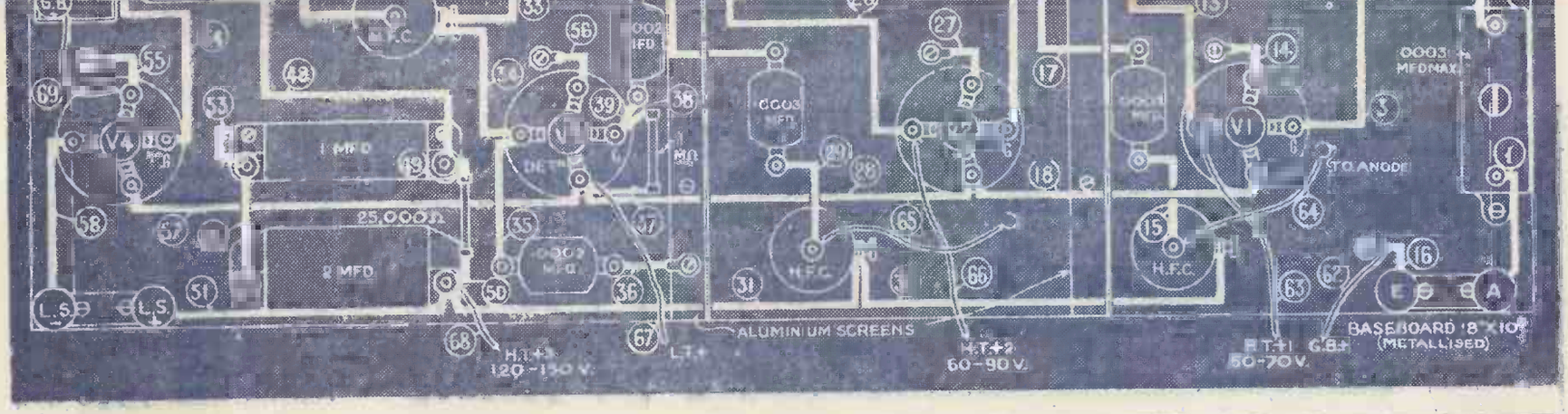

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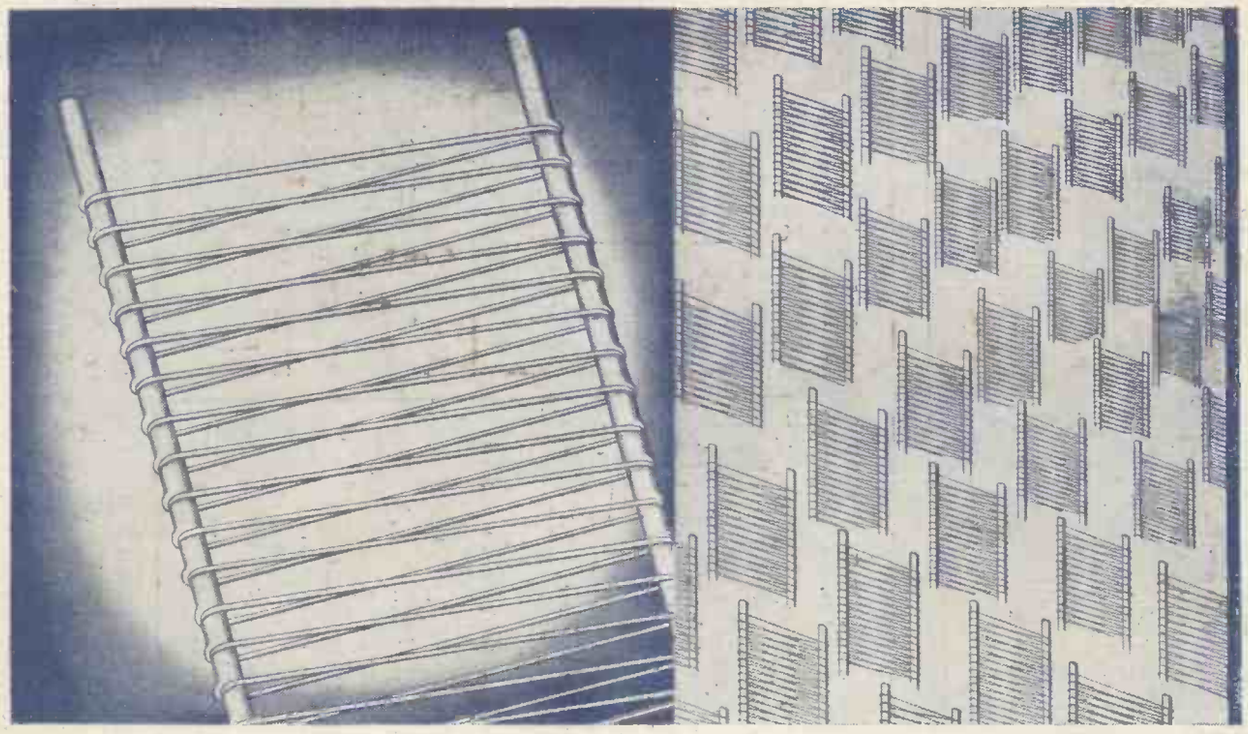

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News and Gossip of the Week

The Opera

FOR the first time the B.B.C. is making use of its new moving-coil microphones at Covent Garden. No doubt you have noticed the improved quality?

Quite a nest of "mikes" they need. Some are in the footlights, others in the prompt corner. Then there are microphones fixed to the orchestral rail and at the sides of the proscenium.

Keeping in Touch

YOU may wonder how they manage to keep the artists in touch with the microphones as they wander about the stage singing their hearts out.

It is all arranged for. Below the stage is the control point, and an engineer keeping his hands on the mixers and faders.

From that point go the leads to all the microphones. A B.B.C. man in the wings keeps telephoning down to the control engineer as an artist gets on the move, thus warning him of the microphones' needed to be "faded up."

400 Pirates a Month!

THAT is the startling figure revealed by the Post Office as a result of their arrival in Scotland. That pirating is rampant is now certain.

The P.O. is, therefore, determined to comb the whole of Scotland, thus extending its previously arranged tour of the big cities.

All of which should gladden the heart of the Rev. Melville Dinwiddie, the Scottish Regional director. For did not Sir John Reith exhort him to gather unto himself no less than one million listeners?

At Tatsfield

GARDENING hopes among the Tatsfield engineers have been damped for the time being by the arrival of sundry lorries with building contractor's men.

They are adding a new boiler house and a garage to the B.B.C. building on the hill. Trenches and ruts are bringing tears to the eyes of the gardening-minded B.B.C. men.

Miniature Television

DID any of you lookers see the image of a lancer on horseback the other night? It was only a *toy soldier*, put over to you on the miniature television transmitter.

This opens up interesting possibilities. Up to now the miniature affair has been used only for captions and drawings.

By the way, on the big television set they are now using giant new photo-electric cells, which are supported on a sort of scaffolding attached to the ceiling.

That Committee

ISN'T it good news that the Government is to appoint a special Committee to investigate television possibilities? Perhaps at last something sensible will be done. High time, too, for interest in the subject is greater than ever.

On page 487 we review the position in a general way.

"It" Voice Again

GRETA KELLER, the girl with "it" in her voice, will be back at the B.B.C. microphone on June 1. She has been in Hollywood since we last heard her.

Ross and Sargent (her husband, the latter) will appear with her. So will Geraldo and his sweet music.

What about Lisburn?

NORTH IRELAND listeners are getting restive again over the delay in their new high-power transmitter.

We hear that the B.B.C. is waiting upon its architect, who has in hand the design of a suitable building to house the plant.

When that is ready, the site at Lisburn, that is now only discernible by tent-pegs, will grow rapidly into a fully fledged 70-kilowatter.

John Henry Again

RE-DISCOVERED by the B.B.C. in its recent cavalcade of the stars, John Henry was dated again for May 4.

Many listeners are wondering now why the B.B.C. ever allowed this comedian of parts to drop out of broadcasting.

Aberdeen Improvements

IN readiness for North Scottish Regional, the Aberdeen relay station has been extending itself.

Two studios, one for talks and another for drama, are already finished, complete with dramatic control panel. The third new studio for band shows is in preparation.

Aberdeen will have more work to do when the new Scottish station opens—hence the present extensions.

Five "Mike" Types

ANNOUNCERS have to watch their voices when they speak into the Broadcasting House microphones these days. For there are no less than five different types, each needing individual treatment.

Engineers always aim to have to tone down a voice rather than amplify it from the microphone. Too much amplification, you see, brings up the background.

But the announcers must not, in an endeavour to gratify the engineering demands, speak too closely to the microphones, or revolting sounds of breathing and moving lips are heard.

This exclusive photograph shows Elsie and Doris Waters at home with their Ekco radio gramophone. "Gert" and "Daisy" are always welcome additions to any broadcast

Big Tom "O.B."

FOR the first few broadcasts of Big Tom, "O.B." lash-up apparatus was used. That gave the engineers time to transfer the gear from Westminster to St. Paul's.

You would not notice any difference, of course. With the permanent apparatus the engineers can switch the bells microphone on and off from the control room.

Kentucky Derby

FOR the relay of this historic American race the B.B.C. was given the choice of several short-wave stations.

Tatsfield made use of 2XAF on 31.48 metres, and W8XK on 48.86 and 25.27 metres.

Slightly Mixed!

IN the May 20 relay from Brussels studio, one item in the programme reads "mixed orchestra."

When the B.B.C. asked what this meant the Belgian broadcaster replied: "An orchestra with a saxophone."

Another dig at the saxophone—or not?

B.B.C. at Olympia

TO seat 3,000 people, a huge theatre will be built this year by the B.B.C. at Radiolympia.

Big vaudeville shows will be presented to visitors and broadcast to listeners, as last year. The accommodation will be fifty per cent. more than before.

Portability

WE all know the joke about the portability of "portables," but this week we are able to give you details of a set that really can be carried about. With a short aerial and some kind of earth this little set really does bring in stations well.

And if you are reasonably close to a broadcasting station, the set will, of course, work a loud-speaker.

Short-wave Record

YOU may or may not be a short-wave fan, but even if you aren't, you cannot fail to be intrigued by the log of 117 stations in five days, reported on page 502.

Readers' Views on This and That

Listeners' Letters

STRANGE MIX-UP

To the Editor, AMATEUR WIRELESS.

AFTER hearing Big Ben's chimes at midnight last night I was surprised to hear faintly an announcer give the wavelengths of two Empire short-wave stations and until the carrier of Daventry was shut off I continued to hear the short-wave programme.

Knowing, of course, that it could not possibly be the fault of the receiver, I was wondering whether the National aerial was picking it up from the nearby short-wave aerials. It would be interesting to know other readers' opinions.

G. F. BROAD.

Tunstall. [1073

1934 CENTURY SUPER

I HAVE no doubt that you will be interested in the results I have obtained with "The Experimenters'" 1934 Century Super described in AMATEUR WIRELESS.

The original Century Super gave me very good results for two years, until the new high-power stations came along, and then the harmonics and whistles made the set almost useless. As I had some spare parts by me, I made up the revised version and right away obtained very good results indeed. The selectivity and volume were better than with the old set, while the self-adjusting volume control was a great help.

My wife had a little trouble with the tuning, owing to there being two wave-change switches, so I obtained a combined oscillator and band-pass unit from Wearite and used this instead. This reduced the wave-change switching to one simple operation and made the set much easier to handle.

A plan view of the modified 1934 Century Super used by a Hitchin reader (see No. 1074)

As my aerial system is rather bad and I do a lot of daylight listening, before fixing the set up permanently in the cabinet I decided to try a few experiments on my own to see if I could improve the daylight range.

I tried various valves and other components without making any noticeable improvement, and then I hit upon a new first-detector circuit which doubled my daylight range and gave me many more stations after dark. The set also had a much more lively feel about it and, as the volume control need never be more than half way on, the background noise was very much reduced.

I have made a rough sketch of the new circuit, which you will see is quite conventional, as it does not mean altering half the set. Readers who have made the Century Super may be interested in this alteration as it gives such wonderful results.

You will see that I have applied 60 volts to the screen of the screen-grid first-detector valve, instead of coupling it to the grid of the oscillator valve as before. The oscillator valve is fed from the maximum high-tension voltage through a resistance of 10,000 ohms.

With this circuit the screen-grid valve passes about 2.5 milliamperes, which I find is better than using it as a double-grid valve, when it only passes about .2 milliampere. Besides this low current is hard to get if you have a mains unit.

With this modified circuit I can now hear a minimum of thirty stations in daylight and round about a hundred after dark. You will be interested to hear that I have heard several American stations between midnight and 1 a.m.

J. G. HOWARD.

Hitchin, Herts. [1074

"RADIO PESTS"

WHY does Thermion assume, as he does in his paragraph "Radio Pests" (page 444, April 28), that listeners are hostile to the "pirate" broadcasters?

I had the pleasure of listening to one of them when in London recently and found the whole programme very entertaining, which is more than can be said of the B.B.C. programmes.

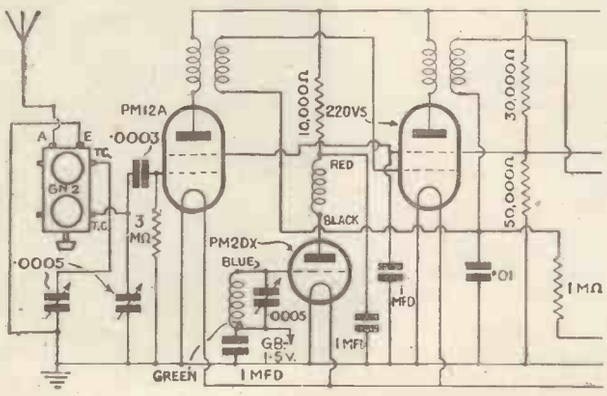
The friend with whom I was staying told me that everybody he knew was tuned-in to the "pirate" in preference to the B.B.C. stations. The "pirate" quite clearly stated that he was on the air to give listeners a more entertaining programme than the B.B.C. Why, then, confuse the issue by references to "worth-while experiments"?

I think that the article shows a very narrow and intolerant attitude on Thermion's part.

F. MCARDLE.

Great Yarmouth. [1075

[Thermion was quite justified in his remarks about pirate broadcasters. We all know how chaotic ether conditions have become in recent years owing to lack of effective international control. If, added to existing troubles, we had unlimited transmissions from "private" broadcasters (whatever the value of their programmes) reception conditions would be intolerable to most listeners.—ED.]



Modified oscillator coupling for the 1934 Century Super suggested in letter No. 1074

HIGH-TENSION BATTERIES

HERE is a point regarding "long life" high-tension batteries that I have not seen mentioned.

Some time ago I bought, at a cost of £1 4s., two 60-volt super-capacity batteries made by a well-known firm. I expected a good six or nine months' run.

Less than four months afterwards they were worth about 10 volts 0 milliamperes apiece.

On looking inside I discovered that some of the cells had rotted away.

These batteries had been kept in a dry room and were quite new when purchased. Were they worth twenty-four shillings?

F. M. WALTER.

Seaford, Sussex. [1076

TWENTY-FOUR HOUR TIME

ALTHOUGH I have a great aversion to writing, I feel bound to write this in support of the introduction of twenty-four-hour time by the B.B.C.—the new system is definitely better than the old one, and its introduction is long overdue.

The B.B.C. is, in this case, doing good work in "educating" the public to the new, and better, system; the word "educate" really seems to be the wrong one, as the very slight mental effort involved in making the conversions is really rather good fun and, personally, I feel sorry to think that very soon the novelty will "wear off."

Already I am beginning to take the "new" times for granted; I expect the first news at 18.00 and my favourite programme item at about 22.30, and that is all there is about it.

The attempts by the B.B.C. to educate the public by the *contents* of their programmes (musically, for example) are quite another matter, however!

May I take this opportunity of thanking you for the interest and pleasure which I derive from AMATEUR WIRELESS?

Although I cannot claim to be a reader "from the first number," I have never missed a single issue since 1923—more than ten years—even when, as at present, away from home on a visit to friends.

B. O'NEILL.

Southport. [1077

REAL-QUALITY RECEIVER

WITH reference to the interesting articles on real quality, by Mr. Bonavia-Hunt, appearing in your excellent paper, I am writing to inquire if it would be possible to give your readers an opportunity to build a local-station quality set designed by Mr. Bonavia-Hunt.

I ask you this question because I feel sure there are many amateurs, like myself, who desire to build such a set, to give quality only on the locals and from gramophone records, but possibly have not yet attained sufficient technical knowledge to put a set together without a complete wiring and component diagram, although after reading the real quality articles realise what is required to obtain their object, that is quality before anything.

Thanking you for catering so admirably for the *real music lover*, and trusting to see full details of "his" set appear in AMATEUR WIRELESS in the near future.

Best wishes for your paper.

FREDERICK G. MILLER.

Streatham, S.W.16. [1078

[Such a set as suggested in the above letter is already under discussion, and details will be published at the conclusion of Noel Bonavia-Hunt's real-quality series. In the meantime many readers will be able to try out some of the suggested schemes for themselves.—ED.]

TELEVISION Is in the News!

The Government Takes Action

THE P.M.G. announces that a committee is to be appointed to investigate the present position of television, and to advise the Government as to the possibility of providing a public service of picture programmes.

This action is approved on all sides. Mr. Baird says: "The time is ripe to settle future policy, and the appointment of a Government committee is a useful step in the right direction."

Mr. Sterling, managing director of Electrical and Musical Industries, whose 120-line system is now under test at the B.B.C., is of opinion that "if the committee works as it should, it will succeed in placing Britain in the forefront of the television industry."

The listening public are also keenly interested. For years they have been looking for television to take its place, side by side, with broadcasting. Unfortunately, for a number of reasons, the whole position seems to have developed into a bit of a muddle.

However, we may soon expect to get an authoritative opinion as to what the future really holds "straight from the horse's mouth."

Baird photo

J. L. Baird demonstrating his first tri-colour television in July, 1928

The committee will find its hands pretty full. In the first place it must not be taken for granted that the B.B.C. will necessarily be given full control of televisoin, though of course the indications point that way.

The Wireless Telegraphy Act gives the P.M.G. a monopoly over all wireless "communications." But the Act was passed some time before television had reached a practical stage of development. Also, there is room for argument as to whether television is a wireless "communication." So that from a strictly legal point of view it may not yet form part of the P.M.G.'s preserves.

New Legislation

If new legislation is required to put this point beyond dispute, it will be part of the committee's duties to make the necessary recommendation.

Assuming that the P.M.G. is legally in charge of television, another point to decide is who is to have the job of running it as a public service.

The present experimental transmissions are being conducted by the B.B.C. because, as it happens, the programmes are radiated on a medium wavelength and so it is possible to use an existing broadcast station.

But suppose the committee decides that in future the television service should be confined to the ultra-short waves, so as to avoid interference with broadcasting. This will involve the getting-up of a new system of short-wave transmitters—each within comparatively close range of the larger centres of population.

Even then the B.B.C. would probably be given control of both systems, but, on the other hand, they might not.

To some extent the point is bound up with another decision which the committee will have to make, and that is to advise the Government which of the rival systems of television is best fitted to provide programmes of definite entertainment value at the most reasonable cost.

The main struggle will be between the cathode-ray tube and other systems which employ mechanical scanning.

The cathode-ray tube has, so far, won its spurs on high-definition television, but mechanical scanning has certain advantages which cannot be ignored when it comes to cost and simplicity of operation.

The cost of a rotating-disc scanner is known, whereas that of a cathode-ray-tube receiver, complete with synchronising equipment, is still uncertain—at least as a mass-production job. There is also the new Scophony system to be taken into account; and other systems will no doubt put in a claim to be heard before the committee.

One point which should be taken into account in weighing up the merits of the various systems is that of flexibility.

Suppose, for instance, the committee decide that a sixty-line scanning frequency is good enough to make a beginning. It may, of course, be more, though it will hardly be less. But whatever scanning speed is taken as the minimum, under present conditions, it is bound to be increased as time goes on and further improvements are made.

The receiver which is best adapted to keep pace with this sort of progress, without having to be completely dismantled and rebuilt, is the one which should get the highest marks.

"Remedying Picture Faults"
See
TELEVISION for May —1s.

Photopress photo

Sir Kingsley Wood, the Postmaster-General, interested in Post Office short-wave gear

Three-colour Television

THE possibilities of colour television were discussed by J. C. Wilson in a paper read before the Royal Society of Arts on Wednesday, May 2. J. L. Baird, managing director of Baird Television, Ltd., presided.

The problem of transmitting television images in colour is not a new one, but it is not until comparatively recently that results have been achieved, said the lecturer. In 1928 J. L. Baird produced colour pictures over a short line circuit, using a single bank of gas-filled potassium photocells, and demonstrated his results at the meeting of the British Association held in Glasgow that year. A little later, Dr. Ives, working in the Bell Laboratories in America, produced coloured television images using a composite bank of photocells of differential colour sensitivity.

Mechanical Scanning

In addition to these, many other systems have been described, chiefly in the specifications of Letters Patent, but the nature of these schemes has been purely theoretical; the present system is the only one developed for use. Both Baird and Ives used mechanical scanning and reconstituting devices. In some systems a colour-mosaic screen is interposed in the path of the scanning-beam at some suitable point, or, alternatively, adjacent lines of the traverse are differently coloured.

In these types of system the fine-structure of the picture is not truly coloured, but the impression of coloured reproduction depends upon the inability of the eye to discriminate between a patchwork of primary colours in small discrete areas, and the hue which would be formed by, as it were, smearing them.

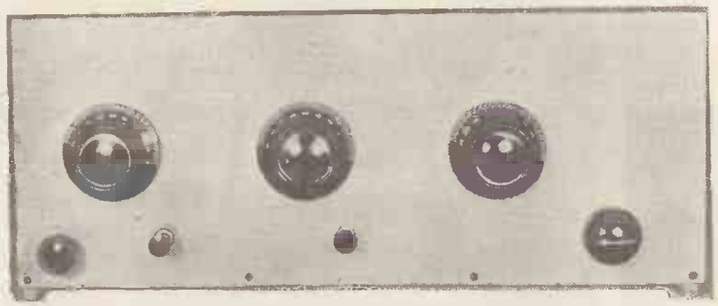
In others the coloured effect is obtained by carrying out a whole scan in one homogeneous, or effectively homogeneous, colour and then repeating the process within the period of retentivity of the eye in another colour, the quickly repeated coloured impressions being superposed, of course, by the psychological effect of persistence of vision.

Operating the LUCERNE MAJOR

"The Experimenters" Give Further Hints about Their New Design

BY now you will probably have heard, or even tried, the Lucerne Major. Much to our surprise the three tuning controls do not appear to be any obstacle to the even merest amateur and many are trying their luck with this experimenters' set—and achieving good results.

Frankly, although many readers asked for a two screen-grid set with separate tuning, we did not feel that they quite realised what they were letting themselves in for. Apparently we were wrong and the seeming disadvantage of three controls is more than counterbalanced by the fact that all of the old tuning condensers can be dug out of the junk box.



Controls of the Lucerne Major, of which full constructional details were given last week. You can build it "from scratch" for 57/6

We were wrong on another point with this set. The triode output valve is, according to our ideas, better than a pentode, for it is much more economical in operation and as from time to time readers have told us that they do not want exceptional volume we thought that we were quite safe in using this type.

Converting to Pentode Output

Judging from our mail this week, at least half of our followers now want a pentode output valve, so to stop further correspondence here are all the details to enable you to convert the Major to pentode output.

Actually the alterations are very simple indeed, merely a five-pin valve holder, 5,000-ohm resistance, 1-microfarad condenser, and four short additional wires, but in case you have any doubts as to what we mean we have altered the blueprint.

First of all remove the last four-pin valve holder and all its associated wiring. Screw down the new five-pin holder in its place and reconnect up the wiring just as before. This leaves one blank terminal on the valve holder, that marked c.

Connect to this terminal one side of the 5,000-ohm fixed resistance and one side of the 1-microfarad fixed condenser. The remaining side of the fixed resistance is joined to the positive loud-speaker terminal. You then have one more wire to connect—the other side of the fixed condenser, which goes to earth or low-tension negative.

The easiest way of making this connection is to screw the wire down under a wood-screw head so that it makes good contact with the metallised baseboard.

That is all there is about it, except to adjust the grid bias to suit whatever valve you decide to use. Make up your mind what you want — either volume and high anode current or moderate power with economical running costs.

Let us take two good examples. A Mazda Pen220A will give an output of well over 1,000 milliwatts with 150 volts high tension and 9 volts grid bias. Under these conditions the anode current will be 18 milliamperes.

On the other hand, a Mazda Pen220 will give 300 milliwatts for 5 milliamperes (with 120 volts high tension and 4.5 volts grid bias). Quite a difference, isn't there, but there is quite as much difference in the output.

So there you are, either of these valves gives the maximum results in its class, so remember you can use the Mazda Pen220A with 150 volts high tension and 9 volts grid bias or the Mazda Pen220 with 120 volts high tension and 4.5 grid bias. Another point to remember is that the output from the Pen220A is just about enough to modulate the neon lamp of a disc television receiver.

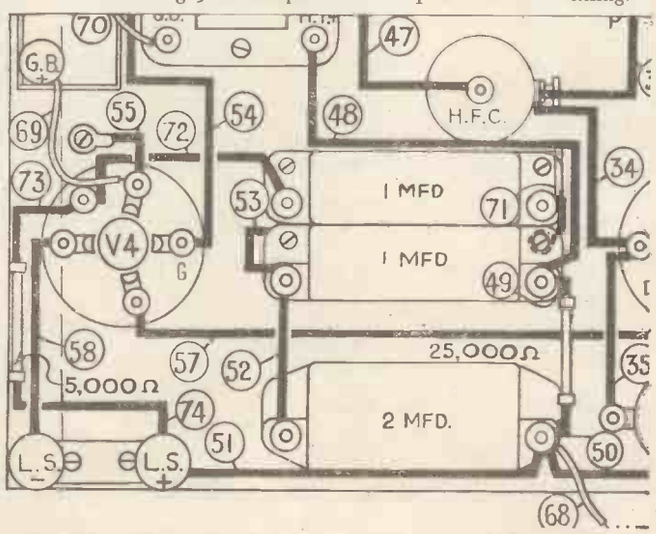
Now let's get back to operating the Major.

Plug in the four valves in the following order: On the extreme left (looking from the front) the variable-mu screen-grid valve. Follow this with the straight screen-grid and then the detector.

Please yourself about the power valve. The original valve was a triode, but you can use a pentode instead if you like.

With these valves the anode currents should be somewhat similar to the figures we obtained with the original set, so here they are for your guidance:

The screens of the two screen-grid valves take 1 milliampere each, while the anodes take only between .25 or .5 milliampere each. Between 4 and 5 milliamperes flow in the anode circuit of a PM2DX detector valve, while our original PM202 power valve took 9 milliamperes, but your reading will depend on the valve used. The total is approximately 16 milliamperes, allowing 9 milliamperes for the power valve.

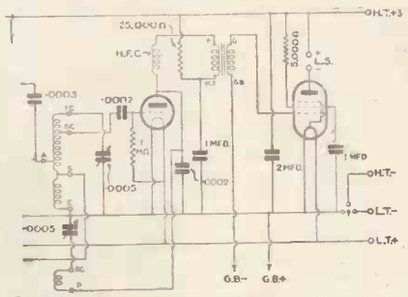


How the wiring is altered for pentode output. A complete full-size blueprint can be obtained for 1s. 6d., post paid; No. AW433 with triode output and No. AW433a with pentode output

There are four high-tension wander plugs, three positives and a negative. Apply to H.T.+1 between 40 and 60 volts and to H.T.+2 between 50 and 80 volts. H.T.+3 is the power tapping and normally goes to the maximum (or 120-volt) tapping. If you can afford the extra high-tension current use up to 150 volts, providing the grid bias is increased in accordance with the makers' instructions.

As a general rule the more high tension you use—up to 150 volts—the better will be the quality, but if you are only going to run the set at half volume 120 volts will be ample.

Now about those three tuning dials. They are not as difficult to manage as might be expected. The one on the right-hand side (tuning the detection-grid circuit) is very sharp indeed, while the one that tunes the aerial is comparatively fairly flat.



Circuit of the Lucerne Major adapted for pentode output. A revised list of parts appeared on page 507

The best plan is to tune the set up in stages. First of all connect the aerial to the wire that goes to the top of the second screen-grid valve anode. This makes the receiver into a plain two-valver. If the volume on the local station is up to standard, leave it alone. If, on the other hand, you want more volume, increase the number of turns on the aerial coupling coil by two or three. This will have the desired effect.

Should the tuning be on the flat side—as it would be if you are very close to the local station—take off a turn or two from this coupling coil until the selectivity is to your liking.

Then connect the aerial to the top of the first screen-grid valve, making the set into the equivalent of a Lucerne Ranger and repeat the experiments you have just made to the third coil, if it needs altering.

Finally turn your attention to the aerial coil. Join the aerial lead-in wire to the aerial terminal and adjust the preset to give sufficient selectivity. Don't make it more selective than you need as this may cause an unnecessary decrease in volume; on the other hand, if the tuning is too flat, the local station will be interfered with by powerful foreigners.

That's all the adjusting you need do. The tuning dials should all be rotated in step, paying most attention to the detector-grid tuner as this is always the most selective.

The knob on the extreme left controls the potentiometer that varies the grid bias to the first screen-grid valve. This controls the gain of that stage and prevents overloading of the detector stage. When the second switch is pulled out the set tunes to the medium-waves.

What Is This DECIBEL Business?

M. G. SCROGGIE, B.Sc., A.M.I.E.E., Explains the Latest Radio Unit

WIRELESS ENGINEERS don't seem to be able to get very far without talking about *decibels*. This is not one of those new words of which one can make a shrewd guess as to the meaning—"startability," for example. It looks rather like one of those Latin words which enable doctors and botanists to talk about ordinary things and still appear cleverer than other folk.

If the technical people are asked straight out "What *is* a decibel?" they make good their escape in a fog of mathematical ratios, logarithms, and exponential curves.

Intelligible Equivalent

When the plain man asks the surgeon what he means by saying he has sustained a fracture of the tibia, he feels he has gained a satisfactory answer when he is told he has a broken leg. And he expects to be able to get some intelligible equivalent of such a commonly-used technical term as the decibel.

A decimetre, for instance, is close on 4 in.

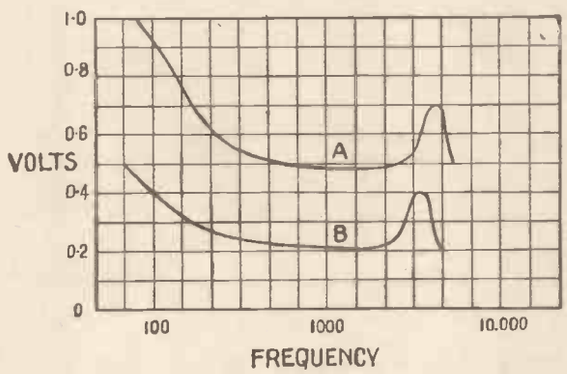


Fig. 1.—Characteristic curves of two imaginary pick-ups according to a voltage scale

Is there no equivalent like this in the more homely system of measures?

Well, there is; if you are a musician. You are accustomed to talking about tones and semitones, and you know that six tones or twelve semitones make one octave. When you go an octave up the musical scale, the pitch, or frequency, of the sound becomes double what it was.

In the same way, if you double the amplification of a receiver or of a valve you might express it as adding one octave of amplification. The decibel is a smaller unit, just as the tone is a smaller jump in musical pitch than a whole octave. It happens that a decibel also is one-sixth of an octave.

So whenever you are told that the amplification has gone up 6 decibels you know that the voltage of the signal has been doubled. It follows that, if the amplification goes 6 decibels *down*, the signal voltage is halved.

At first it might seem that as we have been relating decibels to a scale of volts, it would be simple to say that so many decibels equal 1 volt. But if you think about it a little more you will see that it isn't quite so simple as that.

Suppose we start with a receiver that is delivering 1 volt to the detector when tuned to London Regional. And suppose the variable-mu volume control is then turned round farther until the detector is getting 2 volts. That is plus 6 decibels, as we have seen. And we have added 1 volt to the signal strength at that point.

Now turn up the wick a bit more until we are getting another volt at the detector —3 volts altogether. Is that another 6 decibels? Not at all! The last jump has been from 2 to 3, and 3 is *not* double 2. Another 6 decibels (written 6 db) would bring us to 4 volts—an increase of 2 volts. So 6 db was 1 volt before, and now it is 2 volts. It is no use trying to find out how many db go to make a volt!

Perhaps you are asking: why make things so complicated? Aren't volts good enough? The answer is: no, they are not; that is, if you really want to know anything useful. Look at it like this: if somebody told you he had made some improvement to his set which had boosted the signal strength by 1 volt, what would you know about it?

You would want to ask what the voltage was to start with. And quite right too; for if originally it was 10 volts another volt wouldn't be much to shout about. But if it used to be 1 volt, it would be a considerable achievement to have doubled the signal.

And if he originally had only .01 volt at that point, his improvement would have been a very striking one indeed—to have brought the strength up no fewer than 101 times.

So you see that you learnt nothing about the worth-while-ness of the improvement by the voltage-increase information. Now if your informant had got the decibel habit, he would have told you his increase was .8 decibel in the first case, 6 decibel in the second, or 40.1 in the third—a method of reckoning things that really tells you something.

You are supposed to know that 1 decibel is about the least change that even a trained listener can detect, and that therefore an improvement from 10 to 11 volts is not worth talking about; but that 6 decibel, from 1 volt to 2, is really stuff.

Other Voltage Measurements

Another thing; we have been discussing voltage at the detector. Suppose we had measured our voltage somewhere else—say at the grid of the preceding valve. While our detector voltmeter was registering a rise from 1 volt to 2, an imaginary instrument at the other point might perhaps show a voltage going up from .02 to .04. The actual rise in volts would be only a fiftieth of that at the detector, but according to the definition of a decibel the change would clearly be 6 decibel—just the same as at the detector.

So the place at which the change is measured does not affect the result when it is stated in decibels — another point to their credit.

Having seen that there may be some sense in the thing after all, you will be wanting to know a little more about how to reckon in decibels. We have discussed steps of 6 decibel, because it is easy to think of doubling a number. What about half as much again, or a 50 per cent. rise? Is that 3 decibel?

Suppose for the moment that it is. Another 3 decibel should bring us to 100 per cent. above the original figure. But 50 per cent. on top of an amount which is already 150 per cent. in

RADIO'S MYSTERY HOUSE

Here is a photograph of Dawley House, close to the great E.M.I. factory at Hayes, where Marconiphone men go when they want to work undisturbed on important research.

It has some fine historical associations. Lord Bolingbroke lived there is 1726 and Pope, the poet, often stayed with him.

The house stands in its own grounds and is far away from the hustle and rush of factory activity.

COMPARATIVE TABLE FOR EASY REFERENCE

Decibels	Voltage (or current) ratio		Power ratio	
	Up	Down	Up	Down
1	1.122	.891	1.259	.794
2	1.259	.794	1.585	.631
3	1.413	.708	1.995	.501
4	1.585	.631	2.512	.398
5	1.778	.562	3.162	.316
6	1.995	.501	3.981	.251
7	2.239	.447	5.012	.200
8	2.512	.398	6.310	.159
9	2.818	.355	7.943	.126
10	3.162	.316	10	.1
20	10	.1	100	.01
30	31.62	.0316	1,000	.001
40	100	.01	10,000	.0001
50	316.2	.00316	100,000	.00001
100	100,000	.00001	10,000 million	.0001 millionth

To get the ratio corresponding to other amounts of decibels, *multiply* the ratios given for decibels which *add* up to the desired number. For example, 25 db. is 10 (ratio for 20 db.) × 1.778 (ratio for 5 db.) = 17.78 voltage ratio.

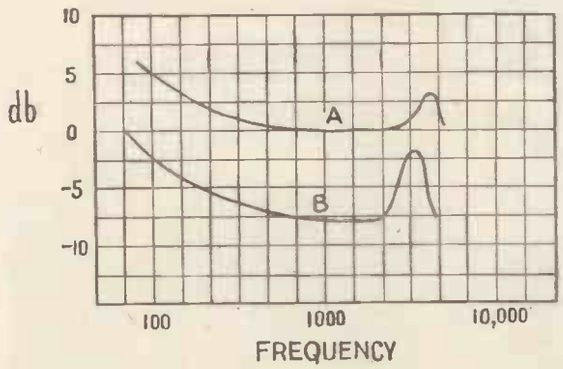


Fig. 2.—The pick-up characteristics of Fig. 1 plotted to a decibel scale

relation to the original is not 200 per cent. but 225 per cent. Something wrong there. We have to get out of our heads the idea that an increase of so many decibels is an addition of some definite quantity. It is really a multiplication.

One decibel is in fact a multiplication by 1.122, or a little over 12 per cent. If you multiply 6 factors of 1.122 together you will get 2, which is just as it should be.

Amplification Curve

When looking at an amplification curve or anything else with decibels in it, it is best to forget all about volts and things, and to remember that 1 decibel is a just perceptible change, up or down. But to help you to know where you are, on the previous page is a table giving the factors by which you must multiply a voltage (or current) when there is a rise or fall in decibels.

Now this is the place where lots of people go off the rails. If the voltage anywhere is doubled, the current is usually doubled too. Power is volts × amperes. So the *power* has gone up *four*-fold. That is why there is a column for power multipliers too, and why power amplification is not the same thing as voltage amplification. Again the decibels keep one right.

There are still other reasons why they should be used. Take a look at the curves in Fig. 1. They are characteristic curves of two imaginary gramophone pick-ups, according to a voltage scale. They both have peaks at the top frequency end, and anybody looking at the curves would be able to see that the peaks are approximately the same height above the flatter part. So the natural conclusion is that the audible results of the two peaks are also similar.

But look at Fig. 2. This shows the same characteristics plotted to a decibel scale. The peaks are shown to the eye in their true proportions as judged by the ear when the pick-ups themselves are in use. The lower one is obviously much more severe than the upper.

Incidentally, the frequency scale is also based on the same principle. It was explained at the start that the ear judges pitch by the *multiplied* increase; not the addition. The increase from 100 cycles per second to 1,000 sounds the same as from 1,000 to 10,000.

If you have followed this explanation of decibels you will have no difficulty in seeing the point of using so-called "logarithmic" volume controls instead of "straight" ones. The logarithmic controls are supposed to give a decibel reduction of volume (though unfortunately many of them are not even approximately correct), as indicated by curve A in Fig. 3.

Decibel Volume Control

Even a rough attempt at a decibel volume control is likely to be a good deal better than the ordinary uniform type, which gives the sort of control indicated by curve B.

It is only fair to mention that a uniform type of component may provide a very decent decibel curve if it is used in the form of a variable-mu bias potentiometer. For this purpose a "log" volume-control may be wrong, because the desired characteristic is obtained in the valve.

Fig. 3 refers to the ordinary signal dividing potentiometer, such as is used for gramophone pick-ups.

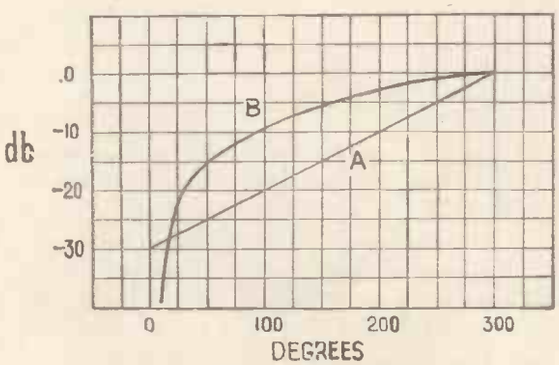


Fig. 3.—A shows decibel or logarithmic volume control and B shows ordinary uniform volume control

Increasing the Output of That Old Pick-up

A Simple Experiment That Any Listener Can Try

AFTER your gramo-radio set has been in use for some time, you may notice an appreciable lack of volume. In some cases this is due to the magnet enclosed in the pick-up losing some of its magnetism, a characteristic of all permanent magnets.

To readers confronted with this trouble, it may come as a mild surprise to know that the old pick-up can be rejuvenated to equal its output when new—and at little or no expense. In the writer's case, the increase in volume was amazing, being even more than when the pick-up was new; and the clarity of the lower frequencies was a treat to listen to.

Horse-shoe Magnet

Going through my old junk box I come upon an old horseshoe magnet and it gave me an idea. Luckily there was a keeper on it and it was in quite good condition. Incidentally, I had purchased it many years ago for a few coppers.

I placed it on the flat side of my pick-up, the polar gap to the lower end, and secured it with adhesive tape. On trying it on a record, I was astounded to find the volume increased by more than 100 per cent.

Not content with this, I then tried reversing the magnet, but I found that there was little or no improvement.

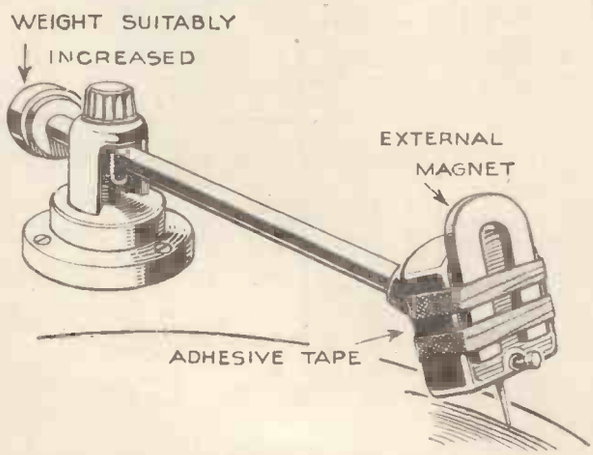
I then started investigating on more scientific lines with a magnetic compass and I discovered that I had placed (in the first instance) the magnet with the "unlike" poles superposed and in the latter instance with the "like "poles superposed.

On reflection it will be seen that the magnets were parallel in the latter instance and the effect thus produced was exactly opposite from what one would expect, but the phenomenon becomes more understandable if we consider the pick-up magnet acting only as the polepieces of a more powerful magnet (that is, the external magnet) when the unlike poles were superposed.

All that remained was to counterbalance the tonearm in order to compensate for the extra weight of the pick-up, which did not present much difficulty.

In practice it was found that the output was equal to an extra stage of low-frequency amplification and the reproduction left very little to be desired. It can also be recommended for situations where the pick-up is some distance away from the receiver.

If on trial, results are not satisfactory, it can safely be assumed that it is due to some other cause than the magnet.



How an extra horseshoe magnet can be fixed to an old pick-up to increase its sensitivity

Causes of Poor Volume

Assuming the leads to the receiver are O.K., the loss in volume is probably due to some of the following causes: The armature is laying over one of the polepieces and requires centreing; or the rubber damping may have become perished. The volume control should receive attention.

There may also be a break in the armature coil and this should be tested for continuity with headphones or a voltmeter in series with a battery. If the latter is the cause, the repair should be left to the makers as it is really out of the scope of the average amateur.

WILLIAM WATT.

On Your Wavelength

By Thermion

What About This Earth?

THIS is really honest-to-goodness cross-my-heart true. A chappie wrote to me the other day to say that he couldn't understand what was the matter with his new set. His friends had told him that the symptoms pointed to a bad earth, but he was quite sure that it couldn't be that, for he had taken all kinds of trouble over this connection.

"I purchased a large wooden tub," he wrote, "filled it with carefully sifted soil, placed it down in the coal cellar and buried the earth tube in it."

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The Radio Train

THE H.M.V. people are nothing if not enterprising. Their latest idea is a travelling exhibition of their products, which is to be taken to many parts of the country in a specially equipped train. The whole of May is to be devoted to the West Country; during June the train will be mostly in Scotland and the north-west of England; in July it will visit places in north-eastern England and the Midlands.

The Prime Minister and other notabilities saw the train off at Paddington when it started its long journey. It was christened the "Musical Train" by little Miss Anne Murdoch, who broke a wireless valve filled with champagne on a gramophone record.

I have broken heaps of wireless valves, but I have never yet found one filled with anything but emptiness. I am writing at once to H.M.V. to suggest that if they will place on the market the champagne-filled valve (think of the pep, the zip, the ginger !) record sales are a certainty.

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Beromünster Grows Bigger

SWITZERLAND (where the openwork cheeses come from) has decided to reorganise her broadcasting system. An order has been placed with the Marconi Company to increase Beromünster's power from 60 to 100 kilowatts, and the work will be put in hand quite soon. I am afraid that it will not be a case of "business as usual" during alterations.

Beromünster will have to close down for about three weeks, so don't start dismantling your set to see what is the matter with it if you find that it is not bringing in Switzerland's Big Noise.

It is likely, too, that both Söttens and Monte Ceneri will put up their power. In a mountainous land such as Switzerland you have to push out your programmes with plenty of power behind them if you want respectable service areas. Beromünster cannot serve the whole country, for the station's language is German. French Switzerland looks to Söttens for its programmes, and Italian Switzerland to Monte Ceneri.

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Reception Oddities

OFTEN I find myself puzzled by letters from readers living in different parts of the country who write to tell me that my remarks about good reception from various foreign stations are—shall we say—terminological inexactitudes.

You talk, they say, about receiving Budapest and Beromünster and Rome and Stuttgart and Berlin and Bordeaux strongly, clearly, and without interference. *We* can't get a single European station decently since the Lucerne Plan came in.

More often than not, those who write in this way are using first-rate sets which I know to be highly selective and good all-round performers. If I can obtain—and really I *do* !—perfect reception from heaps of foreign stations, why can't they?

Trimming to Blame?

IN many cases I believe that the trouble is due to faulty trimming of their sets. It may have been all right, when they were first installed, but it is quite possible that, for one reason or other the ganged circuits are no longer in perfect alignment.

Not everybody realises that if a new valve is inserted in the high-frequency or intermediate-frequency departments, re-trimming is usually necessary.

This would explain why I am sometimes told that on a certain set the local station "spreads all over the dial," though that same set in my home will *annihilate* either of the Brookman's Park transmissions at a range of fifteen miles when a small movement of the tuning knob is made.

Then there is the question of aerials and earths—particularly earths. Until you have seen actual instances, as I have, it is sometimes difficult to believe what a difference to the performances of a modern set a bad or indifferent earth can make.

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Battery Reports Postponed

IT has occurred to me that the weekly reports on the batch of batteries now being put through their paces in my lab. may bore some readers—and I don't want to be boring if I can help it. Also the many new readers who have come along since the tests started may have difficulty in following this kind of serial story, which cannot have a synopsis of previous chapters every week.

This being so, I am not going to tell you anything more about the batteries until after the end of the great test. There are still three weeks to go. At the end of that time I will sum up the whole thing in a brief article, which, though I say it myself, should be of some use to battery-ites.

H.M.V. photo

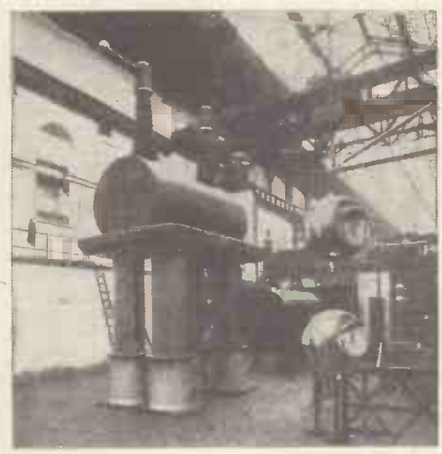
Making good use of radio in the summer house. Take a portable away with you when you go on holiday this year !

More for the P.M.G.

THE latest returns show a steady increase in the issue of broadcast licences, the grand total now being within an ace of six and a quarter million. London heads the list with well over 900,000, Lancashire comes second with 750,000, whilst Yorkshire's 650,000 makes a good third.

This is very satisfactory for all concerned, more particularly for our friend the P.M.G., who "gets something for nothing" out of each licence.

Like Oliver Twist, he is naturally looking for more, though his present "rake-off" doesn't really do him much good, because he simply hands it over to the Public Purse.



Ferranti photo

Giant transformers and spark gaps used for 1,000,000-volt tests of electrical gear

Grid Battery Plays Up

A READER sends me an almost tearful letter about his adventures with grid batteries. Some time ago, he writes, he was fixing up a variable-mu valve and, whilst tightening up a connection, short-circuited the condenser with the pliers. The blue flame effects were pretty, but the variable-mu had "gone west" with a burnt-out filament.

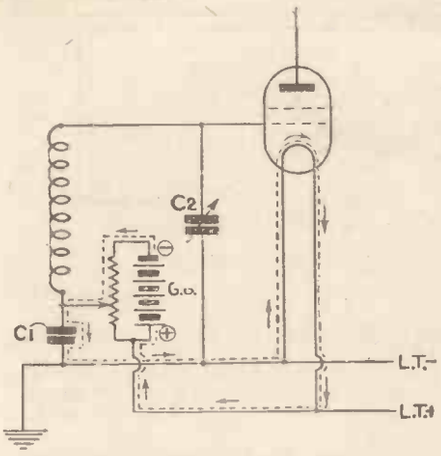
That was merely a beginning. Just the other day he was adjusting a seven-valve superhet. He turned the chassis on its side to get at something underneath. There were more blue flames and no less than seven valves were candidates for the dustbin.

He was using fuses in the high-tension negative lead on both occasions. Won't I, he entreats, warn readers that such fuses are no protection against the misdeeds of the grid battery.

How the Fireworks Happened

WHEN I had read his letter I did a bit of thinking, as well as of the quick work on the backs of old envelopes that we all do with our pencils in such circumstances. For the life of me, I couldn't discover at first how he could possibly have "done in" that vari-mu valve by shorting the condenser.

The seven valves seemed almost equally mysterious, for if you have your grid battery wired up in the ordinary way it could hardly do any damage, unless you had a loose wire



How a valve can be burnt out if grid-bias positive is connected to low-tension positive (see "Grid Battery Plays Up")

attached to its negative socket which came into contact with the low-tension positive busbar.

Then I saw daylight. I think there is no doubt that he had his grid-battery positive connected to low-tension positive. If you will examine the accompanying drawing you will see how a filament can be blown by shorting either C1 or C2. I have shown the grid battery connected to low-tension positive. Now let's see what happens if you short C1.

Follow the arrows along the dotted line, starting at grid-battery negative and assume that the potentiometer slider is right over to the negative end. Current passes through the slider, across the shorted condenser to the low-tension negative busbar, up the negative filament leg, through the filament, down the positive leg, and so back to grid-battery positive. The circuit is thus completed through the filament and—up she goes!

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The Superhet Casualty

IN the case of the superhet a similar connection of the grid battery would account for everything. Remember that it was built on a metal chassis which would, of course, be earthed and connected to low-tension negative. Let the positive socket of the grid battery be touched by anything at earth potential, as might easily happen when the chassis is turned on its side, and you are all set for the bluest of blue flames and a holocaust of valve filaments.

The moral is: Be careful about the way in which you do connect up your grid battery. So long as its positive goes to low-tension negative, you can feel pretty safe; but if you connect grid-battery positive to low-tension positive, as is sometimes done for obtaining a bias of half a volt positive or 1-volt negative, it is wise to place a fuse between grid-battery positive and low-tension positive.

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What About Television?

PERSONALLY, I think the fairer plan would be to use the whole of the licence money for improving the programmes. Of course, the P.M.G. is entitled to be paid a small commission for collecting the cash, but after that it should all be earmarked for the present or future benefit of the broadcast service.

If the share now paid to the B.B.C. is sufficient for their immediate needs—and most of us will probably admit that the programmes are good value for money—there is always room for a development fund. It might be employed, for instance, in helping to launch television.

The 30-line transmissions are all right for the time being, but there are better things ahead, and they ought to be pushed forward with the help—if necessary—of some of the surplus licence money.

Disc Versus Tube

MOST television experts seem to back the cathode-ray tube as the television receiver of the future, chiefly because an electron stream can move faster than any rotating disc when it comes to really high-definition work.

At the same time, I doubt whether the tube is going to prove an easy winner. In the first place, a fluorescent screen has greater limitations, so far as light intensity is concerned, than the modern neon lamp. Secondly, although the rotating disc may be slower in action than the electron stream, it gives better—or at all events simpler—"spot control" than the cathode-ray tube.

Finally, there is the question of relative cost, and also the value of high-tension required in each case. For some time, at all events, I expect there will be room for both types of receiver, though cost will prove the deciding factor in the long run.

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Wired Wireless Again

THE question as to whether electric supply companies should be given Parliamentary powers to relay programmes to their customers by wired wireless has now apparently been shelved—at least for the time being.

I wonder if at some future time we shall be compelled—either by dint of increasing ether congestion, or otherwise—to take all our broadcast programmes "over the wires."

Captain Donisthorpe, for instance, thinks that the Government might one day be forced to checkmate the activities of foreign propagandists in this way. But I doubt whether an order to "down aerials" would really prevent anybody from listening to such rubbish, if they really wanted to.

The only really effective way to keep the foreigner out—if it ever comes to such a crisis—would be to prohibit the sale of high-frequency amplifiers.

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Popular Programme Feature

"IN Town To-night" is a very popular item of the Saturday evening programmes. I forget now whose idea it originally was, but I here and now award him one of Thermion's special pats on the back.

I have only one criticism to make, and I know it is one with which heaps of readers will agree. The interview type of turn should be used very sparingly and only in cases where the "subject" is likely to carry it off well.

Interviews before the microphone are apt to sound too much like put-up jobs—which, of course, they are. The interviewer reads out his questions from one paper and the—er—victim reads his answers from another.

It would be much better, I feel, to let most of the turns do their stuff without any spoof interviewer. What do you think about it?

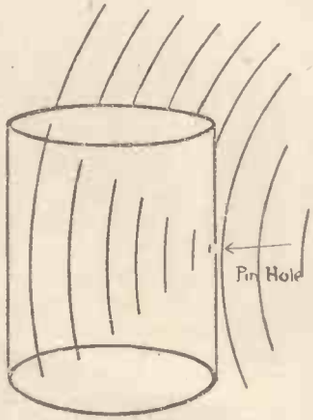
Would You Believe It? . . . . . Asks G. H. DALY

Wireless between England and America is impossible if the old theory of electromagnetic waves is correct. The curve of the earth between the two countries would act as a great wall.

This is what Marconi was told when he wanted to erect stations in England and America.

Theoretically the statement is true, for wireless waves, being similar to light waves, should fly off the earth at a tangent. Actually they cling to the earth's surface and are also reflected by layers of gas in the upper air.

In what war was wireless first used?
The South African War



Where are there no wireless waves?

No wireless currents can penetrate a sealed metal tank. If, however, a pinhole is bored in the tank the waves will pour in.

Every man, woman, and child is a potential, although inefficient aerial, if they wear rubber shoes. Tiny currents are set up in the marrow of the bones by wireless waves. Women are better conductors than men owing to slight differences in their chemical constituents.

Real-quality Series.—9

Coupling the Second Low-frequency and Output Valves

By Noel Bonavia-Hunt, M.A.

Chandler photo

A good set is even more important in the open than indoors. Sunlight seems to show up poor quality very quickly!

AMATEUR: I say, Professor, I tried a pair of headphones on the receiver you and I have been discussing stage by stage, and the quality was gorgeous, I thought. That is, up to the second low-frequency valve, which is as far as we got last time.

PROFESSOR: No doubt it sounded quite satisfactory. The problem is to maintain this high standard right up to the last stage.

AMATEUR: What is the difficulty?

PROFESSOR: Simply this. You cannot repeat the same coupling system in each successive stage. If you do, you lose either the bass or the treble, or even possibly both.

Repeating First-stage Coupling

AMATEUR: Supposing we were to repeat the first-stage coupling which we discussed last time, using it in each of the low-frequency stages, that is, between the first and second and the second and third valves? (*See Fig.* 1.)

PROFESSOR: The result would be a loss of bass. The general tone would also be poor.

AMATEUR: I see. Of course, I know that at each successive stage of the amplifier we are building up the signal volume, and it is very important to maintain the correct proportions all along.

PROFESSOR: It is. The rule I adopt is to increase the anode load at each stage up to the output valve. The load on the latter is, of course, designed to match the valve to the speech coil and so cannot be increased in this way.

We are really concerned with the two low-frequency valves that precede the output valve or, if you prefer to look at the matter the other way, the valves that follow the detector circuit until the output valve is reached. The external loads in the plate circuit of the first and second low-frequency valves must be carefully designed.

Total Anode Resistance

AMATEUR: I remember that we had a total resistance of 53,500 ohms in the plate circuit of the first low-frequency valve.

PROFESSOR: Excuse me, it was 28,500 ohms. The high-tension positive is taken to the junction point of the two 25,000-ohm resistances.

AMATEUR: So it is. I forgot that for the moment. Anyway, I take it that the resistance in the plate of the next valve will have a greater value. This is your idea, isn't it?

PROFESSOR: Yes. If we decide to adopt a pure resistance here, it should not be less than three times the value of the preceding one.

AMATEUR: Why is that?

PROFESSOR: Because the amplified signals require a larger load impedance with a view to preserving the proportions at all frequencies.

AMATEUR: Do you mean that the bigger the signal the bigger should be the impedance on the valve plate?

PROFESSOR: Yes, but only provided there is another amplifying stage to follow. In the case of the last valve the loud-speaker follows, and the output valve has much more work to do than any of the preceding ones, so that a big load in the plate circuit is not wanted. We shall come to this part of our subject in due course.

You will understand that the earlier valves are coupled by means of plate to grid circuits, while the output valve is coupled to the loud-speaker by means of a circuit in which the speech coil takes the place of the grid circuit.

Since the D.C. resistance of the speech coil is much smaller than any of the grid resistances in the preceding stages, it follows that the anode resistance of the last valve must also be smaller than any of the anode resistances of the preceding valves.

AMATEUR: Well, I know that this follows usual practice. Now what about the value of the resistance in the plate of our second low-frequency valve? Three times 28,500 is 85,500. Will 100,000 ohms be all right?

PROFESSOR: Quite all right. I said at least three times. The limit in size is five times. We must remember that our plate volts are limited, so we cannot afford to drop too many through the resistance. Fortunately, we do not require to pass much current on the plate of this particular valve: from .5 to 1 milliampere will suffice.

AMATEUR: Poor valve!

PROFESSOR: What on earth do you mean?

AMATEUR: Well, I presume we shall be using a power valve here.

PROFESSOR: Yes, a valve of the P215 or PM2 class.

AMATEUR: Won't it start bottom bending?

PROFESSOR: Of course not. With only 50 volts on its plate and a suitable grid bias it won't be able to pass much current. The characteristic curve of a valve depends largely on the external load applied to its plate. The maker's graph doesn't even mention what this load is. It merely assumes that a given voltage is applied to the plate.

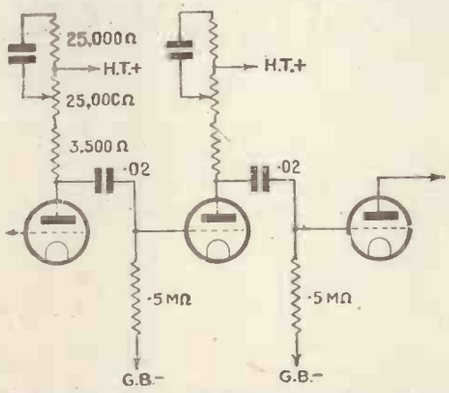


Fig. 1.—Two stages of low-frequency coupling in which the special coupling of the first stage is repeated in the next. The result would be very poor indeed

AMATEUR: I never thought of it in that light. Anyway, if you say that only .5 to 1 milliampere of current is necessary, I am quite ready to accept your statement, as after all the proof of the pudding is in the eating.

PROFESSOR: It is, and we are always ready to take the cook's word for it when she hands us the recipe.

Need for Pure Resistance

AMATEUR: Is it necessary to adopt a pure resistance in the plate circuit of our second low-frequency valve? I mean, couldn't we have a choke or an auto-transformer instead?

PROFESSOR: We could, if we liked; but it would have to be a very big winding, and there is the question of cost to consider. In any case we have got to have a big auto-transformer in the grid circuit of this stage, and that is why I think we had better be content with the pure anode resistance.

AMATEUR: Will this resistance pass the high notes as well as the low?

PROFESSOR: Why shouldn't it?

AMATEUR: Well, I always understood that a high resistance stops the high notes from coming through.

PROFESSOR: Who told you so? .25 megohm makes a mild beginning at doing so, but 100,000 ohms is quite a low value comparatively. Don't you use grid leaks of 1 meghom and get plenty of treble? Why then should an anode resistance of .1 meghom cut out treble?

Impedence Relationship

AMATEUR: I always understood that the value of the anode resistance had to bear some relationship to the internal impedance of the valve itself. I was once given a rule never to let the resistance in the plate circuit exceed five times the impedance of the valve. Since the impedance of the P215 is 5,000 ohms, the anode resistance should, according to this rule, not exceed 25,000 ohms.

PROFESSOR: I am aware of such a rule, which the sooner forgotten the better. You simply cannot make hard and fast rules like this one. We should never make any progress at all if we were to bind ourselves down to anything so rigid.

As a matter of fact, this particular rule applies very fairly to high-mu valves employed as detectors, and also to the duo-diode-triode,

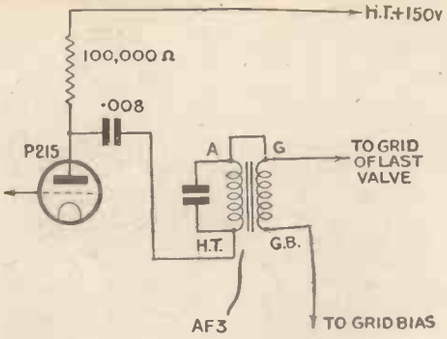


Fig. 2.—Coupling between second and third low-frequency valves

But to apply it to every type of valve in any position in the receiver is ridiculous.

AMATEUR: Of course, I am not forgetting that we have still to develop the coupling circuit we are discussing for the second stage. If we adopt the 100,000-ohm resistance in the anode circuit of the second low-frequency valve, what coupling condenser shall we choose, and what shall we use in the grid circuit of the next valve?

Big Transformer Needed

PROFESSOR: First of all, let us decide as to the latter, that is, the grid circuit. We want a big transformer here, such as the AF3 or the AF5. The latter is the ideal type, but the AF3 will serve very well. In the case of the AF5 the correct value of coupling condenser will be .005 microfarad, while, if the AF3 is chosen, the condenser should be a little larger in capacity, namely .008 microfarad.

AMATEUR: Are these values critical? Would not .01 microfarad do?

Professor: No, it wouldn't. The values *are* critical, if you want to preserve the low notes.

AMATEUR: Shall we make a sketch of it?

PROFESSOR: In a minute. I just want to make it clear to you that it won't do to substitute a choke for the transformer.

AMATEUR: Nor a grid leak?

PROFESSOR: No, not a grid leak either.

AMATEUR: Why not a grid leak? It's much cheaper, you know!

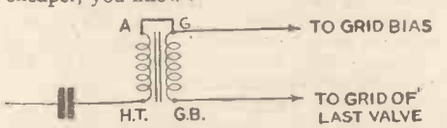


Fig. 3.—Reversing connections to transformer secondary

PROFESSOR: Is it? Not if it is wasted. But we really need the transformer for maintaining our high notes. You would lose them if you insisted on a choke or pure grid resistance. So you see that the 100,000-ohm anode resistance, *by itself*, guarantees nothing apart from the remainder of the coupling circuit.

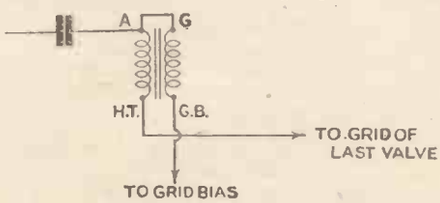


Fig. 4.—Reversing connections to transformer primary

Another very good reason for selecting the transformer is that we wish to make sure of preserving the transients as well as the high frequencies. As far as the "attack" goes, the grid leak would take care of the transients, but it would distort them none the less. Besides which, a transient does not merely consist of an attacking characteristic, but also of a collapsing one.

Suppose we want to reproduce the notes of the piano. The "attack" of the note is produced by the hammer striking the string. Its collapse is caused by the damper. The attack and collapse of the note are both pretty sudden when rapid passages are played. This is only one instance of a transient or series of transient effects. There are hundreds of others, with all of which our receiver has to try and deal as faithfully as possible.

Pure resistances deal very faithfully with the attack characteristic of the transient, and I have seen it stated by responsible people that transients stand no chance with any other type of impedance. This is not correct. Transients can be preserved with auto-transformer coupling when this is properly designed.

They can also be preserved with resistance coupling when this, too, is properly designed, as in the case of our first low-frequency stage, where the values of the anode and grid resistances are kept sufficiently low and yet not too low to pass the bass register.

AMATEUR: You have really interested me this time! What is the circuit of the auto-transformer in the second stage we are developing?

PROFESSOR: I will give you the complete coupler now. (*See Fig.* 2.) Note that the transformer is serialised by joining the "anode" terminal to the "grid" terminal. Instead of connecting it up so as to give a step up ratio of 1 to 3½, we are connecting it so as to give a smaller step up, namely, 3½ to 4½ or 1 to 1 2/7.

AMATEUR: What would happen if we connected it up as 1 to 3½? (*See Fig.* 3)

PROFESSOR: You would get more amplification but less bass. Strictly, you would be amplifying frequencies from 500 to 3,500 cycles in the bigger ratio, but not the frequencies above or below.

AMATEUR: What a horrid effect! And tell me, what would be the result of reversing the connections to the primary winding? (*See Fig.* 4)

PROFESSOR: The quality would be excellent, but you would get a slightly reduced amplification all round. In cases where mains hum is a difficulty, this reversal of the primary connections often solves the problem.

A Tip Worth Knowing

AMATEUR: That's worth knowing. We have not any worries of this nature with our battery set, so I suppose we can keep to the connections shown in Fig. 2.

PROFESSOR: Certainly. And you will find that the AF3 with the coupling condenser of .008 microfarad will provide you with beautiful quality. In fact, this is precisely the coupling I have employed in my little set here which you were good enough to admire.

AMATEUR: Well, that's good enough for anyone. I could listen to it all day long.

PROFESSOR: Don't you be too sure! Your ears never finish hungering for better and better things.

AMATEUR: Granted. But there's a whole hemisphere of difference between that lovely little set of yours you demonstrated to me a month ago and all other sets I have heard.

Electricity—the Servant

By FRANK CHARNLEY

ELECTRICITY no longer causes the average city dweller to pause and marvel at the many duties which it carries out on his behalf. This is not because its adaptations are any less than they were, but because the very familiarity of it is such that it has bred in the town dweller, if not contempt, then something closely resembling a complete ignorance of its existence.

Yet we owe a very considerable proportion of our social fabric and progress to the ever-increasing uses to which electricity is being put. Take, for instance, Brown dwelling in a suburb of London.

Immediately on waking, he switches on the electric light. He notes from the synchronous clock that he has overslept by ten minutes. Possibly he may also switch on an electric fire to take the chill off the room and, hurrying downstairs, he picks up from the mat his newspaper, which a few hours earlier has been produced by highly complicated machinery operated in many places by electricity.

He looks at the pictures reproduced on one of the pages by methods involving electrical processes, but does not visualise the delicate and complicated system involved. Electricity causes his telephone bell to ring, and, in a few minutes, he is speaking to his chauffeur and arranging the day's programme.

An electric boiler is set into operation to produce hot water for tea and possibly shaving, and shortly he is enjoying a comfortable shave in an electrically-heated bathroom by the aid of a mirror which projects a beam of electric light on to his face to enable him to find the "worst spots."

In the breakfast room, the furniture of which was made by machines driven by electricity, he finds electrically toasted bread, coffee from an electric percolator, bacon kept warm by an electric hot-plate, and porridge prepared from oats which have been cleaned and dried by electric processes.

His bread has been electrically mixed and baked, and his butter made by machinery driven by electric motors. The electric door bell rings, and his car, in part actuated by a delicate electric system, is waiting to take him to the station.

On the way he passes numerous electric tram-cars and petrol vehicles with their electrical systems, all carrying numerous city workers to the station, whilst at his home, washing, cleaning, ironing, and cooking are being simplified by electric boilers, etc.

He steps into an electric lift, and is rapidly lowered to the tube, where an electrically driven, heated, and lighted train whirls him citywards, safety made almost absolute by electric signals and locking systems.

At His Office!

Arriving at his office, Brown is whisked to the sixth floor in an electric lift, and as he passes along the corridor, he observes office cleaners packing away electric vacuum machines after their early morning labours. Electricity simplifies his daily task and saves him money—his copying and other apparatus is driven electrically.

He deals with orders and consignments of goods which cause hundreds of kilowatts to be consumed in many factories in the country.

After a hearty evening meal at the electricity café, he again avails himself of electricity to transport himself back to his home.

Electric light and heat mellow the atmosphere of the drawing room as he settles down to listen to the evening broadcast programmes made possible only by the use of electricity, and as he dozes, he is awakened by the twelve strokes of Big Ben, brought actually into his home through this magic agency.

As he slips into bed, he removes an electrostatic bed-warmer, and so to sleep until the following morning again brings to his service this wonder of all wonders

Are Modern Sets Too Complex?

Asks PERCY W. HARRIS, M.Inst.Rad.E.

THERE are two kinds of wireless enthusiasts. First there is the keen fan who studies everything he can find about the subject, makes numerous sets, is always on the look-out for novelties and improvements and generally "lives" for the hobby.

Then we have another and much larger class made up of people who are generally interested in the hobby and take AMATEUR WIRELESS regularly, but do not build sets very often and, in fact, do not trouble to study all the designs as they come out.

There is perhaps too big a tendency on the part of radio writers to assume that all readers are of the first type, and to suppose that they read everything that happens to be published in the paper, being therefore completely *au fait* with latest developments.

Building New Sets

They are not, of course, but every now and again, realising the improvements that have taken place, they do want to build new sets and thereupon—and not before—begin reading details of the latest receivers and their make-up.

Many of them have either written or spoken to me on a point which merits attention in these pages. "I like building wireless sets," they say, "and they used to be very simple to make up, but nowadays they seem terribly complicated with all these valves with many pins and highly complex switching arrangements. Are all the alleged improvements *really* improvements? And is all this complication really necessary?"

A sensible sort of question, when you come to think about it. Let us try to consider why all these complications have come about.

Wireless progresses rapidly, but not, perhaps, so rapidly as the first glance at modern sets might suggest. It seems rather quixotic, although it is perfectly true, that much of the complication arises from our desire for simplicity! A few years ago one needed the arms of an octopus, combined with those of a starfish, to tune in quickly on a multi-valve set for everything that could be varied *was* variable (often needlessly), and the various circuits were tuned successively instead of together.

So long as receivers were tuned by enthusiasts who did not mind the trouble they took such receivers "got by," but when everybody wants to work a wireless set the working must be reduced to simplicity. Therefore we get ganging, long shafts controlling several condensers, and a multitude of switches acting simultaneously, as well as many other complications all arising because tuning needs to be made simpler.

Now the second lot of complications arises from the necessity of getting much sharper tuning than was possible with early sets.

Other things being equal, the more tuned circuits the sharper the tuning, and the main reason why the super-het is getting so popular is not, as so many people think, because such a receiver gives better quality or greater sensitivity, than that of what is generally called a "straight" set, but simply because a whole lot of tuned circuits can be controlled more simply with this type of receiver than with the straight kind.

This comes about from the fact that by changing the received signal frequency (which naturally varies over the whole tuning range) into a fixed intermediate frequency by means of a frequency-changing circuit, we can remove quite a number of the necessary tuned circuits from the variable into the fixed tuning part thereby greatly simplifying the ganging.

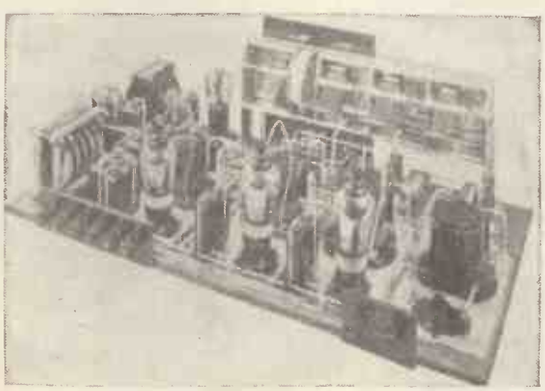
We have to pay the price for this, too, not monetarily so much as in complications and difficulties which at the moment seem inseparable from the super-heterodyne circuit. That nasty phenomenon called "second-channel interference" haunts every super-het manufacturer and though it has been repressed in most cases it turns up now and again in a very objectionable manner.

Second-channel interference comes from the fact that in the frequency-changing method used in a super-het two different signals separated by twice the intermediate frequency are simultaneously changed into the intermediate frequency.

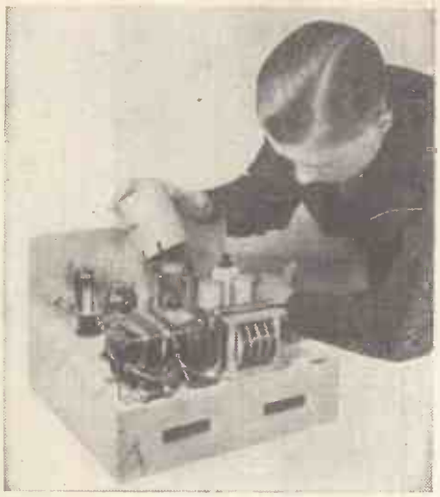
So long as the arrangements are such that there is no station working at twice the intermediate frequency away from the one we want to receive, we don't get any trouble, but if there is such a station (it usually happens at several points on the tuning scale) then the amount of interference we can get from this second station is the measure of the second-channel interference.

An old wireless enthusiast told me recently that he "did not think much of Q.P.P. and class B," judged by the results of a number of sets fitted with these forms of low-frequency amplification. He said quite rightly that his old push-pull set gave better quality and it did, for I have heard it; but what he did overlook was the fact that he has a mains unit giving plenty of power and there is no necessity in his case to economise in high tension.

So the complications of low frequency as shown in the newer systems come not from any better quality if you already have plenty of power available for push-pull, but from the need for economy for battery-set users. The complications in super-hets come from not better quality reception, but from the need for sharper tuning. At the moment there is a slight tendency to go back to more simplicity because the new and highly efficient iron-core coils give sharp tuning with fewer tuned circuits.



Is this set complicated? It was published in "Wireless Magazine" as long ago as April, 1930



A good example of a modern chassis-built receiver

As for these wonderful valves which are turning up now with as many pins as a hedgehog has quills, these are not really so complicated in principle as they appear to be for they are nothing more than two or more valves put up in one bulb with the necessary number of pins to make the proper connections.

Take, for example, the new triode-pentode. This is a mains valve with a heater and a cathode which emits the electrons. Inside it is made up of both a triode or three-electrode valve with a grid and a plate working with the cathode I have just referred to and another set of electrodes consisting of a plate and three grids working with the same cathode as before to form a pentode.

Frequency-changer for Super-hets

This valve has been designed for super-het sets to work in that part of the circuit that has given so much worry to designers—the frequency changer. In order to get the desirable effect of changing the variable frequencies of tuning into the fixed frequencies of the intermediate circuit, we have to mix both the incoming signals and the oscillations produced by the local oscillator.

There are dozens of ways of doing it. One method involves the use of a triode as oscillator and a high-frequency pentode as a first detector. The new valve combines these two in one bulb and this makes the commercial set more compact. Furthermore these two valves have been designed to work with one another in a particular kind of frequency-changing circuit so as to give a high efficiency. Almost exactly the same result will be obtained if these valves were separated into two bulbs.

And so we could go on with other multi-electrode valves which have two and perhaps three in one. Quite a number of them have been brought out just for the purpose of making compact commercial set with automatic volume control, this in turn bringing about lower cost of production, manufacturing simplification and so on.

And what is the net result of our inquiry? Good quality, higher performance sets can *still* be built simply and such sets when properly designed can still give superb performance. They may not be so compact as others, but it is really *performance* that you want.

If, therefore, you are thinking of building a new set do not run away with the idea that the most complicated-looking sets are better than the simple-looking ones. Judge each on its merits.

The Hiker's Headphone

1 Here is a portable that is really portable. It measures only 12 in. by 8 in. by 3½ in., and weighs a little under 10 lb.

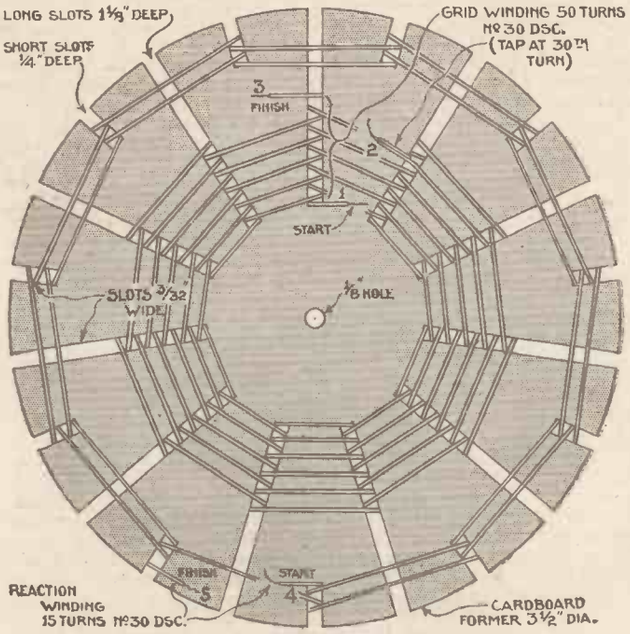
2 Built into a small attaché case, this portable needs only a short external aerial wire to complete it for reception

3 Intended primarily for headphone reception, it will work a loud-speaker if a normal outdoor aerial is utilised

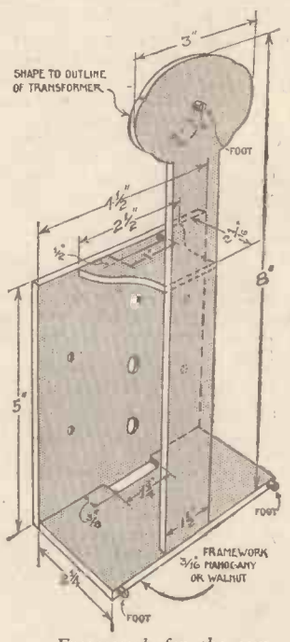
4 Selective tu tained with a basket coil, wh medium waves separate reactio

This youngster is certainly not slowly plodding his weary way to school—he has his portable with him as well as his books!

Specially designed by the "AMATEUR WIRELESS" Technical Staff



All you need to know for the basket coil, which is home wound as explained in the article. Note the double series of slots: one for the tuning and the other for reaction. This sketch is actual size



Framework for the components of the Hiker's Headphone Portable

On headphones, then, with an indoor aerial, we have logged not merely the locals at fine strength but a good number of the more powerful foreigners. Even with only 10 feet of flexible wire as an aerial and no earth at all we were able to bring in the locals at more than sufficient phone strength. All this at about 25 miles from Brookman's Park.

So you see it is a good "goer," this attaché case portable. The size of the attaché case used is handy, being 12 in. by 8 in. by 3½ in. The total weight of the [illegible] with everything ready for reception, including the phones, is just under 10 pounds—which is certainly not back-breaking, is it?

No Aerial Difficulties

In use the Hiker's Portable will give good phone strength with just a short piece of flex slung to any convenient point. Out of doors there is always a convenient branch of a tree, while indoors the end of the wire can usually be hooked to the picture rail or other high point in the room.

From the mass of illustrations you ought to be able to gain a very fair idea of the construction and general design of this intriguing little set.

For a start, you will note that it is a simple two-valver, with a reacting detector and a transformer-coupled low-frequency output stage. We found an HL2 type of valve was very suitable as detector, while almost any valve of medium to low impedance will serve

IF you agree to listen on headphones, and do not insist on hearing everything on a loud-speaker, the really *portable* sort of portable set becomes quite practicable. More than that, it becomes a set *everyone* can find a use for.

Hikers occur to us first because these stalwarts are accustomed, apparently, to carrying their belongings about with them. No more delightful companion for long hikes can be imagined than a neat little portable, giving the news of the day and, say, a spot of dance music before the camp fire is damped out.

A Set for Everybody

But don't imagine only hikers need the sort of attaché-case portable we are describing this week. Emphatically, we say that *every* listener can find a good use for it.

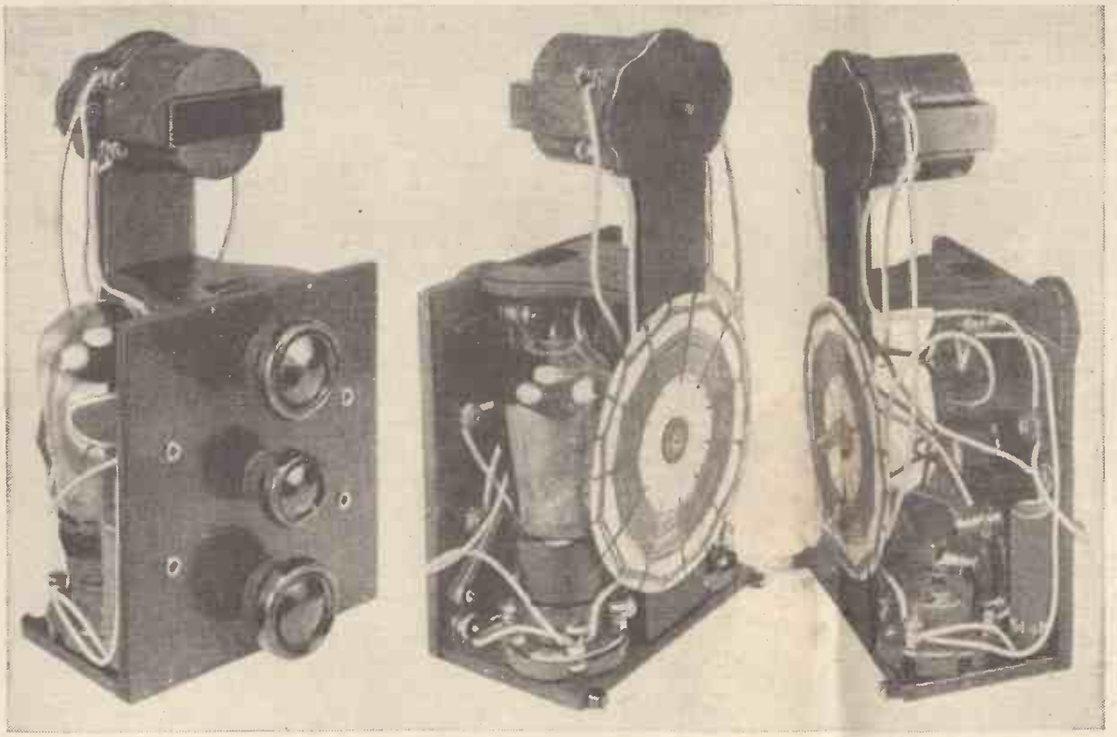
An example or so will prove our point. What about the busy office workers who miss the Derby and other running commentaries? Surely a little set would be a great boon to them? Most people can spare a few moments even in the middle of the afternoon if they really want to hear something special.

Then, again, for week-ending sportsmen a little attaché-case portable is ideal. It keeps one in touch with the news of the matches—and if the weather is wet it whiles away the hours that should have been spent on the links or the footer field.

Fine Complementary Equipment

For the hiker, the camper, the city worker—for almost every type of listener—a little headphone set is definitely an advantage. Not as a substitute for the family set at home, of course, but as a complementary equipment.

So much for the need for this type of set. Now a little about what you can expect from it. Our tests of the two-valver shown by the various illustrations prove that with a normal outdoor aerial and earth you can easily log the locals on a moving-iron type of loud-speaker. That is not primarily the function of the set—neither to work a loud-speaker nor to be connected to a full-size aerial.



How the components are arranged on the wooden framework is very clearly shown by these three photographs. The low-frequency transformer is screwed to the shaped end-piece. Note the position of the basket coil

Portable

ning is ob- home-made hich covers and has a on winding

5 Due to the use of very small batteries, the maintenance cost of this portable has been cut down to an extremely small amount

as the output—our valve being an LP2 type, which will work the phones nicely and at the same time can give reasonable results on a small loud-speaker.

A Run Through the Circuit

Well, shall we first of all run through the theoretical circuit? Then we can get down to its practical interpretation. The aerial, you will see, is taken to a tap some way down the tuning coil. This gives the necessary degree of loose coupling, and with a short aerial will effect just the right compromise between selectivity needs and volume.

You can experiment with this actual point at which the tap is made—but later we will talk about the making of the coil itself. This coil is tuned with a .0005-microfarad condenser of the bakelite dielectric type. A separate winding near the tuning winding gives the reaction coupling, which is controlled by the .0003-microfarad bakelite condenser.

As you will see, this reaction condenser is connected in series with the reaction winding between the anode of the detector and low-tension negative. The circuit is arranged so that the moving plates of the reaction condenser are at earth potential, in order to reduce hand-capacity effects—rather an important point in such a set, as you can imagine.

Across the anode and earth of the detector we connect a .0001-microfarad fixed condenser to by-pass any high-frequency that might be inclined to trickle through into the low-frequency amplifier. This is an essential component, and on no account should it be left out. Don't blame us for instability if you do!

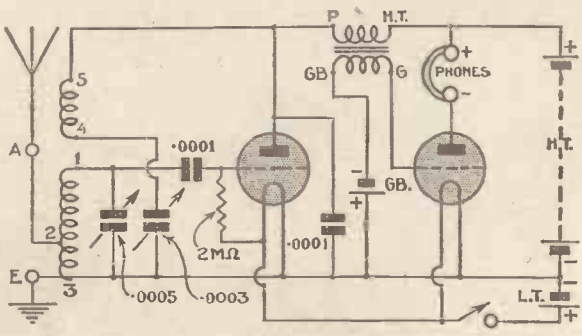
The detector valve is connected in the usual way to the primary of the low-frequency transformer, so that this valve gets its high-tension voltage through the winding. The secondary is connected to the grid circuit of the low-frequency valve, in whose anode circuit are the phones.

On-off Switch

To switch on and off the set a filament switch is inserted in the positive accumulator lead. That completes the circuit. Quite "straight," quite sound—and including everything needed for good results.

Tuning in the local station during an early test of the Hiker's Headphone Portable. A short indoor aerial wire was used, without any earth

Plenty of room is available inside the attaché case for the batteries and headphones, as this close-up photograph shows. A wiring guide appears overleaf



Theoretical circuit of the Hiker's Portable, showing the detector with reaction and the transformer-coupled low-frequency stage

It is a circuit that has the advantage of easy control, good amplifying properties, and low running costs. A circuit that can easily be built into a small attaché case without loss of efficiency.

From the blueprint reproduction you will immediately see that the heart of the practical set is a *basket-wound coil*—a somewhat old idea that still has an application to a set of this kind.

Very few amateurs to-day know much about basket coils, so we had better give a brief description of its assembly. Cut out the drawing of the basket coil former and stick it on any good quality thin cardboard. The diameter is exactly 3½ in. There are two series of slots to be cut—short slots ¼ in. deep at the centre of the fingers formed by the large slots, which are made 1⅛in. deep.

Having cut this cardboard former to shape as shown, you can wind on the aerial tuning winding and the reaction winding. Start off with the tuning, which has 50 turns of No. 30 d.s.c. wire. Leave plenty of spare wire at each end for subsequent connections.

Reaction

When the tuning winding is well on and secured, you can tackle the reaction winding, which is laid into the smaller outer slots as indicated, with 15 turns of the same wire as for the tuning.

From the coil diagram you can quite easily follow the method of putting on the wire. It is threaded in and out of successive slots, so that the completed coil has a basket weave or spider web appearance.

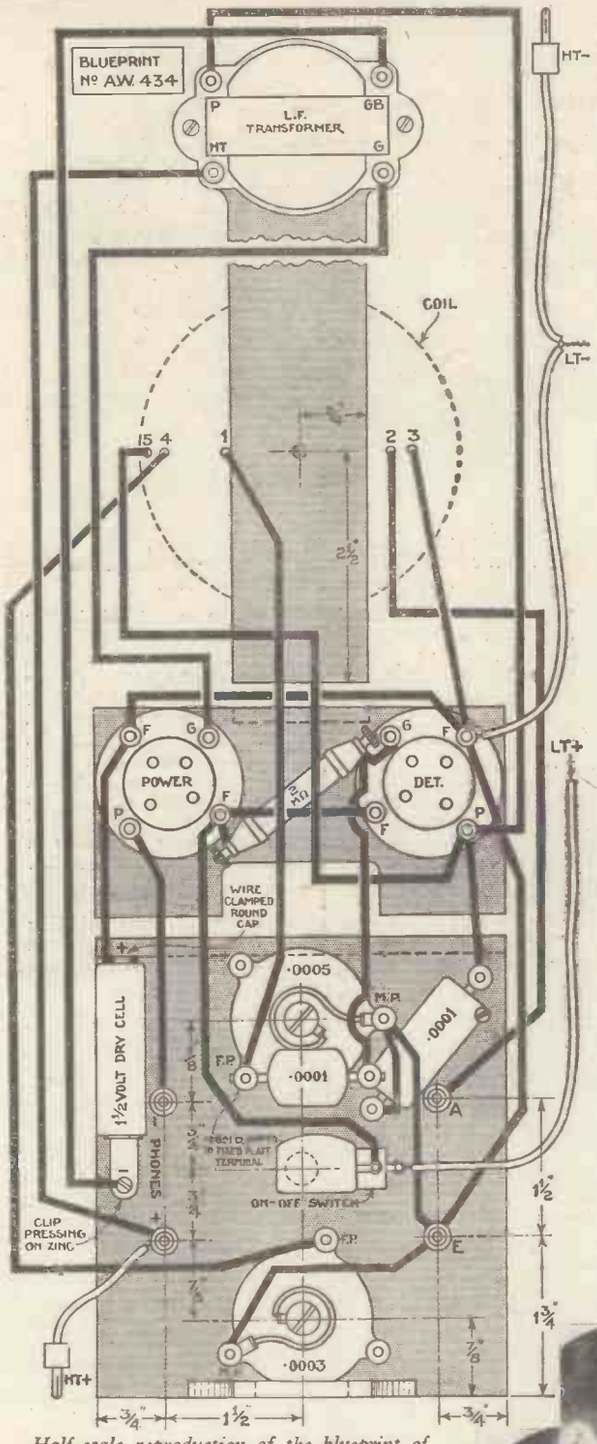
Incidentally, this sort of coil is extremely efficient, and plays an important part in the excellent results that have been obtained during the tests of the set.

Inside the Case

Again taking a good look at the illustrations, which we have prepared for you with great care to make the whole design absolutely clear to you, note now how the space inside the main section of the attaché case is utilised.

A wooden framework is built up to take the basket coil, low-frequency transformer, and underneath are grouped the rest of the components. The controls are on the top horizontal piece of wood, and the valve holders are mounted on the under flap. All this is very clearly shown, and it is rather a waste of space to go into any more intimate details. We do advise intending builders to make a very careful study of all the illustrations before they tackle the work. Then we feel sure they will meet with no real snags.

Assuming that you can get a good grasp as to how the parts are disposed, perhaps a brief indication of the



Half-scale reproduction of the blueprint of the Hiker's Portable. The full-size print can be obtained price 1s., post paid. (No. A.W. 434). It gives all the component dimensions and the point-to-point wiring

most useful order of assembly will be welcomed.

Mark out the wood shapes shown by the diagrams, the wood being ⅜ in. mahogany or walnut. Note that the shape of the end piece depends to some extent on the make of transformer used—this being a matter of individual choice.

When you have cut out these pieces with a fretsaw they can be tacked together with what are known as ½ in. panel pins. Then smooth over the whole framework with a piece of fine glass-paper.

To make a really nice job of it, stain and varnish the resulting framework, so that when you open the lid of the set it will look attractive.

Now you can fix the components to the framework. Here again a study of the blueprint, either as reproduced this week, or the full-size print available price 1s., from the AMATEUR WIRELESS Blueprint Department, will save you a lot of perplexity.

Incidentally, the three close-up photographs of the framework will also help you to locate the positions of the components. It is such an unusual shaped framework that we cannot describe the layout really clearly—and that is why we have provided so many illustrations.

Wiring up can be done with tinned-copper wire and the usual insulated sleeving. For this job we certainly advise you to adhere strictly to the blueprint. When you have completed the connections, get a friend to check it over with you—may save a couple of valves going up in smoke, to say the least!

Parts Needed for the Hiker's Headphone Portable

CONDENSER, FIXED
1—Dubilier .0001-microfarad, type 665.
1—Dubilier .0001-microfarad, type 670.

CONDENSERS, VARIABLE
1—Ormond .0005-microfarad, type R506.
1—Ormond .0003-microfarad, type R505.

HOLDERS, VALVE
2—Telsen four-pin.

PLUGS, TERMINALS, ETC.
6—Belling—Lee wander plugs marked: H.T. +, H.T.—, red (2) black (2).
4—Belling—Lee metal sockets.

RESISTANCE, FIXED
1—Graham Farish 2-megohm, type grid leak.

SUNDRIES
Wood for chassis 11 in. by 6 in. (3/16 in. three-ply).
Connecting wire and sleeving.
4 ft. thin flex.
Card for coil former.
24 yd. 30 d.s.c. wire for for coil.
1—Ever Ready 1½-volt cell, type No. 1915.
1—6BA terminal and ½ in. long bolt.
2—Bulgin knobs, type K12.

SWITCH
1—Bulgin rotary on-off, type S91.

TRANSFORMER, LOW-FREQUENCY
1—Igranic, ratio 1 : 5, type Midget.

ACCESSORIES

BATTERIES
1—Drydex 66-volt high-tension, type H1004.
1—Exide 2-volt accumulator, type MR2.

CASE
1—Attaché case inside dimensions 11 in. by 7¾ in. by 3½ in. (Gray's Inn Trunk Stores, type No. 319).

PHONES
1—Pair Lissen, type LN173.

VALVES
1—Marconi HL2 (or Osram).
1—Marconi LP2 (or Osram).

Before dealing with the operation, a word or so on some points of construction. Before fixing the rotary switch specified, a short piece of the tinned copper wire should be soldered to one pole and a 15 in. length of flex to the other. If you are not good at soldering perhaps your local dealer will help.

As this picture graphically proves, the Hiker's portable is compact in size—even a boy can carry it without discomfort

You will note that that miniature grid-bias battery is fitted inside the case. This battery is obtained by breaking in half a No. 1915 Ever Ready torch type.

Fixing this battery is by means of a small aluminium bracket which is arranged to press down on to a looped wire connected to the negative filament terminal of the detector valve holder. The loop in the wire is made to fit snugly round the brass cap of the cell. Take care that the aluminium makes good contact with the zinc bottom of the cell.

Connecting the Batteries

Assuming that you have assembled the set according to the diagrams, you can insert the two valves and connect up the small 2-volt accumulator and 66-volt high-tension battery.

Aerial, earth and phones are connected by plugs going into the sockets provided for them on the top wood panel. Having connected everything up, turn the two condenser knobs to zero—that is, turn them fully to the left.

Then turn up the reaction knob until you hear a faint rushing sound—but keep it well below the oscillation point. Swing the tuning condenser knob slowly until you find the local, and if it is too strong reduce reaction a little.

After very little practice you will find that foreigners can be brought in at good phone strength. The secret is, of course, to make judicious use of the reaction, always keeping the detector just below the oscillation point—and adjusting the tuning control very slowly.

Range with this type of set depends very largely on the sort of aerial and earth system you can erect.

With a good outdoor aerial and earth this little portable will work a moving-iron type of loud-speaker

Little Components in the Making

A Visit to the Dubilier Factories by the AMATEUR WIRELESS Technical Staff

STEPPING blithely from North Acton station, we found ourselves almost on the doorstep of one of the most famous—and certainly one of the pioneer—firms in the radio industry—the Dubilier Condenser Co. (1925), Ltd.

F. H. McCrea, Deputy Managing Director, was ready for us. He handed us over to the care of Mr. Higginson, the company's press liaison officer, who soon had us gazing with interest at the manufacture of the well-known Dubilier metallised resistances.

What is Inside Them ?

Millions of these little components are in daily use, but how many users realise what is inside them? Or how much care is taken to ensure that the resistance value printed on the outside of the component is within the prescribed limits—and not only that but incapable of deviation?

That is what we went to find out for ourselves. We saw the resistances made in the various stages of production, the long, thin rods that form the basis of the resistances are coated with a special resistance deposit.

Now, the diameter of the rod is very constant, as is the thickness of the deposit. So that the only possible variation is in the length of the individual pieces of rod.

Testing the capacities of moulded fixed condensers

We saw how the long pieces of rod were cut to exact lengths on a special jig arrangement.

As was explained to us, this resistance element has the great advantage that it does not vary with temperature changes. Even when the resistance is run almost red hot there is very rarely any breakdown. When cooled down, the resistance so ill-treated returns to its normal value—anyway, to within 1 or 2 per cent.

Next, we saw the porcelain rods that fit over the resistance element. Instead of little hollow tubes, such as you might have imagined, these are solid except for a tiny hole right through the centre—just large enough to take the rod element.

Naturally, the result is a practically unbreakable component that can be severely ill-treated without harm.

Now we come to one of the most interesting stages in the making of the Dubilier resistance. We refer to the joining of the lead-out wires to the centre resistance rod. As you can guess, it is not possible to solder tinned-copper wire to the special resistance rod. Something very ingenious has to be thought out.

That is where Dubilier experience comes in—and incidentally a secret Dubilier process. They use a mould into which the little rod, with its porcelain tube already slipped on, and the lead-out wires are all inserted.

Into the top of the mould is poured a hot liquid alloy, which, when it cools, as it does almost immediately, joins the lead-out wires to the rod, forms the entire metal caps at each end, and at the same time fixes the lead-out wires to the caps—so that there is no possibility of the wires coming adrift from the resistance element.

The waste alloy takes the form of two small cones at each cap, which are knocked off to leave the resistance ready—not for use, but for the next important stage, the testing.

Here the Dubilier people make use of some very fine equipment. First, the resistances are tested for accuracy of value. This is done by means of a resistance bridge—but instead of reading sundry meters the operator can instantly see whether each component has the right value by noting the deflection of a spot-light on a special galvonometer.

We noted how quickly this process of testing could be done by this spot-light system. The girls at the bench worked with amazing speed and accuracy.

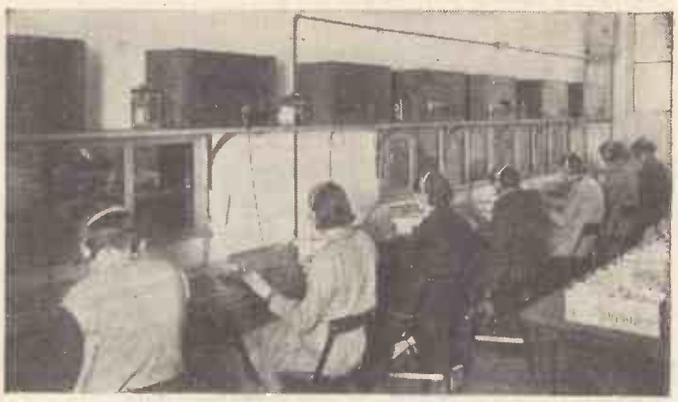
Among the other tests we were much impressed with the practical-working test. In this the resistances were inserted into an amplifier with current passing through them. Any trace of noise was immediately detected by the girls wearing headphones. Thus each resistance is tested to ensure that it does not add any background noise to your set.

We were left with little doubt, after seeing these demonstrations, that the Dubilier metallised resistances represent a definite advance over the old methods of wire windings and spaghetti construction.

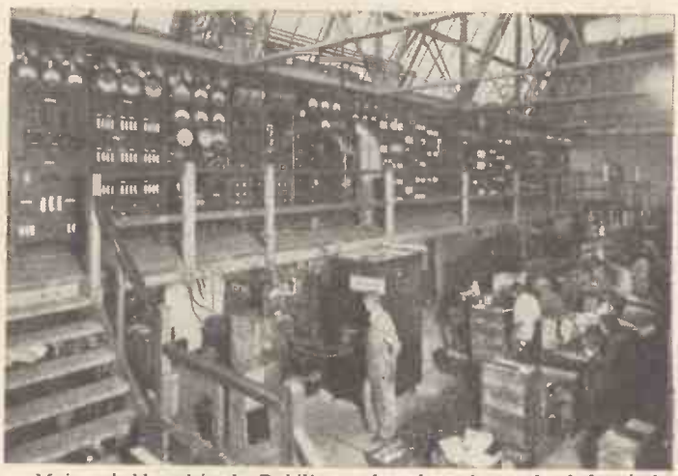
We hurried over then to Shepherd's Bush, where we were surprised to find that Dubilier's had a complete factory devoted to the making of electrolytic condensers of the well-known dry types. Here we were conducted round by the highly informative chemist, who certainly knows more about electrolytic making than anyone we have met so far.

We cannot help thinking that far

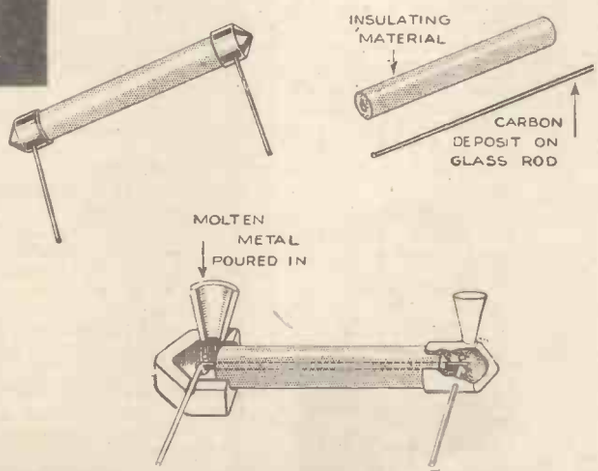
Continued on next page



A scene in the Dubilier test room for resistances. Noises in the headphones show up faulty resistances instantly



Main switchboard in the Dubilier works, where thousands of electrical tests are made every working day



How Dubilier resistances are made. The mould shown in the lowest sketch is simply the artist's impression of what the inside shape is like. The cone piece corresponding to the funnel is knocked off

Criticisms by WHITAKER-WILSON

My Broadcasting Diary

B.I.P. photo

Richard Tauber as Franz Schubert in the B.I.P. film "Blossom Time"

Monday

MY week begins seriously but greatly to my liking. Hermann Schey has been singing Schubert, Schumann, and Hugo Wolf delightfully, the latter especially. In his bigger moments he showed he was not afraid of the big bad Wolf (afraid it is pronounced Volluff—still, what matter?) because he was not afraid to pile up his tone. Very satisfying.

Must say a word for Orrea Pernel's violin-playing. She pleased me immensely in the Vitali work. I have often played the piano part for a friend. Which only confirms my opinion that we all enjoy things we know intimately.

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Frederica delightful. No idea Lehar's music was so beautiful. Tauber and Edith Day really fine in their parts. Nothing against the rest of the cast, for that matter. In fact, I make a note in my diary of one of the most successful broadcasts of the year.

Tuesday

WILL SHAKESPEARE gave me nearly two hour's quiet thought. There is something in English blank verse which makes for good broadcasting—but what it is, exactly, I am not sure. The rhythm?

Haidée Wright gave me a picture of Queen Elizabeth which I have often had of her from studying her life. I suppose the author (Clemence Dane) had a hand in that, but Miss Wright's playing had something to do with it.

Emlyn Williams (*plus* Clemence Dane, of course) left me wondering whether Shakespeare was like that or not. Perhaps I have set views as to what he was like. Well, I don't mind saying I can accept this view of him.

A very interesting experiment in playwriting.

Wednesday

LIKED the variety show to-night. Teddy Williams one of the best compères (silly word, that; don't know why I use it) up to now.

Sterndale Bennett and Fred Gregory just my style of humourists. Subtle. Didn't agree a bit about *Wonderful Woman*. Found my wife did.

Mona Grey very clever. One unfortunate thing, though. Once I realised she was taking all those parts I began to lose interest. Still, that is nothing against taking all the parts. Wish I could say something helpful. Is it any good my suggesting she writes a *play* and takes all the parts? The effect might seem less like imitations, but still show off her powers. A good plot, though, please!

Loved Tubby Harold's *Gawn!* Very funny. Has it occurred to him that he can sit down and write a dozen new verses and do it again? Suggestion: *make them topical.*

Ben Osborne and Nellie Perryer rather out of the picture in this particular show. I don't mean that rudely to them. On second thoughts, I will say they might improve their patter and make their present best the basis for their future ditto.

Thursday

OLD Music Hall a jolly good show. Very good and very jolly. Nice and slick, including Freddie Grisewood's breezy way of announcing. John Rorke, Tessa Deane, Bertha Willmott and Denis O'Neil are just the people for this sort of thing. For that reason I suggest that, some time, four others be tried out. Just for the sake of change. That's all.

Friday

SEVEN DAY'S SUNSHINE seemed a bit stale to me this time. Heard it before. The dialogue is not too brilliant in parts, and the concert scene seemed waste of time. No sense in stopping a show to have a concert in it, just for the sake of making it last an hour. Otherwise a good production, as the Pepper-Watt productions generally are.

Denis O'Neil

Saturday

IN TOWN TO-NIGHT not too good. Sir Malcolm Campbell didn't interest me very much and I don't think Jack Smith, the Covent Garden fruitseller, did, either.

With all due respect to the mouth-organ band from Sheffield, I thought I detected a few concertinas from Huddersfield and one or two percussion instruments from Bradford—but, of course, I may be wrong, though I didn't think any of it very wonderful.

By far the best item was Big Ben. Hope Great Tom is not nervous at the prospect of being his deputy for a couple of months.

Jack Payne

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And then Jack Payne. Some instrument sounded rather tinny to me. Didn't think too much of his vocalist. When Jack sang I was better pleased. If he would only sustain his notes a little more he might as well sing all the refrains himself.

Little Components in the Making

Continued from preceding page

too little is known about the highly scientific research work that has been put into the design and manufacture of this type of condenser. It involves an intimate understanding of chemistry as well as very great care in manufacture.

As we saw, the first stage in the process is the making of the positive plates. Very briefly, this consists in running a large roll of aluminium foil through an electrolyte bath at a high voltage. This process, which is done automatically, forms a dielectric film on the foil. The condensers are made for various working voltages, and the idea is to form the film at a slightly higher voltage than will normally be used in working conditions.

Current Flow of 100 Amperes

The roll of filmed foil is then taken out of the bath and dried. It is then subjected to the next process, which is the application of the working voltage to the foil. This causes a very high current flow—over 100 amperes, sometimes. But as the film slowly changes its nature, the current falls from this very high value right down to a very low one, indicative of the final leakage current of the condenser.

After this the foil is ready for condenser making. Some foil is cut into lengths while at other times it is wound on a large reel, the number of turns being noted on a revolution counter.

As a rule, an electrolytic condenser consists of two foils interleaved with cotton gauze, which has previously been impregnated with electrolytic paste. One plate or foil is positive and the other negative.

In the assembly of the electrolytic the greatest care has to be taken to ensure that the two foils are thoroughly insulated from one another.

Quite a lot of small points that mean a great deal in the working of the condenser have to be carefully attended to. For example, the electrolyte must on no account come in contact with the connections, as corrosion would be set up. The same care must be observed with the insulating film.

We were impressed with the method of connection for the external leads for the condensers. A finger of foil is cut away and bent back on itself under the gauze, so that no strain will break it off. The lead-out wires are then eyeleted to the foil finger, making a really sound connection free from any chance of a break.

As an additional precaution, the whole condenser block is then immersed in wax, thus firmly securing the lead-out wires up the entire length of the condenser—adding still further to its strength.

Exhaustive Tests

Then come the exhaustive tests. Capacity and leakage are tested for at the working voltages on a specially arranged rack. Each condenser undergoes an individual and lengthy test, under approximately the conditions under which the component would be expected to work in your set.

One of the features of this type of condenser is that if it is over-run all that happens is a rise in leakage current. When put back to normal voltage its leakage returns also to normal as it re-forms. Compare this with the instant breakdown of the paper type when over-run in the same way!

We noted the different methods of containing the Dubilier condensers—in cardboard boxes, circular metal cans and even in moulded cases for the small, low-voltage types as used for such purposes as grid-bias by-passing.

Altogether a most illuminating visit, which has given us a new respect and understanding of the name Dubilier and its products—notably its resistances and electrolytic condensers.

Increased Service Area

By JAY COOTE

DOUBTLESS during the last week or so you will have noticed the increased power of the Mühlacker (Stuttgart) station; the 100-kilowatter has now again been brought into action. There is every likelihood in the course of a few weeks of even greater signal strength as the aerial tower is not yet being used at its full height.

When completed to the 190-metre summit (607 ft.) that little extra will assist in increasing the service area. By the way, note that we no longer hear the Suedfunk call, but that the station is now Reichssender Stuttgart (phon : Shtootgart).

The word Reichssender (State Transmitter) has been adopted by all German main stations; Königsberg replaces Heilsberg, and Koln (Cologne) is heard instead of Langenberg.

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Interval Signals

A mention of altered calls leads me to interval signals. If you have listened to Rome lately you will have observed that between items from this station you hear the trill of the nightingale, as used by Milan, Trieste, Turin and so on. All Italian studios have adopted the same interval signal.

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Plans for the installation of bigger and more powerful transmitters are still being disclosed by Continental states. Beromuenster, which is to be converted during the summer to a 100-kilowatter, will be closed during the month of August. From Söttens, both German and French programmes will be broadcast. Later, this latter station in its turn will also see its power increased.

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In Czechoslovakia a site is being sought for a 30-kilowatt station, for which an order has been placed. I understand, in Great Britain. Moreover, in the meantime, in order to cope with interference from neighbours, Kosice is to haye its plant overhauled, tuned up and generally furbished to bring it up to 10 kilowatts—at least, provisionally.

Poland also has further ambitions and has selected Mokre, near Torun (Thorn) for the location of its second high-power transmitter. Work on this 100-kilowatt plant has begun and it may be ready by the end of the autumn.

Torun was, previous to 1918, in the possession of Germany; it is distant from Danzig by just over ninety miles. Poznan will probably pass on its channel to the newcomer and when the latter is in full swing will transfer its existing plant to Pinsk.

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Relays from Tripoli

There is a possibility that through the Italian stations we may shortly hear broadcasts relayed from Tripoli (North Africa) as the colonial authorities have installed a short-wave transmitter at Mellaha in addition to a small local station for the retransmission from Italy of news bulletins, operatic performances and so on. Listeners on short waves will have picked up relays of Rome on unfamiliar channels; these tests are being made with Tripoli.

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Another relay of interest this year, although no date has yet been definitely fixed, is one which will be made by the Swiss stations. It is in conjunction with the National Broadcasting Company of the U.S.A., who propose to broadcast a running commentary of an actual ascent of the Jungfraujoch (11,090 ft. high), from Grindelwald. The transmission will be taken by all stations in the N.B.C. network.

Five Days—and 114 Short-wave Stations!

KENNETH JOWERS Reviews the Short Waves

HOW many short-wave fans can claim a log of stations to beat W. A. Clemenson's (of Hampstead)? Some of you may have heard all of these stations from time to time, and perhaps more besides, but to receive 114 different stations within five days takes some doing. Most of these stations were on the 20- or 40-metre bands, although there are a few on 80 metres.

Detector and Two Low-frequency

If anyone can equal this log I should like to hear about it, but don't forget that Mr. Clemenson only uses a detector and two low-frequency receiver, so don't go using an umpteen-valve super.

Remember that the whole world can be received on a simple one-valver. I should also like to hear from anyone receiving stations in Cuba, Costa Rica, Peru or Nicaragua, which are all very hard to log.

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An Essex field day was held last Sunday, with all the portable stations doing their stuff. Portable G6UT was heard all over the country at exceptionally good strength; in fact, in some localities the field strength was equal to that of many fixed 10-watt stations.

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An interesting experience was in store for all the hams who visited G2LZ just recently. As I have told you before, G2LZ is the transmitter who worked Z14AO of New Zealand every morning. On this particular occasion 2LZ recorded the signals of Z14AO and played the record back to his visitors later in the day.

But that's not all. The twenty-seven visitors then all made a record which was transmitted back to New Zealand. The experiment was 100 per cent. successful, so this might help to convince some of the sceptics that short waves do get there.

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G6CT of Westcliff is in the news quite often these days for his excellent work on 20 metres. Just recently he made contact with the Argentine station LU3DE at a strength of R4. This is very good indeed if you remember that 6CT uses less than 10 watts.

Another amateur who is doing good work is G5VQ, who with a power of 10 watts has contacted American stations in the first, second, third, fifth, eighth and ninth districts at strengths between R8 and R9. He has also worked stations in the first, second, third and fifth Canadian districts. All of these stations were again worked on 20 metres.

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Good Scottish Reception

A Scottish reader, Edward Smith of Dundee, has sent me an excellent report on the 49-metre band broadcast stations. He has logged W1XAL, W8X, W2XAL, W3XAU and OXY, all at good strength. This is pretty good going, for there are not many more stations that he could have heard.

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With the valve makers all bringing out universal mains valves there should be quite a number of self-powered short-wave converters coming along very shortly. I have often wondered how the non-technical listener with a mains set tuned in the short-wavers.

He could have used a plug-in adaptor or

Continued on page 504

Five Day's Short-wave Log with a Three-valve Receiver

The following prefixes are used in Mr. Clemenson's report. For example, all stations beginning with "W" originate in America. As the United States is split into nine different radio territories, each station has a call sign preceded by the territory number and the letter "W". So we get W1AKR and W1CDO, etc.

The same methods of identification are in use in the other countries mentioned in this report :—

VE =	Canada	OA =	Peru
W =	America	G =	Great Britain
K4 =	Porto Rico	PA =	Holland
TI =	Costa Rica	OM =	Belgium
CM =	Cuba	XN =	Nicaragua
ZL =	New Zealand	EAR =	Spain
VK =	Australia	LY =	Lithuania
SU =	Egypt	VQ4 =	Kenya
LU =	Argentina	D =	Germany
TG =	Guatemala	CQ =	General Test Call

14 megacycles is equivalent to the 20-metre band; 7 megacycles, 40-metre band; and 3.5 megacycles, 80-metre band. Stations in heavy type indicate exceptional or freak reception.

FIRST DAY

Station	Mega-cycles	Time	Calling
VE2AP	14	22.00	Calling G2DL
W1AKR	14	22.05	Working G5HC
W1BLI	14	22.05	Call. CQ
W3CDO	14	22.10	Work. G2DL
W2GOX	14	22.10	Call. CQ DX
K4SA	14	22.20	**Work. HB9JI**
W2BMZ	14	22.25	Call. G5MR
W4CBY	14	22.35	Work. ON4AC
W4SI	14	22.45	Call. PAORP
W1HTP	14	22.50	Call. PAORP
W1AID	14	22.55	Call. CQ
VE2OM	14	22.55	Call. CT2AP
VE1FG	14	23.00	Call. G5BY
W4BSJ	14	23.40	Call. CQDX
W1EBT	14	23.40	Call. CQ
W1EWA	14	23.45	Call. CQ DX
W1BLI	14	23.45	Call. CQ
W1BMI	7	23.55	Work. W8KZJ
W2FPL	7	23.55	Call. CQ
W1HUO	7	24.00	Work. PAOPN

SECOND DAY

W3BWA	7	00.10	Call. XZN2C
W2AQN	7	00.10	Call. EAR3CY
W2CRM	7	00.15	Call. VP7NA
W1AJM	7	00.15	Call. CQ
W2EDR	7	00.15	Call. G2SN
VE1EA	7	00.20	Call. VE2BT
W2BIC	7	00.20	Call. CQ
TI2FG	7	06.00	**Work. W6GRL**
CM2FA	7	06.05	**Work. W6EOM**
W3EMM	7	06.10	**Call. ZL2KK**
W4VB	7	06.15	**Call. CQ DX**
W4CLK	7	06.20	**Call. CQ**
W4AH	7	06.25	**Call. CQ**
W6GJA	7	06.30	**Call. CQ**
ZL2LQ	7	06.35	Call. TI2FG
ZL3AN	7	07.10	Call. CQ
VK2HF	7	07.35	Call. CQ
W9GOT	14	19.05	Work. G6HP
W2DTB	14	19.10	Work. LYIJ
W1EFC	14	19.10	Work. G5BD
SU3EH	14	19.15	Call. G5ML
W1CBJ	14	19.15	Call. CQ DX
W1LZ	14	19.20	Call. GI6YW
W9CRA	14	19.20	Call. GI2SP
W9ARN	14	19.25	Call. G2GQ
VE3JZ	14	19.30	Call. VQ4KTA
W3ZJ	14	19.40	Call. LYIJ
W4AKH	14	19.50	Call. VQ4KTA
VE2FQ	14	19.50	Call. CQ DX
W1HQ	14	20.00	Call. SU1SG
W4BSJ	14	22.10	Call. PAORP
W4EF	14	22.10	Call. PAORP
W1BLI	14	22.15	Work. G5QY
VE3JE	14	22.25	Call. CQ DX
W4COO	14	22.40	Call. PAOKT
CM2FA	14	22.45	Call. CQ DX
W2FIS	7	22.50	Call. CQ
W2ETA	7	22.50	Call. EA1ST
W2ECR	7	23.10	Call. G2QO
W1KN	7	23.10	Call. CQ
W3ANT	7	23.15	Call. CQ
W1DHE	7	23.20	Work. PAOKW
W1CCD	7	23.20	Call. G5DS
W1DZE	7	23.30	Call. CQ Europe
W3EHW	7	23.35	Call. PAOLA
W2BHM	7	23.35	Call. ON4MT
W1AJO	7	23.40	Call. PAOPN

THIRD DAY

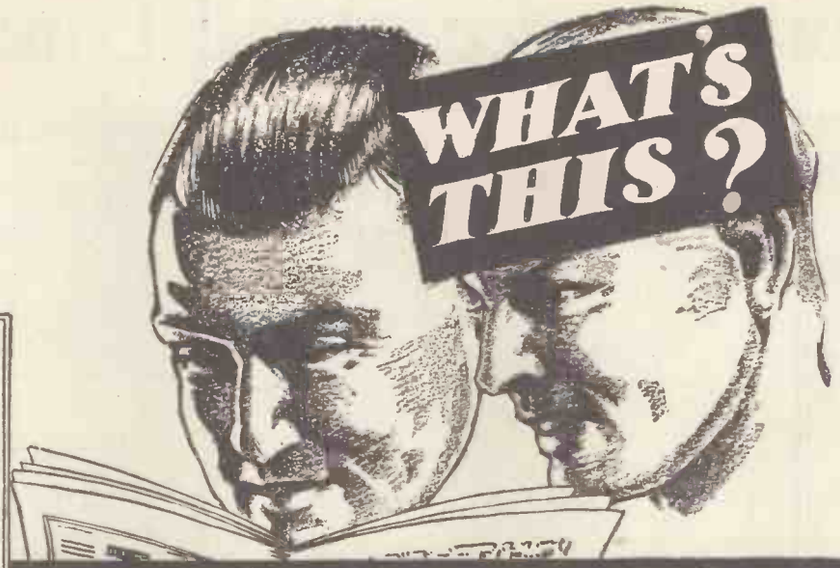
K4SA	14	22.50	**Call. ON4MY**
W2OA	14	22.55	Call. CQ DX
VE2HG	14	23.00	Call. CQ DX
W2GOX	14	23.15	Call. CQ

FOURTH DAY

Station	Mega-cycles	Time	Calling
LU5CZ	7	05.55	**Call. CQ DX, Hawai**
ZL3AZ	7	06.10	Work. 11YL
W5ABQ	7	06.15	**Call. CQ**
ZL3AN	7	06.20	Work. EA3EG
ZL4FW	7	06.30	Call. CQ
TG5JB	7	06.35	**Call. CQ, test OE**
ZL3CC	7	06.40	Call. D4BKK
LU6DJK	7	06.45	**Call. CQ DX**
LU6DD	7	06.50	**Call. CQ**
VE2BG	14	22.10	Call. G5YH
VE2CM	14	22.30	Work. G5VM
VE3JV	14	23.20	Work. G2OA

FIFTH DAY

W1AJM	7	02.05	Call. CQ DX
W8WC	7	02.10	Call. CQ
W1DMD	7	02.10	Call. W9MKX
W1HSA	7	02.15	Work. ON4GU
W9NE	7	02.15	Call. CQ
W3DQ	3.5	02.20	**Work. W1VES**
W1VES	3.5	02.20	**Work. W3DQ**
W4AZZ	3.5	02.25	**Work W5ZZ**
W3ANT	7	04.40	Call. CQ
W4AJS	7	04.50	Call. D4BIU
ZL2FN	7	05.00	Call. OH2PM
W7BB	7	05.35	**Call. CQ DX**
TI2FG	7	05.50	**Work. W2BDT**
VE4LX	7	05.55	**Call. W2BGD**
ZL3AN	7	06.05	**Work. W7BB**
OA4J	7	06.25	**Call CQ DX**
ZL2FR	7	06.30	Call. CT1EU
VK2HW	7	06.35	Call. G2BY
VK2AH	7	06.40	Call. CQ DX
W5NW	7	08.10	**Call. VE5IO**
W6FYT	7	08.15	**Call. CQ DX**
W4ABV	7	08.20	**Call. VK2DL**
VE2BG	14	16.20	Call. CQ DX
W6BAX	14	17.50	Call. PAOLR
VE1DO	14	18.40	Call. W1AMD
VE3HF	14	18.40	Call. CQ DX
W6AHZ	14	18.45	Call. CQ
VQ4CRL	14	18.50	Call. CQ DX
VE2CX	14	19.15	Call. EA3AN
VE4JV	14	20.50	Call. CQ
W7DL	14	21.00	Call. CQ



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Your Choice of the Latest Records

By WHITAKER-WILSON

Trying out some new records on one of the latest His Master's Voice radio gramophones

SEVERAL good fox-trots in this month's consignment. They are well above the average, taking them as a whole. Decca (F3926) gives an excellent impression of Roy Fox's band in *No More Heartaches, No More Tears*, with the popular *Midnight, the Stars, and You* on the reverse.

Brunswick produce two good tunes on 01720A, *Playing Carioca*, with a tango on the reverse. The players are the Castillians—and very good, too. Rather on the brilliant side.

Parlophone (R1785), with George Olsen's Orchestra, does *Wagon Wheels* and *I'm Weaving Rainbows for Those in Love*. The refrains are particularly well sung. There are three H.M.V. dance records. Ray Noble plays *Spin a Little Web of Dreams* and *Wagon Wheels* on B6469. This is one of the best dance orchestras for recording. The singer is quite good, but I have heard better.

Jack Jackson's Band in *Gosh, I Must be Falling in Love* and *Ol' Poppy* (B6472) attracts me, in the latter especially. A very good-toned band. Another Ray Noble record (B6470) is *What Now?* and *An Hour Ago This Minute*. Very attractive. Both are from the film, *Big Business*, as you probably know.

I have five Columbia records of varying kinds. Ivory Keys and the Grand Piano Orchestra playing *Faust Waltzes* (Gounod's music) and the Barcarolle from *Tales of Hoffmann*. Very effective and also very unusual. Quite worth getting (DB1343).

There is (DB1341) a B.B.C. Military Band record well worth having. Mr. O'Donnell plays the *Introduction to Act III of Lohengrin* and the *Tannhäuser March*. A very good arrangement in each case. The playing is really smart. Get this; you will enjoy it.

The London Phil. Orchestra under Harty plays (DX571) *Marche Militaire* of Schubert and *Valse Triste*. One of the most expressive records that has come my way recently. The bass is particularly fine from the recording point of view.

On DB1342 there is a vigorous piece of work, where Raymond Newell and the B.B.C. Male Chorus (under Leslie Woodgate) sings three traditional melodies: *Mary Had a Little Lamb, Jack and Jill*, and *Upidee*. Delightful and diction without blemish. I strongly recommend this record to your consideration. They ought to have a big success with it.

The other Columbia disc (DX572) is an excellent medley called *My Songs from the Shows*, by Marie Burke, who sings a number of favourites with orchestra. A good voice.

Two Deccas. *Spanish Rhapsody*, played by the Lamoureux Orchestra of Paris, under Albert Wolff (CA8174), is worth having. Excellent light orchestral music, well played. Ray Warren (F3890) has a good recording voice. He sings *Croon to Me*, without crooning, too. Quite effective.

Two Panachords. On 25622 Lee O'Daniel, with his Light Crust Doughboys, gives *I Want Somebody to Cry Over Me* and *Memories of Jimmy Rogers*. A little twangy, but quite entertaining.

On 25585 the Coral Strand Players of the Hawaiian style play a tune called *The Swallow*. I liked this and think it may be popular.

Effective Rendering

Paul Robeson sings *Mammy's Little Kinky-headed Boy* and the immortal *Wagon Wheels* on H.M.V. (B8135). I suppose his rendering of the latter is authoritative? It is certainly very effective.

Rosing, whose tenor voice is one of the best recorded, sings *My Father Has Some Very Fine Sheep* in English, with one French and one Russian song on the reverse. Are you a Rosing fan? If so, you had better get E11247; you will not be disappointed. He is delightful. Amusing, too, in the English song.

Zonophone (MR1240) gives the Commodore Orchestra a good chance to express itself in *Knave of Diamonds* and a remarkably good rendering of Sinding's *Rustle of Spring*. Worth having.

Bing Crosby, in *The Last Round Up*, hardly needs recommendation. The number is enough: Brunswick 01608. Williams and Browning, those excellent piano duettists, play *Rasputin* and *Nagasurk* on Parlophone R1794. And there is nothing the matter with any of it!

Five Days—and 114 Short-wave Stations

Continued from page 502

converter with separate power supply, but what a business that would have been. It will in the future be quite an easy matter to knock up a short-wave converter, suitable for either A.C. or D.C., with the new universal valves. This unit can then be hooked up in front of the standard set without any trouble.

The nearest commercial unit to this idea uses high-voltage filament valves and consists of a high-frequency stage in front of a combined detector oscillator—quite a good arrangement.

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Schoolboy's One-valver

Most of you probably saw the one-valve short-waver in the Schoolboys' Number of this paper. As well as being a simple lash-up for the schoolboy for whom it was intended, it has turned out to be a real record breaker. Reports are coming in from all over the country telling us of DX results with poor aerials and semi-rundown high-tension batteries.

Every correspondent appears to have heard America at the first attempt, which says a lot for the design of the home-made coil used. It is all very well talking about short-wave supers and so on, but there is no getting away from the fact that a one-valver does get there.

It may not give loud-speaker strength, but as the background noise is negligible, weaker stations can often be sorted out more easily than with a larger set. So if you are just starting on the short waves, don't forget that a one-valver will bring in America, Australia, and other parts of the world quite as reliably as a larger set.

So if you have never tried the short waves yet it is worth considering building up this little receiver. It won't cost very much, anyway.

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If you are on the look out for ways and means of saving money, I came across some coils which are a great help in that direction.

The Stratton people are selling some new six-pin high-frequency transformers that tune right down to 12.5 metres. Bear that in mind and then read this:

A friend of mine has a screen-grid three with which he is very pleased. The only trouble with it is that he gets blind spots, where it will not oscillate. He can overcome the trouble by using a detector choke of the same type as is used in the high-frequnecy stage. This does the trick, but upsets the screen-grid stage.

He then hit upon the bright idea of using tuned transformer coupling between the high-frequency and detector stages. This eliminated one high-frequency choke and the coupling condenser. Incidentally the performance of the set was improved and the blind spots eliminated. The high-frequency transformers were, of course, the new Strattons.

Ashley Sterne

"A.W." photo

ON page 455 of the issue of AMATEUR WIRELESS dated April 28 we published what purported to be a caricature of Ashley Sterne. We regret to say that this drawing was not of the author of *Table D'Hote*, which Whitaker-Wilson described that week as being "one of the best shows ever"; indeed, it bears no resemblance to this popular writer.

This week we take pleasure in publishing a new and exclusive portrait of Ashley Sterne.

Television in Germany

By Dr. ALFRED GRADENWITZ

THE Telefunken people have for some time been engaged in developing the cathode tube, with a view to securing high quality television pictures, long life of the tube, and an improved method of controlling the cathode ray as well as wireless synchronisation of the television receiver.

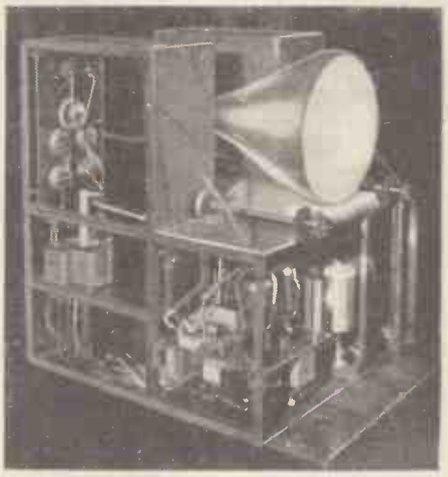
Gratifying results have also been obtained in the way of reducing the total number of switches and valves, thus bringing the price within the range of a wide circle of buyers.

On the strength of the experience thus gained, a type of apparatus has been developed which is both reasonably priced and of high quality. A limited series of these receivers is to be manufactured for experimental purposes, in connection with the new ultra-short-wave transmitter installed at Witzleben. Transmissions are on 7 metres, with 180-line scanning.

Special Synchronising Method

Synchronisation of the television set with the transmitter is to be effected by a special Telefunken method. The starting date of these tests will be decided on as soon as the television transmitter is in working order, which may be in the near future.

However, inasmuch as television pictures will have to be supplemented with acoustic transmissions, to which effect the Witzleben ultra-short-wave transmitter so far used for the same purpose, but designed for 90-line pictures, will have to be reconstructed, one or two months will have to be allowed for organising the experimental service.



This Telefunken cathode-ray receiver is the latest thing in German television

As it is, a smooth-working visual and acoustic transmission service is expected to be in full swing by the time this year's Radio Exhibition is opened.

Plans are also being made for making broadcasting tests, on the results of which will depend the final decision whether ultra-short-wave television is ripe for inclusion in the radio service or whether further technical improvements will have to be waited for.

A complete sight-and-sound outfit made by Telefunken

The bulk of expert opinion in Germany still is that even the undoubted progress recently obtained in the development of television has not resulted in sufficiently simplifying the design and operation of television receivers for the man in the street to be able to handle them.

It is also thought that even at the transmitting end much additional research work will be required to secure a sufficient receiving range and reduction of blank zones. Also, it is deemed advisable, in order definitely to do away with the last traces of flicker, to raise the number of frames to 36-40 per second.

While this desideratum may seem trifling in itself, it is bound to give rise to a number of new technical problems.

Medium-wave Broadcasters

This week we give details of all the important European medium-wave stations. Next week we shall publish a list of short- and long-wave transmitters.

Metres	Kilocycles	Station and Call Sign	Country	Power (Kw.)
201.1	1,492	Bordeaux-Sud-Ouest	France	3.0
203.5	1,474	Plymouth	Great Britain	.3
203.5	1,474	Bournemouth	Great Britain	1
204.2	1,469	Pecs	Hungary	1.25
206	1,456	Fecamp	France	20.0
208.6	1,438	Miskolez	Hungary	1.25
209.5	1,432	Beziers	France	1.5
209.9	1,429	Newcastle	Great Britain	1
211.3	1,420	Tampere	Finland	1.2
214	1,402	Sofia	Bulgaria	5.0
215.	1,395.4	Radio Lyon	France	.7
216.8	1,384	Warsaw (2)	Poland	2.0
218.2	1,375	Basle, Berne	Switzerland	.5
221.1	1,357	Turin (2)	Italy	.2
222	1,351	Dublin (2)	Irish Free State	1.2
222.6	1,348	Koenigsberg	Germany	.5
223.7	1,341	Milan Vigentino (2)	Italy	7
224	1,339	Montpellier	France	.8
224.1	1,338.8	Lodz	Poland	1.7
225.6	1,330	Hanover and other Hamburg relays	Germany	1.5
227.1	1321	Magyarovar	Hungary	1.25
230.2	1,303	Danzig	Germany	.5
231.8	1,294	Linz and other Vienna relays	Austria	.5
232.7	1,289	Dresden	Germany	1.5
233.5	1,285	Aberdeen	Great Britain	1
235.1	1,276	Stavanger	Norway	0.5
236.8	1,267	Nurnberg	Germany	2
238.5	1,258	San Sebastian (EAJ8)	Spain	.6
238.5	1,258	Rome (III)	Italy	1.0
240.2	1,249	Juan-les-Pins	France	2.0
241.9	1,240	Cork	Irish Free State	1
243.7	1,231	Gleiwitz	Germany	5
245.5	1,222	Trieste	Italy	10
247.3	1,213	Lille PTT	France	1.4
249.2	1,204	Prague Strasnice (2)	Czechoslovakia	3
251	1,195	Frankfurt-am-Main and relays	Germany	17
253.2	1,185	Kharkov (2)	U.S.S.R.	35
255.1	1,176	Copenhagen	Denmark	10.0
257.1	1,167	Monte Ceneri	Switzerland	15
259.1	1,158	Moravska-Ostrava	Czechoslovakia	11
261.1	1,149	London National	Great Britain	50
261.1	1,149	West National	Great Britain	50
263.2	1,140	Turin (I)	Italy	7
265.3	1,131	Hoerby	Sweden	10
267.4	1,122	Belfast	N. Ireland	1
267.4	1,122	Nyiregyhaza	Hungary	6.25
269.5	1,113	Kosice	Czechoslovakia	2.5
270.8	1,107.6	Radio Vitus (Paris)	France	1.0
271.7	1,104	Naples	Italy	1.5
271.7	1,104	Madona	Latvia	15.0
273.6	1,096.5	Madrid EAJ7	Spain	3.0
276.2	1,086	Falun	Sweden	.5
276.9	1,083.6	Zagreb	Yugoslavia	.75
278	1,079	Bordeaux PTT	France	13
280.9	1,068	Tiraspol	U.S.S.R.	10
283.3	1,059	Bari	Italy	20
285.7	1,050	Scottish National	Great Britain	50
288.6	1,040	Leningrad (2)	U.S.S.R.	100
288.6	1,040	Rennes PTT	France	1.3
290.7	1,032	Parede	Portugal	5.0
291	1,031	Heilsberg	Germany	60
293.5	1,022	Barcelona (EAJ15)	Spain	2.0
296.2	1,013	North National	Great Britain	50
298.8	1,004	Bratislava	Czechoslovakia	14
301.5	995	Huizen (Hilv. prog.)	Holland	20
304.3	986	Genoa	Italy	10
304.3	986	Cracow	Poland	1.7
307.1	977	West Regional	Great Britain	50
312	962	Grenoble PTT	France	3.0
312.8	959	Poste Parisien, Paris	France	60
315.8	950	Breslau	Germany	60
318.8	941	Algiers	North Africa	13
318.8	941	Goeteborg	Sweden	10
321.9	932	Brussels (2)	Belgium	15
325.4	922	Brno	Czechoslovakia	35
328.6	913	Limoges PTT	France	.7
331.9	904	Hamburg	Germany	100
335.2	895	Radio Toulouse	France	8
335.2	895	Helsinki	Finland	10
338.6	886	Graz	Austria	7
342.1	877	London Regional	Great Britain	50
345.6	868	Poznan	Poland	17.0
349.2	859	Strasbourg	France	15
350	857	Bergen	Norway	1.0
352.9	850	Valencia	Spain	3.0
356.7	841	Berlin	Germany	100
360.6	832	Moscow (4)	U.S.S.R.	100
362.8	827	Radio LL, Paris	France	1.2
364.5	823	Bucharest	Roumania	12
368.6	814	Milan	Italy	50
373.1	804	Scottish Regional	Great Britain	50
377.4	795	Lwow	Poland	21.5
379.2	791	Barcelona (EAJ1)	Spain	8
382.2	785	Lelpzig	Germany	120
385	779	Fredriksstad	Norway	0.7
386.6	776	Toulouse PTT	France	.7
391.1	767	Midland Regional	Great Britain	25
395.8	758	Katowice	Poland	16
400.5	749	Marseilles PTT	France	2.5
405.4	740	Munich	Germany	100
410.4	731	Seville	Spain	1.5
410.4	731	Tallinn	Estonia	11
410.4	731	Madrid (Espana)	Spain	1.0
415.5	722	Kiev	U.S.S.R.	36
420.8	713	Rome	Italy	50
426.1	704	Stockholm	Sweden	55
431.7	695	Paris PTT	France	7
434.8	690	Fredriksstad	Norway	0.7
435	683.9	Belgrade	Yugoslavia	2.8
443.1	677	Sottens	Switzerland	25
449.1	668	North Regional	Great Britain	50
455.9	658	Langenberg	Germany	60
463	648	Lyons PTT	France	15
470.2	638	Prague (I)	Czechoslovakia	120
476.9	629	Trondhelm	Norway	1.2
476.9	629	Lisbon (tests)	Portugal	20.0
483.9	620	Brussels (I)	Belgium	15
483.9	620	Cairo (tests)	Egypt	20.0
491.8	610	Florence	Italy	20
499.2	601	Sundsvall	Sweden	10
499.2	601	Rabat	Morocco	6
506.8	592	Vienna	Austria	100
514	583.5	Agen	France	0.4
514.6	583.2	Riga	Latvia	15
514.6	583	Agen	France	0.5
522.9	574	Muhlacker	Germany	100
531	565	Athlone	Irish Free State	60
539.6	556	Beromunster	Switzerland	60
549.5	546	Budapest	Hungary	120
559.7	536	Wilno	Poland	16
569.3	527	Vilpuri	Finland	13.0
569.3	527	Ljubljana	Yugoslavia	7
578	519	Innsbrueck	Austria	0.5
696	431	Oulu	Finland	1.2
724.8	413.9	Ostersund	Sweden	.6
748	401	Geneva	Switzerland	1.5
748	401	Moscow	U.S.S.R.	20.0
775.2	387	Boden	Sweden	.6
824	364	Smolensk	U.S.S.R.	10.0
833.4	360	Budapest (II)	Hungary	3.0
845	355	Vadso	Norway	10.0

NOTE:—The following wavelengths are common to several transmitters: 206 m. (1,456 kcs.); 207.3 m. (1,447 kcs.); 208.6 m. (1,438 kcs.); 211.3 m. (1,420 kcs.); 218.2 m. (1,375 kcs.); 221.1 m. (1,357 kcs.); 225.6m. (1,330 kcs.); 228.7 m. (1,312 kcs.); 235.1 m. (1,276 kcs.); 236.8 m. (1,267 kcs.); 251 m. (1,195 kcs.).

● *Look out in next week's "A.W." for details of a Simple Screen-grid Three-valver*

Radio Cures an Eight-second Time Lag

BECAUSE in Mid-Victorian times architects knew nothing and cared less about the science of acoustics, the fifty-years-old Brompton Oratory has had to contend with an obnoxious time-lag of no less that *eight seconds* between organ and choir.

Owing to this time-lag, a chord struck by the organist would take four seconds to reach the ears of the choir, and their response took another four seconds to reach the organist, so that eight seconds elapsed before the organist had the least idea that the choir had started singing: in any case he would play very softly at first so as not to drown the sound of the choir to his own hearing.

Several Bars Behind

On many occasions the choir would be several bars behind or ahead of the organ for a considerable period until the organist had adjusted this playing to the tempo of the choir.

With the introduction of Marconiphone public address apparatus, this age-long difficulty has been completely overcome. A complete and comprehensive system of microphones and loud-speakers has been installed, with the object of carrying the service to the ears of every member of the congregation, no matter how large this may be.

In a building so vast, this installation will prove a boon to those in the more remote parts of the Oratory.

To counteract the time-lag effect, Marconiphone engineers have installed a microphone on the high altar to keep the organist in touch with the service through a loud-speaker installed specially for him, and thus obviate the distressing discrepancy in the unison of choir and organ.

This is the first time a microphone has ever been used on an altar in any church, but the purpose it fulfils fully justifies its inclusion.

The installation consists of four microphones, an amplifier giving an undistorted output of eleven watts, and nine loud-speakers. The microphones are placed at the disposal of the officiating clergy, the nine loud-speakers distributing their voices over the whole of the building.

Three weeks were spent by Marconiphone engineers in overcoming the time-lag, and over two miles of special cable were used in the wiring-up.

Notes and Jottings

WOULD you like to win £1 a week for a whole year? Yes! Then send for details of a competition organised by the Automatic Coil Winder and Electrical Equipment Co., Ltd.

By the way, owing to a printer's error, many readers may have already received an entry form on which the last figure in the ohms range is given as 0-3 megohms; this should read 0-3 megohms.

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Readers who visited the Empire Stadium, Wembley, to see the Cup Final, probably noticed the new loud-speakers mounted on poles encircling the ground. There are fourteen of these super-power loud-speakers which work in conjunction with a 600-watt amplifier giving an undistorted output of 130 watts. The output valve used is a Philips MA4/400, using an anode voltage of 4,000.

The equipment was manufactured and installed by Philips Lamps, Ltd.

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An entirely new range of components and accessories bearing the famous Formo trade mark will shortly be available through the new Formo Products, Ltd., of Bromley, Kent.

We understand that Mr. Graham Farish is the managing director of the new concern.

Components Needed for the Lucerne Major (Pentode Model)

(For details see page 488 of this issue)

BASEBOARD — £ s. d.
1—18 in. by 10 in., metallised ... 2 0

CHOKES, HIGH-FREQUENCY
3—As described in "A.W." for February 3 ... ... 4 6

COILS
3—Lucerne (types: aerial (2) and grid) as described in "A.W." for January 27 ... ... 7 6

CONDENSERS, FIXED
2—.0002-microfarad 1 0
2—.0003-microfarad 1 0
4—1-microfarad 6 0
1—2-microfarad 2 0

CONDENSERS, VARIABLE
3—.0005-microfarad, air dielectric, with slow-motion drives 13 6
1—.0005-microfarad, reaction type 2 0
1—.0003-microfarad, preset 9

HOLDERS, VALVE
3—Four-pin 1 1½
1—Five-pin 8

PLUGS, TERMINALS, ETC.
8—Wander plugs 8
2—Spade terminals, marked: L.T.+, L.T.— 4
2—Terminal blocks 1 0

RESISTANCES, FIXED
1—5,000-ohm 7½
1—25,000-ohm 7½
1—1-megohm 7½

RESISTANCE, VARIABLE
1—50,000-ohm with combined switch 5 0

SUNDRIES — £ s. d.
4 yd. thin flex ... ...
15 ft. connecting wire ... ...
8 bolts and terminals ... ... say 3 4½
1—Aluminium sheet, 12 in. by 10 in.
Wood for panel, 18 in. by 7 in. ...

SWITCHES
1—Three-point push-pull shorting ... 10½
1—Four-point push-pull shorting ... 1 3

TRANSFORMER, LOW-FREQUENCY
1—As described in "A.W." for February 10 ... ... 8 6

ACCESSORIES

BATTERIES
1—120-volt high-tension 1 4 0
2—9-volt grid-bias 2 0
1—2-volt accumulator 8 6

SUITABLE VALVES

Make	Variable-mu	Screen-grid	Detector	Pentode	Price
					£ s. d.
Cossor* ...	220VS	215SG	210Det	220HPT	2 14 6
Dario	TB452	TB422	PB172	TC432	1 16 0
Hivac	VS210	SG210	D210	Y220	1 8 6
Lissen	SG2V	SG215	L2	PT225	2 12 0
Marconi* ...	VS2	S23	L210	PT2	2 14 6
Mazda* ...	SG215VM	S215B	L2	Pen220	2 14 6
Mullard* ...	PM12M	PM12A	PM2DX	PM22	2 14 6
Osram* ...	VS2	S23	L210	PT2	2 14 6
Triotron ...	S208	S215	SD2	P225	1 16 6
Tungsram ...	SE220	S220	LD210	PP230	2 4 6
362	VS2	SG2	L2	ME2	1 8 6

*Indicates B.V.A. valves

PREPAID ADVERTISEMENTS

Advertisements under this head are charged THREEPENCE PER WORD, minimum charge THREE SHILLINGS. DEPOSIT SYSTEM.

As the publishers cannot accept responsibility for the bona fides of advertisers in this publication, they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to "Amateur Wireless," Advertisement Department, 58/61 Fetter Lane, London, E.C.4.

THIS WEEK'S SPECIALS.—Brand new goods at fraction of usual cost and listed supplementary to our bargain lists.

1/- EACH, LOTUS DIFFERENTIALS, .0001, .0003, .0005-mfd. variables, 11d.

1/3 BROWNIE DUAL-RANGE COILS.—Screened, 2/2; Lucerne Coils, Aerial or Grid, 2/4.

1/8 EACH, AMPLION CONE SPEAKER UNITS (well worth 7/6).

1/9 PHILCO 20-HEN. CHOKES,—G.E.C. 20-hen. L.F. Chokes, 3/6.

2/11 COLUMBIA L.F. TRANSFORMERS (list, 10/6). S.M. Extensers (list, 18/6), 2/11.

2/6 IRON-CORED DUAL-RANGE COILS.—Dubilier 8-mfd. electrolytic, 2/10.

3/4 CLASS-B DRIVERS and Output Chokes. Class-B Valve Holders, 6d.

3/6 IGRANICORE IRON-CORE COILS with Switch (list, 10/6).

5/6 A.V.C. UNITS for battery receivers (list, 10/6).

8/6 SHORT-WAVE ADAPTOR with full instructions, in sealed carton.

9/6 D.C. ELIMINATOR KITS complete with full diagrams, 100-120 or 200-230 volts.

10/6 S.T.111 VALVE KITS complete in sealed cartons.

10/6 CLASS-B CONVERSION KITS complete. Class-B Valve, 8/10.

12/6 SHORT-WAVE 111 KITS in sealed cartons, complete.

15/6 ULTRA "TIGER" WALNUT CONSOLE CABINETS, a superb production, worth 50/-.

18/6 CLASS-B 111 VALVE KITS, absolutely complete in sealed cartons.

21/- A.C. ELIMINATOR KITS, 25 m.a. Class-B Eliminators, 29/6.

3d. EACH.—Fixed Condensers, 1-watt Resistances and Grid Leaks, all values; Edison Bell Jacks and Switches, 4-point (list, 4/-), 9d.; H.F. Chokes, 9d.; Mansbridge Condensers, 1-mfd., 9d.; 2-mfd., 1/4; 4-mfd., 2/8.

HUNDREDS UPON HUNDREDS of equally attractive bargains in the new May issue of "The Radio Gold-Mine." The most comprehensive surplus radio lists published in Great Britain. You cannot afford to be without them. Enclose 3d. stamps.—London East Central Trading Company (Dept. A.99), 23 Bartholomew Close, E.C.1. Terms: Cash or C.O.D.

INFORMATION BUREAU

Will every querist please observe the following revised rules?

Please write concisely, giving essential particulars.

A fee of one shilling, postal order (not stamps), a stamped, addressed envelope and the coupon on this page must accompany all queries.

Not more than two questions should be sent at any time.

The designing of apparatus or receivers cannot be undertaken.

Slight modifications of a straightforward nature only can be made to blueprints. For more serious alterations the minimum charge is 2/6.

Blueprints supplied by us will be charged for in addition, but of course, readers may send their own blueprints for alteration.

Modifications to proprietary receivers and designs published by contemporary journals cannot be undertaken. Readers' sets and components cannot be tested by us. Queries cannot be answered by telephone or personally. Readers ordering blueprints and requiring technical information in addition should address a separate letter to the Information Bureau and should see that their remittance covers the price of the Blueprint and the amount of the query fee.

We do not answer queries in cases where the fee is omitted.

Queries should be addressed to the Query Dept., "Amateur Wireless," 58/61, Fetter Lane, London, E.C.4.

REPAIRS to Loud-speakers, Transformers, and Headphones, 4/- each; Blue Spots, 5/-. Moving Coils a speciality. Cones fitted. Eliminators and Sets quoted for. Satisfaction guaranteed. Prompt service. Inquiries invited. Terms to trade.—Loud-speaker Repair Service, 5 Balham Grove, London, S.W.12. Battersea 1321.

TELEVISION RECEIVERS.—The "Salter"—"Major" and "Minor" complete kits. Supplied direct to constructors, now available. Prices from £3 10s. John Salter (estd. 1896), Member Television Society, Featherstone Buildings, High Holborn, W.C.

4-VALVE Superhet. Midget, A.C. or D.C.; m.c. speaker, £3/19/6; 5-valve, £5/5/0. Other wonderful bargains; write catalogue.—"Royal," 5 Buckingham Road, London, E.18.

REPAIRS to Loudspeakers, Transformers, Pick-ups; any type, 3/-. Mains Transformers, Moving Coils quoted for 24 Hours Service. 12 Months Guarantee. Malden 2060.—Graham's, 208 High Street, Tooting, London.

HIGHEST POSSIBLE ALLOWANCE made on used wireless sets or parts in exchange for any new set, kit, or parts. Peto-Scott kits supplied. Goods bought for cash.—R. Wigfield, Furlong Road, Goldthorpe, Yorks.

WANTED.—Good Modern Wireless Parts, Sets, Eliminators, Meters, Valves, Speakers, etc. Spot cash waiting. Send or bring. We pay more than any other dealer. Open 9-8.—University Radio, 142 Drummond Street, Euston, N.W.1.

BANKRUPT BARGAINS.—List free. Clearance sale of sets and components. Write for requirements. Positively the lowest prices for quality goods. Full-size vacuum cleaners with all gadgets, 65/-. High-class tennis racquets, 6/6.—Butlin, 143b Preston Road, Brighton. Preston 4030.

RADIO DEALERS.—"Cambridge" the World's Best Bikes—will help you through the summer. Send for lists and catalogues—trade only supplied by Nasco, Pittville House, Alma Street, Birmingham 6.

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AT HOME WITH HENRY HALL

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HOW I PREPARE MY BROADCAST TALKS

by S. P. B. Mais

These are just some of the splendid contents of Friday's issue of Radio Pictorial. Don't forget to get your copy—the folks at home will enjoy it, too.

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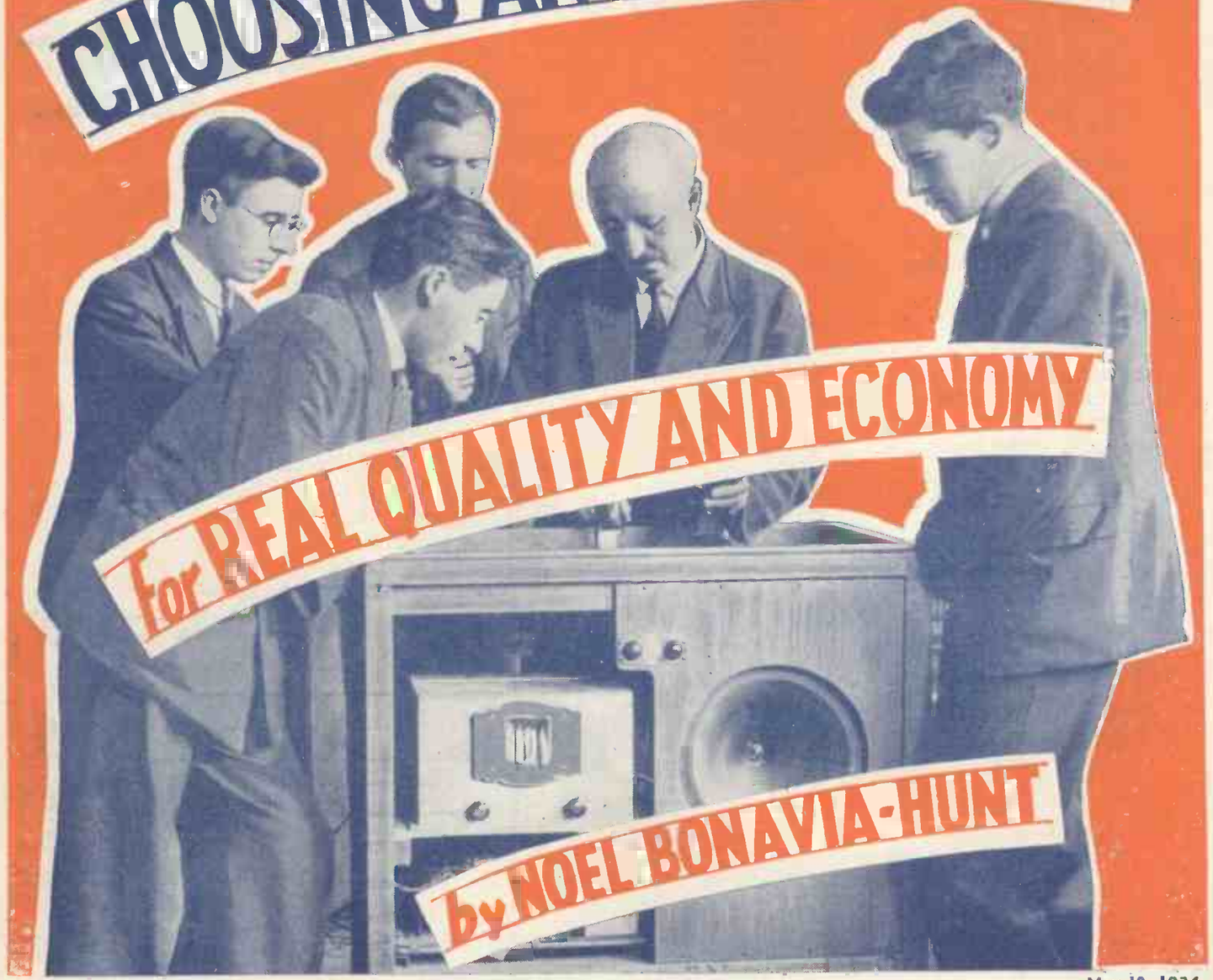

For REAL QUALITY AND ECONOMY

by NOEL BONAVIA-HUNT

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News and Gossip of the Week

This Television

We are still speculating about the people who will be on the P.M.G.'s television committee. Noel Ashbridge will represent the B.B.C., anyway.

The radio trade and the various services will also come into the affair. Like most committees of this sort, it will no doubt take its time.

We are not likely to hear any verdict until late in the year.

Ultra-shorts

All of which supports the view that anything in the nature of a real service of television on the ultra-short waves is still years off.

Meanwhile, amateurs are wondering what is to happen to their present 30-line transmissions from London National.

End of 30 Lines?

We can reassure lookers that the B.B.C. has no immediate intention of abandoning 30-line transmissions, though, of course, it has made no promise that they shall continue indefinitely.

Best judges say that 30-line transmissions will probably end when the London National is shut down—which will not be until near the end of the year. After that—hiatus?

Thin Time

Meanwhile ardent lookers seem to be having a pretty thin time with the London transmissions. Opera has several times held up the vision signals until 11.30.

In order to alleviate the inconvenience to lookers and artists alike, two television dates for the future have been changed.

The May 22 transmission has been shifted to May 23, and the May 29 one to May 30.

High-tension Harry!

That the television productions department is not discouraged by the way things are going is evident from Eustace Robb's latest — a comic television announcer called High-tension Harry.

He made his first appearance recently before the projector. Besides announcing, H.T. Harry can sing and dance and patter quite amusingly.

Gielgud's Lesson

From his enormous listener ballot, Val Gielgud, the B.B.C. Drama Director, has learned many things. He has now passed on the nice—and the nasty—remarks listeners have made about recent productions—and producers.

In the autumn we shall reap the advantage. Simplicity will be the keynote of future productions. Complicated studio hook-ups and other futuristic ideas will be mainly taboo.

Black Too Busy

Yes, isn't it a shame? Too busy to do that B.B.C. show he intended to do. But there is nothing more sinister in it than that.

Proof will come in the autumn, when Black will really put over his again-postponed broadcast music-hall.

Coloured Show

In place of the Black show we shall have another coloured performance.

An all-coloured cast will assemble themselves in the studio for a broadcast entitled, "Symphony in Colour."

Reply to Ridgeway

When it got around that Philip Ridgeway was giving auditions, he had to handle between one and two hundred artists at Broadcasting House.

Polly Ward was singing. He asked her if she did anything else.

"Oh, yes; I play the ukulele."

"Then why didn't you bring it with you?"

"Because I didn't like to bring my harp to the party!"

I.B.U. Meeting

Vice-admiral Sir Charles Carpendale will preside at the June meeting in London of the International Broadcasting Union.

Noel Ashbridge will be on the technical committee, C. F. Atkinson on the programmes committee, and L. W. Hayes on the relay committee.

Cecil Graves, the Empire Director, will also attend the meetings.

Sabotaging Lucerne

Although the main business of this I.B.U. meeting is routine appointment of officers for the year and so on, there is no doubt the wavelength situation will be on the agenda.

What we should like to know is whether the French delegates will be put on the spot for the way their private stations—and Eiffel Tower, too, for that matter—have partially sabotaged the Lucerne Plan.

At Radiolympia

Three shows a day is the promise of the B.B.C. for visitors to its giant theatre to be built at Radiolympia this year.

Eric Maschwitz will direct the shows. John Watt will produce them. A redoubtable team that augurs well for us!

Droitwich in June

Private tests of the Droitwich giant should begin, according to present progress, by the end of June.

As we have told you, the "T" aerial is now slung. But there are still five miles of wiring to be done before the station can take the air.

Nearly New Regionals

For North-eastern and North Scottish Regionals and the new Midland Regional, the little Nationals will form the basis.

But don't forget that a station involves more than just a few transmitter panels. There is the power supply and the building itself.

The B.B.C. will save a thousand or so pounds on shifting the transmitter panels, but they will have to buy completely new engines for running them—and to build new stations to house them.

North Scottish Regional

At last the site of this new station has been located. It is at Burghead, on the south side of the Moray Firth, some thirty miles from Inverness.

Signals will carry across the Firth to the highlands, thus giving the Scots their long-looked-for local service.

Ubiquitous O.B.'s

If the B.B.C. goes on using its Outside Broadcast staff at the present extravagant rate they will need a lot more men.

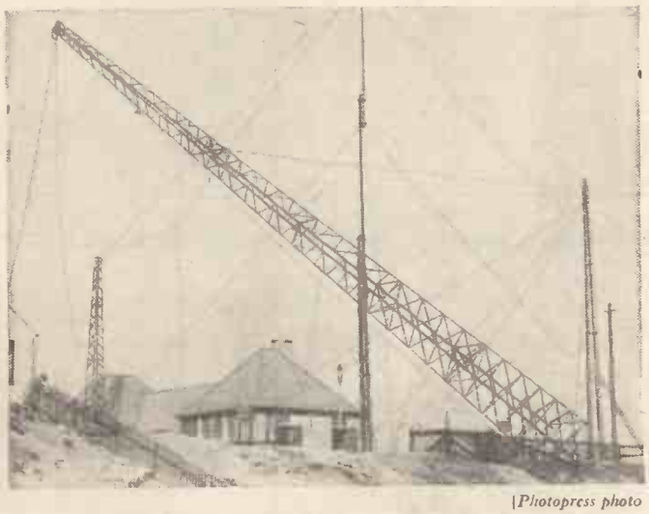
Just for ten minutes of characteristic noises the O.B. people will record the arrival of the steamer to Weston-super-Mare during the Bank Holiday programme.

Elaborate land-line hook-ups for odd outside broadcasts are growing. All very well for listeners, but the O.B. boys are getting overworked.

"Body Radio"

Exciting possibilities for really portable sets—sets that you can carry about on your person—are opened up by this week's centre-page article on police radio.

It is suggested that the amateur might well learn a thing or two from the police—especially in the use of midget valves.



[Photopress photo

Aerial erection made easy! This is how the new masts for the Post Office station at Cullercoats, Northumberland, were put into position. Hardly a job for the amateur, is it?

Readers' Views on This and That

Listeners' Letters

CRYSTAL RECEPTION

To the Editor, AMATEUR WIRELESS.

NOT having had a "fixed abode" for the last six months I have not taken a lot of interest in wireless, but seeing AMATEUR WIRELESS with "A Strong Case for the Crystal Set," on the cover, I dived in the shop and got one.

Although I have had 1-, 2- and 3-valve sets, I have never forgotten the fascination of my old crystal of about ten years ago, a National set costing 25s., on which I got about eight stations, including Glasgow, Nottingham, Manchester, Dundee and Radio Paris—and got them confirmed from the stations.

A few months ago I bought the old set back for 1s., and although I tried a lot of shops for a crystal, I could not get one, and got laughed at in most of them. Is it possible to buy the kind you mention in "A.W?"

I think a crystal set is ideal for anyone who wants a little quiet listening, and think it a great pity they have not been kept more up to date, and hope you will not let them die out. I intend trying the zinc and copper earth, if I can obtain the crystal.

A. H. IVES.

Brentford, Middlesex. [1079

I AM much interested in the simple, serviceable crystal set having had one on hand since 1927. It is easily portable, taking only a small space, not easily damaged yet easily rigged and *should* be licensed for 5s.

A "fan" is *always* ready to listen, a wireless admirer is often ready to hear an alternative programme while even one who is generally indifferent will sometimes be glad of entertainment or instruction.

Wearing phones is not onerous if they are properly adjusted by easing springs, hanging them from a band or using sponge rubber next the ears. Nor is wearing them "like being tied as a dog," since phone leads are connected to a *pleasure*, while a dog chain is *unpleasant* connection to something *not* a pleasure.

I admit the catwhisker adjustment is as difficult as threading a needle, yet many needles are threaded many times each day (especially the past two years) not for pleasure—whereas an adjustment or two give zest to using an apparatus.

There is *no* merit in operating that which requires *no skill*.

Recently two months in bed found me with a pair of phones jacked into extension leads in my clothes closet. When stations were faint the phones hung on the door as a sounding board and when stations were loud the phones were put under the quilt.

A carborundum crystal even without a battery will give results.

It is true that a crystal set will only bring in (say) three nearby stations but—that is all many valve sets will do.

As for battery use with a crystal set—I regret throwing batteries away (even grid-bias or flash-lamp) while they could be of use with a potentiometer—and zinc and copper earths make even that control unnecessary.

"CRYSTALISED."

Ealing. [1080

BETTER SWITCHES NEEDED

IS it possible to persuade switch manufacturers to produce a really reliable *low-tension* switch, one with contacts made of non-oxidisable metal?

My set is a six-valver, using 2-volt valves and taking just about 1 ampere low-tension current, and I have tried half a dozen different types, even electric-light switches, and more than one of the several makes.

Using even the best of these I find there is a loss up to between .3 and .4 volt across the switch, and one cannot afford this loss with 2-volt valves, the result being a loss of volume so that the volume is reduced to a whisper.

Working the switch from two to four times one can get the volume up to proper strength. If some maker would put on the market a switch with contacts of gold and silver alloy it would meet the case.

"DISGRUNTLED."

Teignmouth, Devon. [1081

MISLEADING TERMS

HAVE you ever noticed how misleading some radio terms are? For instance, accumulators don't accumulate, transformers don't transform, condensers don't condense, high-tension eliminators don't eliminate high-tension, etc.

Why are mains-driven receivers termed all-electric? Are not all sets (bar crystal) electrically driven? And whoever invented the term "loud-speaker"? "Reproducer" is a better term, although this isn't entirely correct (at least, not yet).

If a microhenry is a millionth of a henry,

"A deep depression is passing over Scotland"

and a microampere a millionth of an ampere, is a microphone a millionth of a phone?

Some advertisers advertise their sets as having full tone, deep tone, rich tone, mellow tone, etc., whereas a good radio receiver should have no tone of its own.

One famous set incorporating dual loud-speakers is stated to give stereo-*scopic* reproduction—which seems to suggest it is the perfect television set.

PHILIP A. BEALES.

Clapton, E.5. [1082

MORE ABOUT THE MASCOT

I HAVE over the past eight years built up several "A.W." circuits, starting with a two-valver, led up to several threes and fours, until one day I tried the Mascot.

This is the only circuit I have really "played with" to any extent, and I still like it after nearly two years. Having no high-frequency stage, the Mascot does not bring in mush, and one can listen to the station it does bring in—quite a goodly number—without irritation.

It works my R.K. loud-speaker beautifully, and is cheap to build and economical to run, my source of high-tension being a home-made mains transformer, a choke, valve, and one or two big condensers.

On an outdoor aerial of fair length it is not over-selective with the straight tuning, but on a short indoor aerial I can bring in stations right on Newcastle's doorstep, with only slight "break-through" on the long waves; truly a good performance.

R. P. FORSTER.

Newcastle-on-Tyne. [1083

WAVELENGTH SHUFFLES

IT seems that every time a wavelength shuffle occurs there is greater ether chaos. The regional scheme is a clever *idea*, but has caused more interference and bad reception than anything else.

So far it has benefited only the vendors of useless selectivity gadgets, and caused countless good sets built of first-class components to be scrapped.

On the receiving side wonderful work and fine receivers have been the record of famous engineers, such as Ferranti and Marconi.

What a pity such brains and sound business methods have not had complete control at the transmitting end—both in this country and abroad!

If such had been the case I imagine there would have been a sensible balance of power—small for small countries and greater for the larger areas. It seems that high power has become a mania, and at the transmitting end they have not the common sense to drop power after dark and not over-modulate.

Enormous power should be used only for great distances, and geographically, powerful transmitting aerials should be several miles apart.

The Brookman's Park aerials are far too close and must cause a certain amount of interaction and re-radiation, particularly if common earths are also used.

The old 2LO gave equal volume and better quality than does Brookman's Park, and in addition caused no interference with stations on nearby wavelengths.

Consequently the economical 2- or 3-valve set which gave better quality and as many programmes as the modern super-het was the favourite.

Thanks to the numerous high-power stations we have to use the multi-valve super-het and put up with rotten quality, atmospherics, mains hum, etc. Might as well stick to the old crystal set.

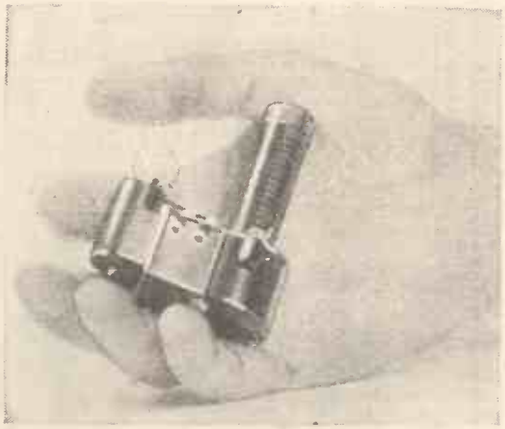
W. H. MORRIS.

Wimbledon, S.W. [1084

[It would be interesting to know how many listeners agree with this correspondent that the quality of the Brookman's Park transmitters is not better than that of the old 2LO. As far as volume is concerned, there is no question that the service area now obtained by listeners of Brookman's Park is greater than that of 2LO ever was.—ED.]

Tune by Eye—Instead of by Ear!

A New Visual Tuning Indicator for Multi-valve Sets



Here is the Weston visual tuning device—quite a "handy" little gadget for your new super-het

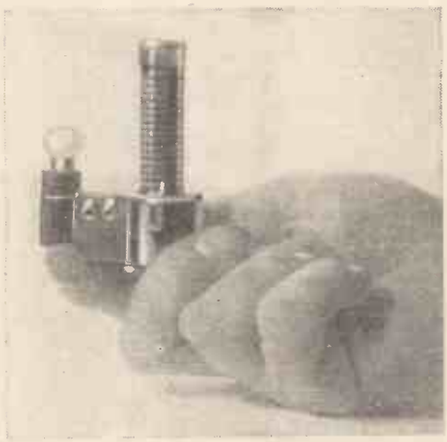
BUT, we can hear some of you saying, don't we *always* tune by eye? When we want a station we turn the tuning control to a point that is located by the eye—to the dial degree or wavelength of the station. True, in this sense tuning has always been done by the eye—but you rely on your ear for the last degree of accuracy in the visual setting.

How Your Ear Helps

You twiddle the *tuning* control backwards and forwards about the approximate scale or dial point, in order to settle down finally at the point that your *ear* indicates is the loudest volume.

So you see now what we mean. Tuning has been done by a combination effort of eye and ear—the eye giving you the approximate setting, the ear the final setting.

Is the ear good enough, though? Notoriously, the human ear is a poor recorder of *small volume changes*. You cannot rely on even a good ear to detect a slight loss of volume. Yet by such a faint recorder you depend for ultimate accuracy in tuning!



Light from the bulb shines through a triangular opening in the tube, a moving shutter varying the size of the triangle of light thus formed

It would not matter if stations were not quite so close together, nor if modern sets were not quite so sharply tuned. There it is, though. Stations *are* terribly near each other, and sets *are* amazingly selective. So much so that even a slight mal-adjustment of the tuning control will distort the side bands and so ruin your quality. Although you personally are of course utterly competent to detect such flaws and to make the necessary re-adjustments, can you expect your non-technical family to do the same? Of course you can't.

That is why the modern tendency towards complete visual tuning—that is, tuning not relying in any way on imperfect detection by the ear—is being sponsored by AMATEUR WIRELESS. We believe that visual tuning is a necessary complement to the conditions of to-day—at least for sets of ultra-selectivity.

With any of the systems of visual tuning now being used in commercial sets *the ear plays no part*. You can actually tune-in the station you want—accurately and without any question of mis-tuning—*with the volume control set at zero*.

Of the several systems suggested for visual tuning the Weston arrangement shown by the drawings on this page appeals to us as one of the most practicable.

Before explaining how it works, though, we had better tell you the basic idea of visual tuning. In all such systems a *change of current* is made to work an optical device. It does not matter whether the device is a neon tube, a shuttered meter needle or a floating shadow piece—some sort of current change is needed to work it. And that current change is the change effected by the incoming signal on the anode current of one of the valves.

Taking the simplest example, you know that when you increase the signal voltage applied to the grid of an anode-bend detector the anode current increases—signal strength change being noted by a dip in the needle of a milliammeter placed in that anode circuit.

In a more complicated set, signal increase causes anode-current increase in the intermediate-frequency stage—provided that it is equipped with self-adjusting volume control. It is for this type of circuit, which is becoming increasingly common, that most of the visual tuning arrangements have been developed.

In the Weston idea the anode current of the intermediate-frequency stage controls the magnetising effect of an electro-magnet, which in turn controls the position of a floating metal shutter.

This shutter floats in front of a triangular opening on a glass tube, covering up more or less of the opening according to its position. It intercepts the light from a little bulb placed behind the glass tube.

Signal Controls Light

In other words the signal current controls the size of the lighted triangular opening.

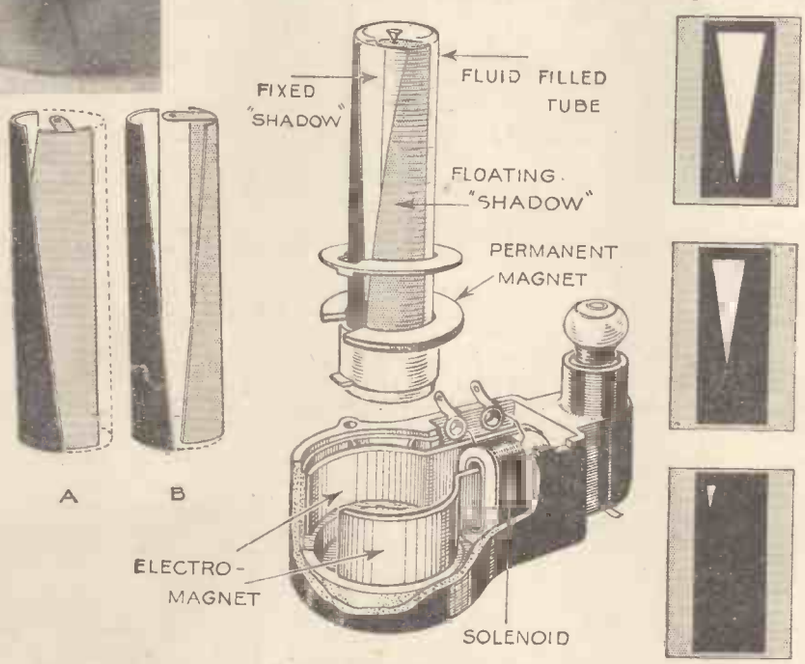
All of which should be clear if you make a careful study of the drawings. You will see from them that the Weston device consists of a bakelite moulding on which are mounted a celluloid bottle and the lamp behind it.

Inside the bottle is the visual tuning movement. The opaque material is cut away so that when the shutter is open the light from the bulb can shine through as a triangle of illumination. But pivoted inside is a metal shutter, floating in oil to provide damping without affecting the responsiveness of the instrument.

A small permanent magnet keeps this shutter in position, so that its movement depends entirely on the effect of the encircling electro-magnet, whose magnetism, of course, depends on the current flowing through its little coils.

When no signal is coming through, the shutter is completely open and the whole of the triangular opening can be seen. As the signal increases, so does the anode current of the control valve, and so in turn does the electro-magnet effect. This acts on the metal shutter, pulling it slowly across the opening and thus decreasing the area of triangular light. Black lines marked down the tube give useful graduation of strength.

To change the triangle from minimum to maximum an anode current change of 5 milliamperes is needed, though a smaller change will work the device—with, of course, less variation in the change of light area



How the Weston tuning indicator is arranged. At A the fixed and moving "shadow pieces" are in the maximum position and at B they are in the minimum position. On the right three positions of the indicator are shown

Build This De-luxe Version of the

SPECIALLY DESIGNED
by the
AMATEUR WIRELESS
Technical Staff

Neat, isn't it? You will like the sturdy layout of the tuning controls above the chassis

I MUST say that it is a set that *no family man should be without.* I had never tackled the job of building up a set before, but three hours after receiving the parts from Peto-Scott I was receiving twenty to thirty stations."

So wrote an enthusiastic amateur in a letter published in the May 5 issue of AMATEUR WIRELESS. He was talking about a little set described in our Christmas number—the £5 5s. S.G. three-valver.

Many readers have written to us in like strain. They have found that, although the set was definitely designed to a price, its performance was exceptionally good.

What is more, it is an easy set to make. As the correspondent from Chester reminds you, "*blueprints are so easy to build from.* The numbers of all the wires make it so simple."

Now, after several months, it has occurred to us that readers who have built the set and have obtained such good results might like to spend a little more in refinements.

Revised Version For All

That is the reason for this week's article—and for the new set you see illustrated so profusely in these two pages. It is a set that appeals primarily to the constructor of the original five-guinea model, though, of course, there is nothing to prevent anyone building this revised version from scratch.

From the list of components you will be able to see what extra parts are needed. Those marked with an asterisk are components not actually used in the original model.

We should like to emphasise two things; first, this new version is definitely built upon the parts of the old original—to that extent it is not, therefore, a new set; secondly, the revisions considered advisable have made an entirely new chassis design necessary, so that the old set would have to be taken completely to pieces if the new version were made.

But isn't that half the fun of the thing? You have a perfectly good little set—and the offer of a still better set by rebuilding for very little extra expense. It is up to you, constructors, to make the decision.

Before we go into the modifications, perhaps it will be as well to outline the original set. It was fully described in the Christmas number, dated December 2, 1933. The set was designed not only to meet a low price need but to give novices a start in radio—a good sound start for a complete five-guinea installation.

A flat baseboard type of layout was adopted, with a small vertical metal screen placed between the high-frequency and detector components.

Combining simplicity with cheapness, the layout was a very practical interpretation of a screen-grid, detector, and power valve circuit. The simplest and most straightforward sequence of valves for modern conditions.

No space wasted here! See how the screen-grid valve is mounted on its side?

The smaller compartment formed by the metal screen on the baseboard was taken up with the aerial tuning condenser, the aerial coil, screen-grid valve holder and aerial pre-set condenser.

All the other components were housed in the larger compartment, such as the grid-tuning coil for the detector valve, the low-frequency transformer, and the combined grid tuning and reaction condenser.

A metal bracket mounted on the baseboard supported the two switches, one for the battery on/off and the other for the waveband switching of the coils. This again saved using a panel.

It was, then, an utterly simple layout, for which we were able to give a full-size drawing to illustrate the article. Its compactness is obvious from the size of the baseboard—which measures only 10 in. by 6¼ in.

Possible Refinements

As we say, the circuit was just about as simple as it could be to combine efficiency with cheapness. But it was, of course, quite obvious that, as it stood, it was not the best possible three-valver with a screen-grid stage. Volume being controlled by the aerial series condenser, for example. That could be improved upon with a variable-mu type of screen-grid valve, particularly when the set is used near a powerful local station creating a big field strength at the receiving aerial.

So we took up this original five-guinea job and set about improving it without too much adding to the initial cost. We found that we could convert the straight screen-grid stage into a variable-mu without much extra cost—but it meant a good deal of alteration to the layout.

In fact it was the desire to incorporate this type of valve that finally lead us to scrap the original layout altogether and to assemble the new model along the lines of a wood-chassis set. While we were at it, we altered the simple reaction into modern differential reaction. Apart from these points, and a little alteration to the coil switching, the circuit is much as before, even though the layout is utterly different.

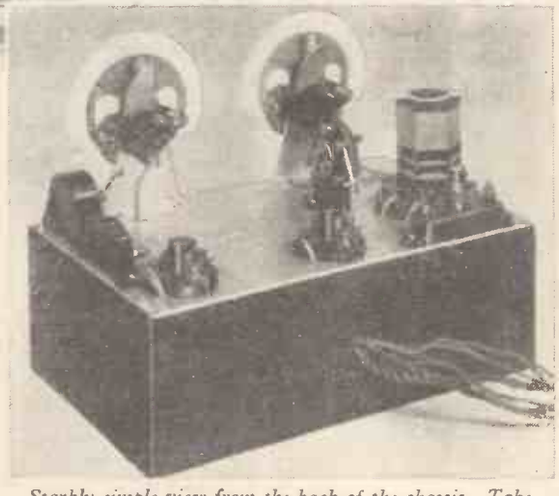
New Set's Action

For our more technical readers, perhaps an analysis of the theoretical circuit diagram will be of interest at this stage. But as this analysis is explanatory of the whole set's action, even novices should not be deterred from reading it.

As you will see, we have a circuit comprising a variable-mu screen-grid stage, detector, and power output. Good selectivity is gained by using two tuned circuits as before—but, of course the variable-mu helps the selectivity still more by enabling you to cut down the sensitivity at the beginning.

As before, the tuning coils are of the tapped type, the aerial lead going to the tap of one coil through the usual preset condenser, and the lead from the coupling condenser going to the tap of the grid coil. These taps still further enhance the selectivity without unduly losing sensitivity.

Now for a few rather important minor



Starkly simple view from the back of the chassis. Take a look at those neat battery cords, too!

£5 5s. S.G. THREE

Here is a neat little wood-chassis three-valver built on a design originally published as a £5 5s. set in the December 2, 1933, issue of "Amateur Wireless." It makes use of most of the parts of the original set, with the refinements of a variable-mu screen-grid valve for the high-frequency stage and differential reaction for the detector. Essentially a compact and inexpensive set, this new version should make a strong appeal to the family man

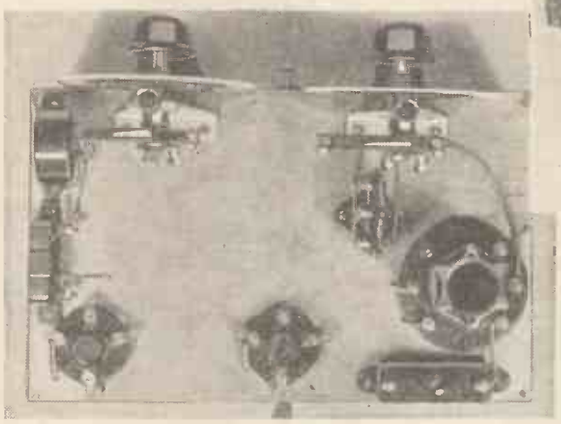
Getting ready to try out the new set. A member of the Technical Staff inserts a valve —a great moment, this!

details of the circuit. For a start, the variable-mu valve. You know that this type of valve works by varying the grid bias. As you vary the bias the valve's amplification factor is varied, and thus for a given signal input you have full control over the final output volume.

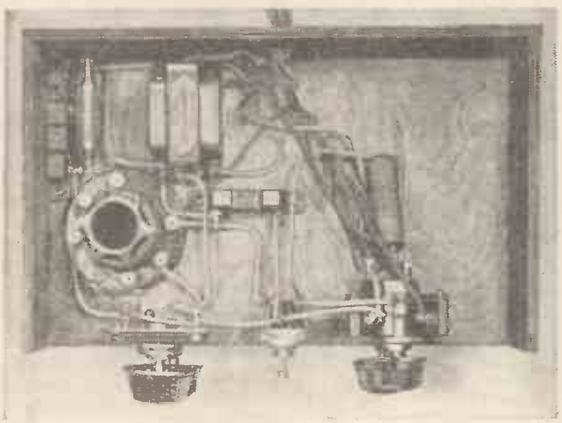
In order to apply this negative variable bias a high-resistance potentiometer has to be used in conjunction with the usual grid-bias battery.

The earth end of the aerial-tuning coil, that is the end normally connected to low-tension negative, now goes to the slider of the potentiometer. The winding of the pot is connected across the battery, so that with respect to the negative side of the variable-mu valve's filament you apply a variable negative bias.

It is necessary, of course, to "anchor" the earth end of this aerial coil, and this is done by connecting a .1-microfarad fixed condenser between the slider and earth. So far as high-frequency current is concerned the lower end of the coil is therefore connected to earth—though from a direct potential point of view it is, of course, insulated.



Looking down on the chassis of the set gives you an idea of how the coil and other components are laid out



And here is another plan view—this time of the underside of the chassis. Quite easy to follow with the blueprint!

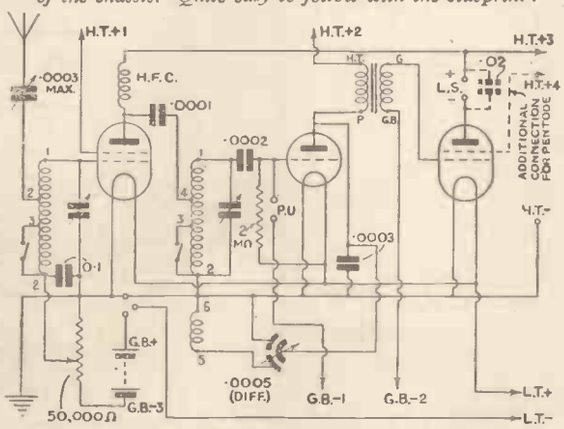
Choke-fed Coupling

So we come along to the detector valve. It is what is known as choke-fed grid coupling or parallel-feed coupling. A high-frequency choke is inserted in the anode circuit of the variable-mu, and the high-frequency current thus impeded at the anode itself is passed through a .0001-microfarad fixed coupling condenser. The end of this, as mentioned, goes to a tap on the grid coil, to which also is connected a reaction winding.

The detector circuit arrangement is quite standard, the usual .0002-microfarad fixed condenser and 2-megohm grid leak being used. The differential reaction condenser, in conjunction with the reaction winding, gives smooth reaction and a constant anode to earth bypass.

Smoothing Reaction

As there is no high-frequency choke in the anode circuit of the detector we have also fitted a .0003-microfarad fixed condenser between anode and earth—this substantially smoothing out the reaction without actually interfering with the action of the differential. In all, then, there is a detector anode to earth bypassing of no less than .0008 microfarad, since the .0003-microfarad fixed condenser gives a fixed bypass of that amount, and the differential an overall bypass of .0005 microfarad—irrespective of the reaction setting.



To technical fans this theoretical circuit diagram will tell the whole story at a glance

You will find that a pick-up can be readily inserted in the grid circuit of this valve. All you need are two terminals. One goes to the grid and the other to a grid bias tapping—shown by the diagram as GB—1. Of course, with a sensitive pick-up you would need an external volume control, or better still use a pick-up with an integral volume control.

For a Pentode

So much for the detector. This stage is coupled to the power output by the usual transformer connections. Note that across the loud-speaker terminals we have shown a dotted line condenser of .02-microfarad capacity. This condenser should be used if you decide to go in for a pentode in place of the specified triode.

Similarly, the dotted line going to HT+4 is the side terminal connection of the pentode should that be used. Take this tapping to about 100 volts—certainly to something less than the maximum high-tension voltage, otherwise you will find the valve is taking a lot of current.

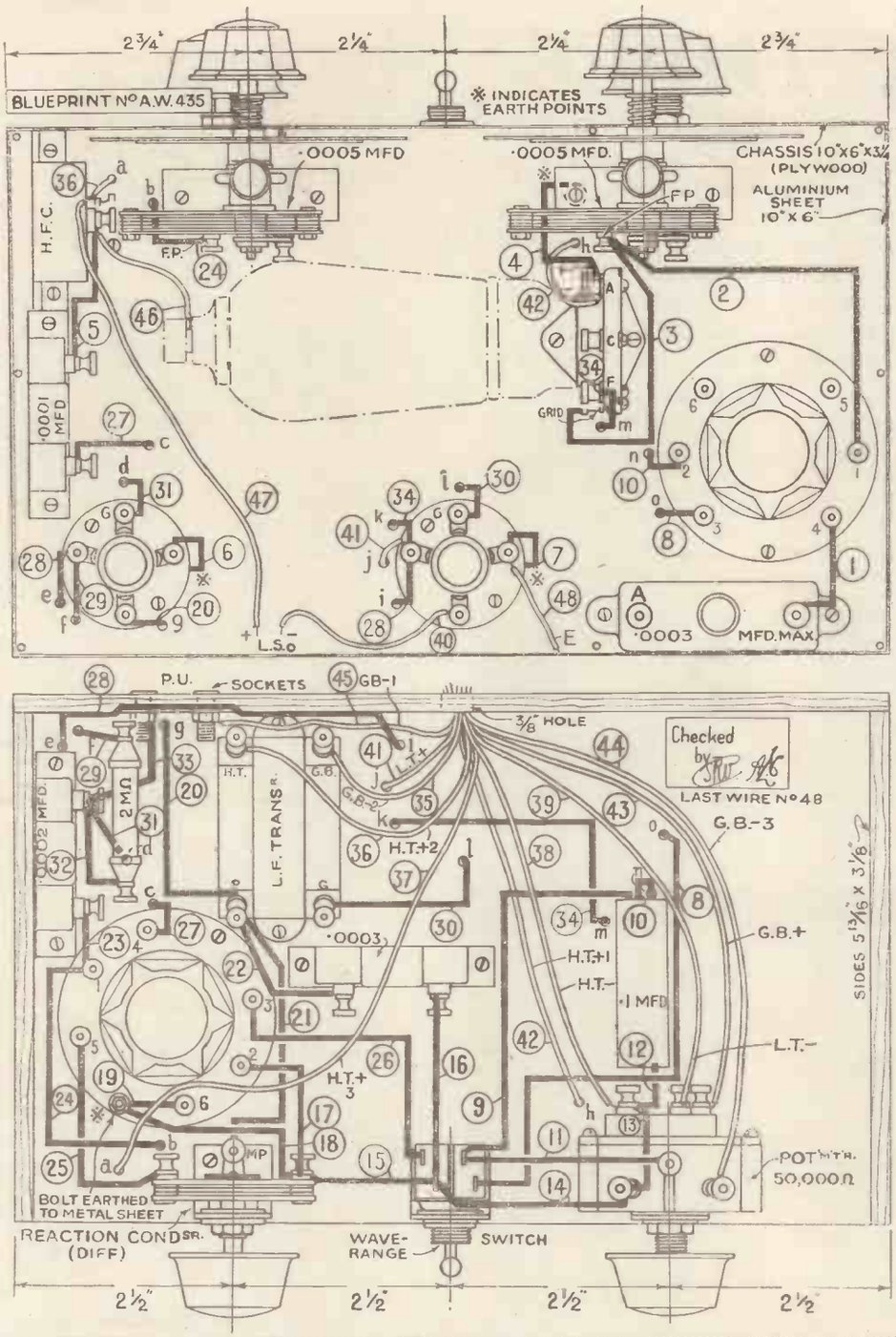
If in the first place you decide to go in for a pentode, of course there is no reason why, you should not use a five-pin valve holder and with it a pentode of the five-pin type rather than one with a side terminal for the screen volts.

Wood-chassis Layout

Well, that is the new circuit. We have gone over it pretty thoroughly for the benefit of beginners, and now for a few bars on the practical layout. A wood-chassis layout, it is. And very neat and simple, too.

As you can see from the many illustrations and from the reduced reproduction of the blueprint, the layout is arranged so that no metal screening partition is necessary to separate the high-frequency from the rest of the components.

As a matter of fact, the metal-foil-covered baseboard itself acts as the screen between essential high-frequency and detector circuits. The aerial coil is upright above the chassis,



This is a half-scale reproduction of the full-size blueprint, which you can obtain, price 1s. post paid, from "Amateur Wireless," 58-61 Fetter Lane, E.C.4. Don't forget it gives all the dimensions—as well as the point-to-point wiring guide

but the grid-tuning coil for the detector is upside down under the chassis and well away from the field of the first coil.

On the top of the chassis are mounted the two tuning condensers on their metal brackets, the vertical screen-grid valve holder, the ordinary detector and power valve holders, the coupling high-frequency choke, the aerial preset and the high-frequency coupling condenser.

Underneath the Chassis

Everything else is underneath, including the low-frequency transformer and three brackets for the subsidiary controls.

Looking from the front, the left-hand knob is the combined potentiometer and three-point battery switch. Now this switch is rather important. It not only cuts off the high- and low-tension, but also cuts off the grid-bias battery from the potentiometer winding, which would otherwise be running down the battery while the set was not in use.

In the centre we have the new toggle switch, which for the medium-wave reception shorts out the two long-wave windings separately. This job cannot be done with the old three-point shorting switch owing to the variable-mu connections in the aerial coil already mentioned.

On the right is the differential reaction condenser, which completes the control layout. As we are using this condenser the old tuning-cum-reaction condenser is not included—though it could be if you care to leave the reaction connections blank.

Thin plywood is used for the wood chassis with a piece of tinfoil tacked to the upper side for the screening. If you like to spend a little more you can make the chassis of Metaplex wood, that is wood having the top surface already metallised.

Care In Assembly

Take care when you assemble components that you do not allow the fixing screws to project through to the foil or metallising at the top.

In operation this set is quite simple, though to some extent its performance depends on how you use the controls. Keep the aerial preset well down, and make up your signal strength with the volume and reaction controls. For ultimate selectivity keep both preset and volume down and push up reaction.

Note that for medium wave reception you pull the toggle switch at the centre down—to the position marked "on."

Components Needed for the De-luxe Version of the £5 5s. Three

CHASSIS
*1—Peto Scott, with aluminium foil, 10 in. by 6 in. by 3¾ in. (¼-in. threeply).

CHOKE, HIGH-FREQUENCY
1—Graham Farish, type Disc (or Telsen, Lissen).

COILS
2—Lissen dual-range, type LN5314.

CONDENSERS, FIXED
3—Telsen, values: .0001-, .0002-, .0003-microfarad (or Graham Farish, Dubilier).
*1—Dubilier .1-microfarad, type 4404 (or Telsen)

CONDENSERS, VARIABLE
*2—British Radiogram .0005-microfarad solid dielectric with disc drive, type No. 14.
*1—Graham Farish .0005-microfarad, type reaction.
1—Sovereign .0003-microfarad, pre-set type (or Telsen, Goltone).

HOLDERS, VALVE
*1—Lissen five-pin, horizontal mounting, type LN733.
2—Lissen four-pin, type LN5069 (or Telsen, Graham Farish).

PLUGS, TERMINALS, ETC.
8—Eelex wander plugs, type 2DM (or Belling-Lee, Clix).
*2—Eelex spade terminals (or Belling Lee, Clix).
*2—Eelex metal sockets, type T14 (or Belling Lee, Clix).

RESISTANCE, FIXED
1—Graham Farish 2-megohm, grid-leak type (or Telsen, Lissen).

RESISTANCE, VARIABLE
*1—Bulgin, 50,000-ohm with combined three-point switch, type VS50.

SUNDRIES
*3—British Radiogram 2½-in. metal mounting brackets.
Connecting wire and sleeving.
5 yards thin flex.

SWITCH
*1—Bulgin double-pole on-off, type S88.

TRANSFORMER, LOW-FREQUENCY
1—Graham Farish, type PIP (or Telsen, Lissen).

ACCESSORIES

BATTERIES
1—Lion 100-volt high-tension, type L2 (or Lissen, Ever Ready).

SUITABLE VALVES

Make	Variable-mu	Detector	Power
Cossor* ...	220VS	210Det	220PA
Dario ...	TB452	TB172	TB122
Hivac ...	VS210	L210	P220
Lissen ...	SG2V	HL2	LP2
Marconi* ...	VS24	HL2	LP2
Mazda* ...	SG215VM	HL2	P220
Mullard* ...	PM12M	PM2DX	PM2A
Osram* ...	VS24	HL2	LP2

*Indicates B.V.A. valves.

1—Lion 9-volt grid-bias, type GB1 (or Lissen, Ever Ready).
1—Lissen 2-volt 20-ampere-hour accumulator (or Fuller, Ever Ready).

CABINET and LOUD-SPEAKER
1—Peto Scott, type Kompact.

**Components not used in the original model described in the December 2, 1933, issue of "A.W."*

On Your Wavelength

This Year's Show

THE dates for this year's Radio Exhibition at Olympia are now definitely fixed. It will open at eleven o'clock on the morning of Thursday, August 16, and continue until the following Saturday week.

The Exhibition, if you remember, some years ago used to take place in the latter part of September, but I always thought this an unsatisfactory time. For one thing, it gave schoolboys—who are the experimenters of to-morrow, if not indeed of to-day—little chance of attending.

Again, the manufacturers did not like it, for they had no opportunity of seeing what the demand for a particular set was going to be like before deciding to put it into full production for the autumn season.

This year's Exhibition will be bigger than ever. I hear that there are to be two staircases, instead of one, up to the gallery and that the theatre will have sitting accommodation for well over 2,000.

What We'll See at Olympia

IT is a longish way yet to August 16, and unexpected developments may take place in the meantime. I think, though, that we can anticipate fairly well some of the wonders of the show. It will be even more a superhet year than 1933 was, and there will be numbers of four- and five-valve supers for both battery and mains operation that won't cost any more, if as much, as the three-valver of yesteryear.

Most of them—certainly all but the most inexpensive ones—will have self-adjusting volume control and in many sets the quiescent type of S.A.V.C. will be found which cuts out interfering noises when you are passing from one station to another.

I expect, too, to see a good many big sets containing anything up to a dozen valves and I feel that the all-wave set will be much more in evidence than in past years.

There probably won't be anything very startling in the way of valve developments, though the full range of battery Catkins should have made its appearance by then.

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Television's Future

THERE can be no question that high-definition television on the ultra-short waves is an accomplished fact and that preparations must now be made for supplying the whole country with a proper service. The snag about the ultra-shorts is the very short range that they possess—though Marconi has covered some wonderful distances in recent experiments.

So far as we can see, the only way of establishing a full television service would be to set up hundreds of short-wave relays all over the country.

Naturally, this would cost money, and the great question at the moment is where the money is to come from. Still, the same question was asked, if you remember, a dozen years ago about broadcasting stations, and the money was found right enough.

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WLW Gets Going

FROM WLW, the giant Crosley broadcasting station at Cincinnati, Ohio, I have just heard that permission has been granted by the Federal Radio Board for full-power working during broadcasting hours.

The station, using the experimental call sign W8XO, has been at work with 500 kilowatts for some months now, but only at times outside normal broadcasting hours—from midnight to 6 a.m. (or from 00 hours to 6 hours, if you so prefer it). This meant 5 a.m. to 11 a.m. by our time.

WLW was well heard by many people in this country at breakfast time during the tests. At any time now the big transmitter will take over full programme duties, working from 6.30 a.m. right through until 1.30 the following morning. I shouldn't be at all surprised if WLW is well heard on dark, cloudy nights this summer.

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What's a Guarantee?

WHEN you buy a set of good make you obtain with it a guarantee of service after sales and of free replacement of any component which plays up within a certain period. That seems all very jolly. But from a case which has recently come my way I am beginning to wonder just what these guarantees are sometimes worth.

Here's what happened. A set, which we will call the XYZ, was purchased just before Christmas at a price that didn't leave much change out of four fivers. Its working began to be somewhat unsatisfactory after a couple of months, and at the end of sixteen weeks it would produce nothing but silence. The local agent was called in to service it. He reported that it was beyond him and must go back to the makers.

It went. Then came their report and estimate, which began something like this: "Defective output valve replaced; no charge. Defective coil unit replaced, no charge."

So far, so good. The sting of the estimate was in its tail. It continued: "Replacement of defective parts, cleaning of set, thorough adjustment, and testing, 17s. 6d." Other items brought the total charge up to nearly 30s.

Now, since the whole of the work done was required because certain parts were defective, I cannot for the life of me see how that charge can be justified. Certainly the items for cleaning and adjusting are absurd after four months' use.

This guarantee business badly wants clearing up.

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Electric-bell Nuisance

MANY of those who have electric bells in their homes find the interference caused with wireless reception, whenever the button is pressed, rather a nuisance. It is due to the fact that most electric bells are miniature spark transmitters. Take off the cover of yours and watch it working in the dark. I think you will find a regular little train of sparks at the points when the clapper is in action.

There is a very simple way of overcoming the trouble. Just take a 2-microfarad condenser from your bits-and-pieces box and connect it up across the contacts of the bell.

Screen-wipers, Too

IF you have a car radio—and the probabilities are that you will have it soon if you haven't got it now—you may find that similar trouble is caused by an electric windscreen wiper when it is in use on wet days. Many of these wipers spark very badly, and again the condenser is the cure.

In both bells and screen wipers the condenser serves another useful purpose in additon to minimising interference with the wireless

[H.M.V. photo

Making a record of the Neo-Bechstein piano, which makes use of microphones and amplifiers to reproduce the sounds for the strings

["A.W." photo

A radio set by the bedside is a real luxury. Once you have tried it, you will never want to be without one!

The small dimensions of the new K series of battery Catkins is well illustrated by this comparison with a Yale key

set. Those sparks play heck with the points, and if you stop them the apparatus will last much longer.

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Spring-cleaning Circuit

CONGRATULATIONS to Noel Bonavia-Hunt on the Spring-cleaning circuit which he gave us recently in AMATEUR WIRELESS. Its operation is so simple, when you come to think it out, that it is a wonder it wasn't invented long ago. But that is usually the way with really effective inventions. Directly you see them you kick yourself hard and say: "Why didn't I think of that?"

The Spring-cleaning circuit really does its job and, simple as it is, it may revolutionise the low-frequency end of the receiving set.

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Tuning by Sight

A WEEK or two ago I wrote a note on the way in which the milliammeter could be used as a visual aid to tuning when trimming a superhet. Actually, I think that such a tuning meter should form a permanent part of the selective superheterodyne of to-day, particularly when it has self-adjusting volume control. It is extraordinarily hard to tune by ear alone to exact resonance, and if you are not precisely "there," you are bound to get some distortion.

An ordinary 0—5 milliammeter in the plate circuit of the I.F. valve is just the thing. Tune till its needle registers the *lowest* reading, and there you are. The instrument need not be a good one, since it has not to measure current accurately. All that it has to do is to indicate when the flow of current is at its lowest.

I see, by the way, that special visual tuning meters on these lines will shortly make their appearance on the market.

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Cathode and Anode

IT is just a hundred years since Faraday invented these terms, and to describe the two poles of an electrolyte cell, the anode being the point at which the current enters the liquid and the cathode where it leaves.

From his recently-published diary it seems that the famous scientist was for some time in two minds as to whether he should not call them voltode and galvanode instead.

Personally I am very glad he didn't. Firstly because it would have put too many v's in the valve, and secondly because the only way I can distinguish "t'other from which" is to remember the old phrase about the "current getting kicked out at the cathode."

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Battery That "Rotted"

A SEAFORD correspondent complains that some time ago a brace of good quality triple-capacity batteries ran down in less than four months and that when the cases were opened he found that the cells within had "rotted away."

Cells don't rot. What does happen sometimes is that, owing either to staleness at the time of purchase or to the presence of certain impurities in the zinc, the cans become perforated by the action of the sal-ammoniac within. In this case the voltage of the battery immediately flops.

This particular battery should certainly have been returned to the makers with a statement of the amount of use that it had had. If the complaint was justified—as I have little doubt that it was—this correspondent would have received fair treatment from the makers.

In all probability the battery had been in stock for months before he bought it. The makers could have verified this point, for each battery of reputable quality has a mark indicating the date of manufacture and the batch to which it belongs.

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Aerial "Reach"

MANY people discard the 100-foot standard for outside aerials and prefer—even where there is plenty of space available—to use shorter length of wire on the ground that it gives higher selectivity. This is all very well so far as it goes, but the real business of the aerial is to pick up as much as possible of the signal energy to which it is tuned, leaving the business of cutting out any unwanted signals to the receiver circuits. Other things being equal, the man with the longer and higher aerial will always have a better "reach" for distant stations. And the same holds good for short-wave working.

Mr. Noel Ashbridge—who ought to know—recently recommended colonial listeners to make use of aerials 300 feet long, for bringing-in the short-wave Empire programmes. He finds the extra length gives far better signal strength, with no loss of selectivity. Of course, the aerial is aperiodic and loosely-coupled to the set, but it is ideal for distant working where "pick-up" is the first consideration.

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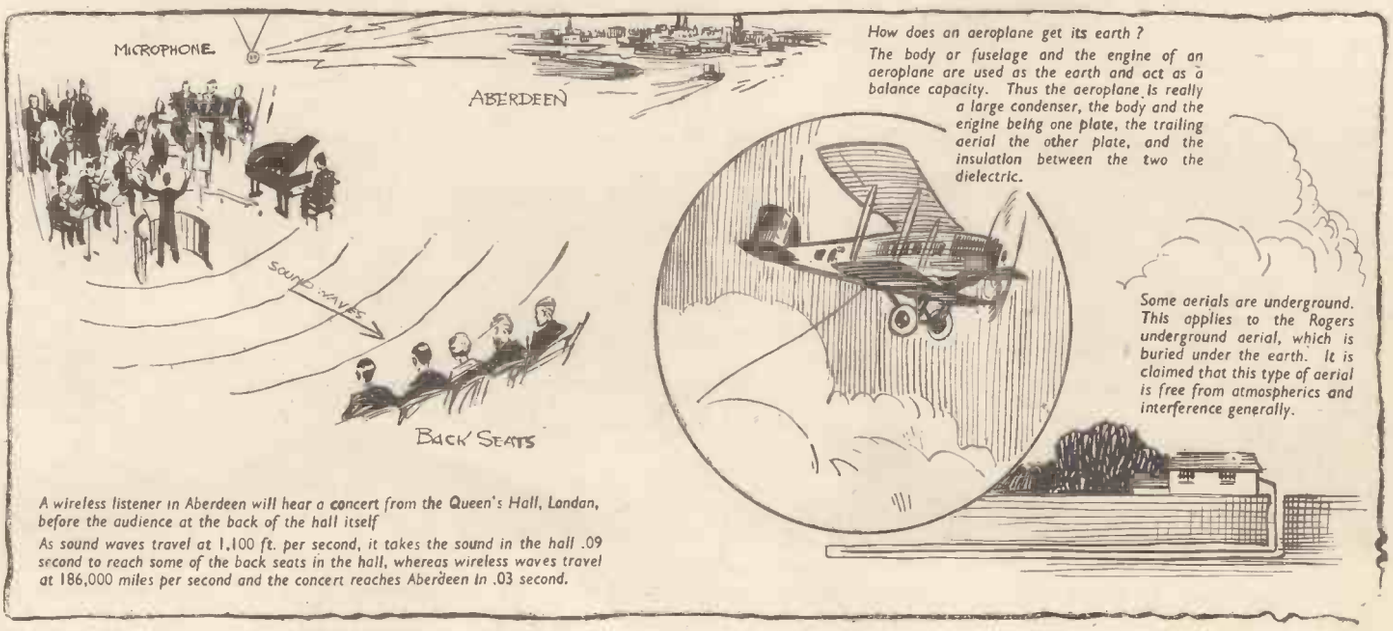
Mains Supply

TALKING of aerials, the engineers at the Beromünster station recently found themselves up against a curious difficulty. The transmitting aerial there is carried by two iron towers—each over 500 feet high—which rest upon insulating supports. Like all structures of this height, they are a positive peril to aviators, and so are compelled by law to carry warning lights at night.

But so long as broadcast transmission is going on, the high-frequency radiation from the aerial reacts on the metal towers, and induces potentials of the order of 1,000 volts which it would never do to admit into the lighting mains. And so it has been necessary to devise an elaborate filter circuit for passing current from the mains up to the lamps at the top of the towers, whilst at the same time preventing the induced voltages from forcing their way into the supply leads.

Would You Believe It? . . . . . *Asks G. H. DALY*



A wireless listener in Aberdeen will hear a concert from the Queen's Hall, London, before the audience at the back of the hall itself

As sound waves travel at 1,100 ft. per second, it takes the sound in the hall .09 second to reach some of the back seats in the hall, whereas wireless waves travel at 186,000 miles per second and the concert reaches Aberdeen in .03 second.

How does an aeroplane get its earth?

The body or fuselage and the engine of an aeroplane are used as the earth and act as a balance capacity. Thus the aeroplane is really a large condenser, the body and the engine being one plate, the trailing aerial the other plate, and the insulation between the two the dielectric.

Some aerials are underground. This applies to the Rogers underground aerial, which is buried under the earth. It is claimed that this type of aerial is free from atmospherics and interference generally.

Real-quality Series.—10

Choosing an Output Valve for Quality & Economy

By NOEL BONAVIA-HUNT, M.A.

[Palmer photo

Where Quality Is Really Needed!

With a microphone, a small harmonium, a five-valve amplifier and two moving-coil loud-speakers, the vicar of St. Margaret's Parish Church, Coventry, is now providing his congregation with even louder—yet just as pure—music than before the proper organ broke down.

The Rev. J. Cornes believes that this innovation proves that there is no longer any need for new churches to install expensive organs—amplifiers will do almost as well.

AMATEUR: We have now arrived at the stage when the question of a suitable output valve has to be considered. I rather fancy we are going to have some difficulty in selecting the valve that will give us the results we want. Or am I unduly pessimistic?

PROFESSOR: You are quite right. It *is* a difficult matter when there is not much high tension to play about with. You see, the undistorted output of 2-volt super-power valves is at most not more than .5 watt, and if you are using dry batteries for high tension even the .5-watt valve is out of the question, since it takes a steady current of 25 milliamperes from the battery.

Relative Outputs and Consumption

The Mullard PM202 has an output of 350 milliwatts when working on a plate tension of 150 volts, and it dissipates a plate current of 14 milliamperes, while the Mazda P220A has the same characteristics more or less. The Lissen PX240, with its output of 800 milliwatts, passes as much as 25 milliamperes on 200 volts plate tension, and the Triotron E235, on 200 volts, with an output of 550 milliwatts, passes 18 milliamperes.

So you see that we should require at least a super-capacity high-tension battery to stand up to such a drainage of current.

AMATEUR: Of course, the pentode takes less current than that. But the saving is not very considerable.

PROFESSOR: The whole question of pentode valves must, I fear, be postponed to another occasion, as I have no time to go into the subject properly now. At the moment I can only say that I have not made any provision for a pentode output in the receiver under discussion. There is no pentode in the set you were good enough to admire and again heard last week.

Had I considered it advisable to use such a valve I should have done so without hesitation, but you will notice that I didn't. I cannot say more than this at present.

Use of a Pentode

AMATEUR: Personally, I do not much care for the pentode, though I admit it is useful in cases where a single stage of low frequency is preferred for economical reasons. If two, to say nothing of three, stages are employed, it always seems to me that there is nothing gained by substituting a pentode for a triode.

PROFESSOR: I think the whole matter can be summed up by saying that it is a far more serious thing to overload the pentode than the triode, and that there is no known method of amplifying signals on the low-frequency side that does not either overload the pentode or defeat its own object by destroying the true balance of the reproduction.

But I must repeat that there is no time to elaborate the argument this evening.

AMATEUR: Have you ever heard good results from a pentode output?

PROFESSOR: Oh dear yes! My brother gets beautiful results, which I must honestly confess I have never heard from any other pentode set.

I do not think, however, that it would be fair to you to prescribe a *particular* design of amplifier for *general* adoption, since so much depends on the locality and the type of valve selected, to say nothing of individual attention to and finishing of the smaller details in the construction of the various parts of the receiver.

Furthermore, I do not recommend a pentode output, in any case, for gramophone reproduction, because the pentode very readily introduces what is known as "third harmonic distortion" due to the more abrupt changes in amplitude caused by the tracking needle point.

AMATEUR: Well, so much for the pentode as an output valve. Is there any objection to the pentode as a high-frequency valve?

PROFESSOR: No serious objection, except that you cannot, as far as I am aware, obtain a 2-volt specimen that is not of the variable-mu type. If you are working on A.C. mains, it is another matter.

AMATEUR: You said earlier that for a battery receiver all output triode valves take too much plate current. How do you propose to get over this difficulty? I mean, there must be a large number of people who cannot afford super-capacity high-tension batteries, but can run to the cost of a standard type.

PROFESSOR: I know all about that! It is quite obvious that such folk must be content with a reduced output, say, that of 150 milliwatts.

AMATEUR: What, as low as that? How can they ever hope to get decent results without overloading the last valve?

PROFESSOR: Nevertheless, it is quite a feasible idea to use a valve of the LP2 or PM2A class in the output stage on 120 to 150 volts high tension, passing only 5 to 8 milliamperes plate current.

AMATEUR: But I don't understand. You have already got a valve of the P215 or PM2 class in the preceding stage. Do you suggest using an output valve of smaller handling capacity and giving a smaller undistorted output than the preceding valve is capable of?

PROFESSOR: I must seize hold of the last two words of your question, "capable of." The point is that I do not propose to utilise the whole of the handling capacity of the preceding valve. The chief reason why I am employing the latter type of valve—namely, the P215 or PM2—is because I want to keep the amplification down in this middle stage so as not to overload the output valve.

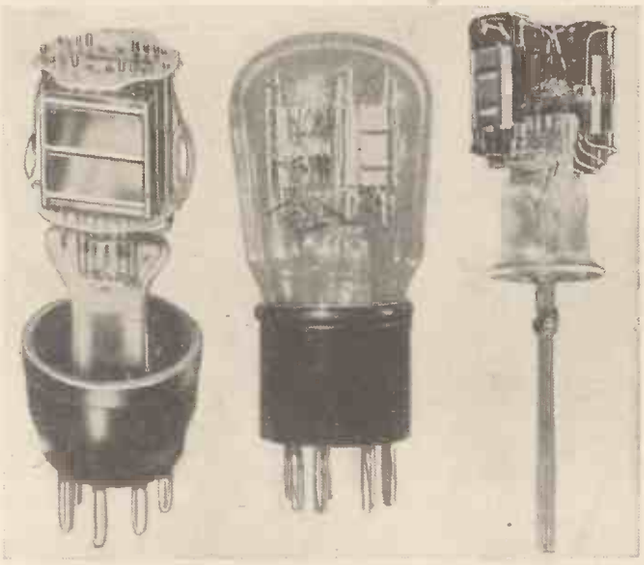
It is, therefore, not necessary to pass anything like the current on the plate of the middle low-frequency valve that would be required if it were actually the output valve supplying the loud-speaker.

Avoiding Overloading

At the same time, I admit that one has to be extremely careful to avoid overloading a valve like the LP2 in the output stage. A *slight* overload is not very noticeable aurally, that is to say, if the overload is caused by introducing the bass frequencies at a slightly bigger amplitude than the valve will handle without a small amount of positive grid volts temporarily applied.

AMATEUR: But I understand that the Westector requires a pretty big input signal voltage for linear rectification. This being so, won't it be impossible to prevent the three-stage low-frequency amplifier from overloading the last valve?

PROFESSOR: There should be no difficulty at all if you make proper use of the manual volume control. As you will remember, this consists of the variable 100,000-ohm resistance



(Left).—Internal construction of the Marconi QP21 output valve. (Centre and right).—Two views of the 362 class-B battery valve

placed between the output of the Westector and grid-bias negative (*see Fig. 1*).

AMATEUR: But this resistance would have to be reduced considerably to prevent overload.

PROFESSOR: I am fully aware of this fact. It can be reduced to as low a figure as 500 ohms without appreciably affecting the balance of the reproduced signals. Let me show you how it works on my standard battery set here.

AMATEUR: Wonderful! What a pity you cannot increase the volume to a greater degree on these battery sets and retain freedom from distortion due to overloading. Can't we solve the problem of maximum output with minimum current dissipation by having class-B output?

PROFESSOR: A great many experts favour this method. Up to the present, I am unable to state that the *quality* results from class B are up to the standard that I desire to set up. It is when we take the trouble to produce the special kind of frequency-response curve that is demanded of a low-volume receiver that we realise the difficulties associated with any type of push-pull or push-push output.

AMATEUR: But you can certainly get a larger undistorted output from push-pull or from class B. As much as 2 watts output is obtainable from some of the class B 2-volt valves.

Twenty-four-Watt Output

PROFESSOR: Granted. But I have frequently heard a set with a 24-*watt* undistorted output which, for quality reproduction, was infinitely inferior to a .5-*watt* amplifier. The poor little battery set had the advantage every time over this monster. So you see you cannot be guided altogether by the question of undistorted output.

It is obvious that if we are confronted with the task of supplying a large volume of undistorted tone to fill a dance hall, we simply must make use of a high wattage output; but that's another story.

Our present problem is to devise an amplifier that is capable of reproducing the original sounds at a *reduced* volume in the correct proportions of bass, middle, and treble required for the listener in an average-sized room.

We have had this particular standard in mind throughout our discussion week by week, and working on these lines we find that a triode output valve is best suited, taking all aspects of the case into due consideration, for the purpose we have in view.

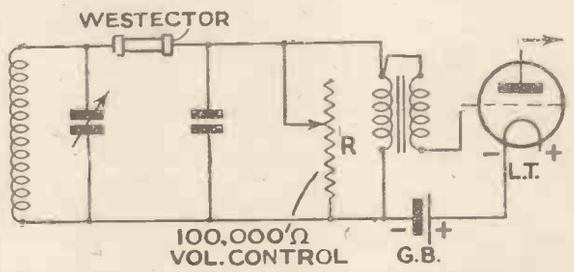


Fig. 1.—The only form of volume control permitted in a real quality receiver is the variable resistance R shown above in the circuit diagram

Since, however, we have no need to economise in plate current and have at our disposal at least 200 volts high tension, it seems a pity not to take advantage of such valves as the PX4 or the PP3/250 with their 2.5 watts undistorted output.

AMATEUR: The undistorted output on 200 volts would be rather less, would it not?

PROFESSOR: Yes, but much more than could be expected from any 2-volt output triode.

AMATEUR: What about the accumulator? We should require a separate 4-volt accumulator to heat the filament of the special output valve. The two valves you mention take 4 volts 1 ampere.

PROFESSOR: You are quite right, we should require the extra accumulator.

AMATEUR: Then why not employ 4-volt valves all along and simplify the filament heating arrangements?

AMATEUR: Supposing we are working on D.C. mains supply, what valves would you recommend for our set?

PROFESSOR: That is entirely a question of *filament* supply.

AMATEUR: Yes, of course. We could use D.C. heated valves with a voltage-dropping resistance for the heater supply.

PROFESSOR: You could. But I have yet to hear a really satisfactory quality result from such a system. I must say I prefer the filaments to be heated by an accumulator. A 2-volt accumulator is all right for the earlier valves; in fact, for all except the last valve.

Indeed, if you do not expect too much output from the set, there are plenty of good 2-volt super-power valves on the market.

PROFESSOR: There is no reason why this should not be done, though I must warn you that the accumulator will have to deliver a steady current of at least 1.3 amperes, assuming that "point one" valves are used in the preceding stages.

There is, however, a very excellent output valve made by the Triotron people called the K435/10. This takes 4 volts .65 ampere, and has an output of 2½ watts at 250 volts plate tension. Two of these valves in parallel give an undistorted output of 5 *watts*, and take 1.3 amperes filament current.

Splendid Results with 200 Volts

If you were to use 2-volt valves with "point one" filament heating in the preceding stages, and two of these output valves in parallel heated by a separate 4-volt accumulator, you would even on 200 volts obtain really splendid volume and splendid results all round. In fact, I know nothing to beat this arrangement for D.C. mains.

There may, of course, be difficulties in maintaining the accumulators unless you are reasonably near or in touch with a charging station. They could be trickle-charged from the D.C. mains, though this is not a very economical method. A good car accumulator would serve best in a case of this sort.

Failing the use of special 4-volt output valves, the next best plan would be to substitute a good 2-volt super-power valve of the Mullard PM202 or Lissen PX240 class. There are several makes of valve that will serve the purpose. Here are some chosen at random:—Tungsram SP230, Six-Sixty SS240SP, and Hivac PX230.

Of all those mentioned, the Lissen PX240 appears to possess the highest undistorted output — namely, 800 milliwatts when using 200 volts on its plate.

All the others, except the Tungsram, are designed for a maximum plate voltage of 150. Most of the valves take .4 ampere filament current, so that if that is felt to be too much, recourse can be had to the PM202 class which takes .2 ampere only.

AMATEUR: Well, you have supplied quite enough information for a man to use his own discretion in the matter. The old adage that we should cut our cloth according to our coat certainly applies to the question of choosing the output valve.

PROFESSOR: I like the way you misquote our ancient adages. Have you any further questions to ask me before we retire from the discussion of output valves?

AMATEUR: If we happen to be on A.C. mains . . .

PROFESSOR: Thank you, that's enough. I really cannot discuss DA/60's and DA/100's to-night!

When to Use SCREENED LEADS

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

A FEW inches of screened lead turned a set which was a comparative failure into a success. This may sound an exaggeration, but it actually happened not so very long ago in my laboratories. The set was suffering from severe background noise and, although it had considerable magnification, it was impossible to use it. The screening of a few vital leads cleaned up the background in extraordinary style.

Probably most readers are familiar with the idea of a screened lead in connection with aerials. The past year has seen the introduction of a number of screened downleads to avoid interference picked up from local sources.

Screened Aerial Connection

In some cases the aerial wire itself is housed in the middle of an earthed tube made up of braided wire or something of this nature to give flexibility. The earthed shielding round the lead-in wire prevents the aerial wire itself from being affected by electrical disturbances.

It is not a big jump from the aerial to the set itself. If we have a sensitive receiver, then there must be portions of the wiring of the set itself which are equally prone to pick up interference. Not only that, but there must be certain portions of the wiring which can react with one another, possibly producing instability, unless suitable precautions are taken.

We have to use for this purpose a small edition of the screened aerial lead and various sorts of shielded cable are available on the market. The wire itself is surrounded by suitable insulation on the top of which is an earthed metal covering.

Slip-on Shielding

Some wires are supplied complete with this shielding, while in other cases slip-on shielding is provided. This takes the form of a piece of insulated sleeve around the outside of which is a lightly braided earthed covering. This may be cut to length and slipped over the particular wire in question.

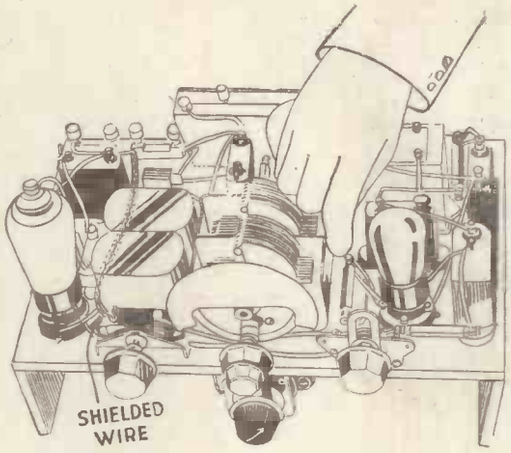
It is important to see that the capacity produced by the use of shielded wire is not too great, or you will find that the tuning range of the set is affected to a serious extent. In a superhet receiver you may have difficulty with the ganging if the stray capacity in the circuit is increased too much.

Since the earthed covering of the screened lead is relatively close to the wire itself, it acts effectively as a capacity across the circuit.

For instance, with the straightforward arrangement where we shield the top end of the coil, we have effectively connected a small capacity in parallel with the tuning condenser, and this will increase the minimum wavelength. This is a disadvantage which must be tolerated.

We can minimise the increase by using suitable wire and, in fact, the slip-on type of shielding just referred to is probably the most satisfactory in this respect. It is not necessary for the earthed covering to be solid and a loosely woven braid or even sometimes a fairly, open spiral of wire, is quite sufficient for the purpose.

Let us now consider where to use this shielded cable. There are two principal applications. The first of these is in preventing interaction between one portion of the circuit and another. A simple example of this is stray coupling between two tuned circuits in a high- or intermediate-frequency amplifier.



" In some cases the aerial wire itself is housed in the middle of an earthed tube made up of braided wire "

Suppose, for instance, that the leads connecting the tuning coils with the tuning condensers are 2 or 3 in. long and run parallel with one another for most of the distance. If the coils are fairly "hot," so that the stage is developing a gain of several hundreds, it is quite possible for the coupling between these two pieces of wire to make the set unstable.

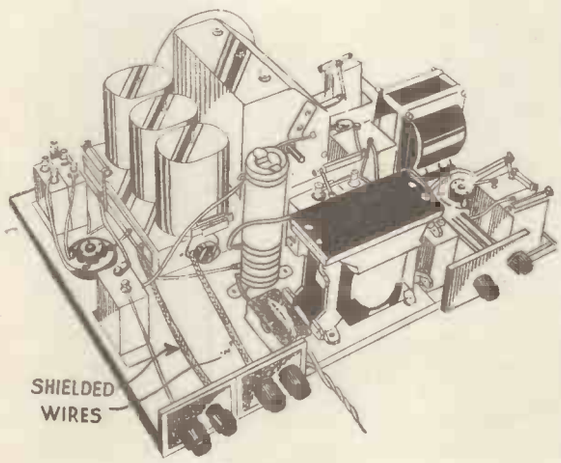
Enough energy is transferred from one wire to the other through the capacity between them to produce reaction and self-oscillation. In such a case the remedy would be to enclose both the leads in a shielded cable, connecting the metal covering to earth.

It should be pointed out that it is only the "live" leads which need shielding in this manner; that is to say, leads which are on the grid (or anode) side of the coil. Leads on the earthy or high-tension end are not liable to give interaction in ordinary circumstances.

Secondly, it is the leads in the oscillating or tuned circuits themselves which are mainly troublesome. The leads from the tuned circuits to the grid or anode of the valve are of secondary importance because they are not carrying a large oscillating current; therefore the energy radiated from them is nothing like so great.

This does not mean that no stray coupling can arise. This is far from being the case, and the lead from the anode of the screen-grid valve is often a possible cause of instability.

It may be necessary to enclose this lead in shielded cable, but it is necessary first of all to ensure that there are no wires actually in the tuned circuits which are running near to one another, because until such wires have been cleaned up it is useless to try screening the grid and anode leads themselves.



" It is important to see that the capacity produced by the use of shielded wire is not too great "

Much the same remarks apply with regard to interaction in superhet receivers where radiation from the oscillator on to the aerial circuit and vice-versa may cause difficulties due to "birdies." The principal requirement is to see that the oscillating circuits are properly screened and then if the trouble still persists attention may be paid to the grid and anode leads.

This question, however, leads up to the second application of screened lead, namely, that of reducing interference.

Leads as Small Aerials

As soon as a set begins to acquire anything like a good sensitivity, the leads in the early parts of the receiver become small aerials and will pick up all sorts of mush and noise. It is quite possible for a receiver to have a background like the sea on Brighton beach without any aerial connected to it at all.

Once the possibility of any defective component has been eliminated, it will then be found that this is due to direct pick-up on the grid leads in the early part of the set.

Bad wiring may exaggerate the noise produced. The short connecting wires between the tuned circuits and the valves act as small aerials. Each one may be picking up small disturbances, which are passed to the set and amplified. These amplified disturbances get into the detector stage and are then fed back to the early stages of the receiver either through coupling due to the batteries, or power supply system, or even by direct radiation from one lead to another.

If any of the detector wiring runs near any of the wiring earlier on in the receiver, there is likely to be sufficient interaction to give very considerable noise.

The remedies are to separate the early stages of the receiver from the detector and low-frequency side as quickly as possible and then to try and check the introduction of the noise in the first place by using shielded cable for all the leads to the valves and all the leads between the coils and the condensers.

It is quite impossible in a short article of this nature to give detailed accounts of the methods, but enough has been said already to indicate the importance of screening the wiring of the tuning circuits. Metal cans are not enough!

Can the Amateur Learn

All over the world the police are keenly testing out the possibilities of radio to help them in their work, and in many forces satisfactory portable receivers have been developed. In this article ALAN HUNTER discusses how far these sets are suitab reception, and explores the the amateur making such a se reference being made to the n

Fiedelholz photo

Police radio in Vienna. This photograph shows the transmitting and receiving aerials on the building where police headquarters is located. Considerable work has been done with police radio in this city.

IF policemen can walk about and pick up wireless messages on pocket sets, why can't amateurs? That is the question I have been asking myself lately.

Perhaps what started me on this track was the Brighton police, who are well equipped with the latest little pocket sets—on which they seem able to keep perfectly in touch with headquarters. Looking at the policemen you would not realise he was so equipped—for the apparatus is well disposed about his person.

Development of "Body Radio"

Of course, this sort of thing is by no means limited to Brighton. In many of the provinces, such as Newcastle and Sheffield, the development of "body radio" has been going on for some time—to such good purpose that I believe I am right in saying that they have made Scotland Yard look almost old-fashioned.

It is with difficulty that you can get the police to talk of their radio. This aversion to "spill the beans" is natural because their object is to outwit the criminals, not to aid them by giving away the secret of their wavelengths.

Being on the side of Law and Order, I should be the last to want to jeopardise police radio work. It is, though, interesting to realise just how far this side-line of wireless has been developed.

While in America the tendency has been towards the fitting of police cars with transmitters and receivers, in Europe rather more attention has been paid to individual radio. The Viennese police, for example, have perfected apparatus that actually enables one man to carry about with him a complete low-power *transmitter*.

Most of the essential gear is contained in a small box hanging from the policeman's neck. In his hand he holds the morse transmitter key. As you know, morse transmitting is very much simpler than telephony—except that you have to learn the code.

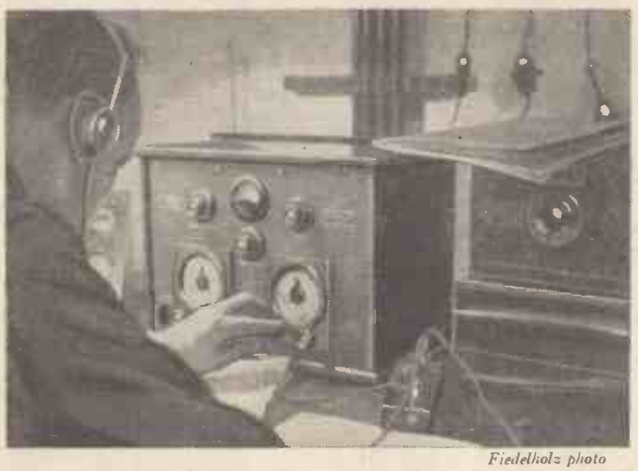
Novel ideas abound in American police radio. One set recently developed by Los Angeles radio amateurs consists of a prepared belt for the apparatus and a triangular back piece for the aerial. The policeman wears rubber-soled boots for insulation—naturally!

You will note that I mentioned amateurs. They do things like that in America. Boy Hunt and Ralph Gordon were the heroes of this particular episode.

Which brings me to the point.

Fiedelholz photo

A wireless operator attached to the Viennese police force passes on a message received on an emergency car



Fiedelholz photo

Receiving and transmitting messages from the headquarters of the Viennese police who are very radio-minded

If these policemen can develop radios to carry around with them, surely there is a useful idea waiting to be developed for amateur use?

We have long since abandoned the loud-speaker portable as such—because we have long since realised that it is not *portable* at all. Is there any reason, though, why we should not turn to headphone sets of Lilliputian dimensions? More especially as on all sides very small components are being designed?

There is everything in favour of such sets. Hikers who seem to take a special delight in loading themselves up with all their worldly possessions when setting out for a day's tramp might well add a little wireless set—a last straw that ought not to break the camel's back if the lessons of the police are taken to heart.

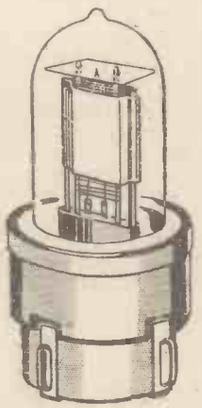
Similarly, listeners going on holiday could easily pack a little headphone equipment to accompany them on picnics—or to find out the weather forecasts before starting out on such a hazardous adventure.

In short, the latent demand for "vest-pocket radio" is very great—and always has been. That this demand was not met by the vast pantechnicon types of portables—suit-cases and otherwise—makes no difference to the underlying need. What I am hinting at here is that modern developments make "radio wherever you go" practicable—if not in the vest pocket then most decidedly in, say, your overcoat.

Without giving away any state secrets, I can tell you that most of the police radio sets in this country making use of the new midget valves are of the oscillating detector and low-frequency amplifier circuit. An H11 for the detector and one

Midget Valves for Midget Sets

A Revolution in Battery Types



The glass bulb is actually not much bigger than a fountain-pen cap—and the diameter is in the same proportion. Ideal, obviously, for midget sets—and don't forget these valves are available to the amateur.

They take .1 ampere at 1 volt, so that two can be run in series from a small 2-volt accumulator. At present there are only two types, the H11 and the L11, with impedances of 30,000 and 12,500 ohms. The output of the L11 is small, but it is enough for headphone work. Or two in parallel would work a small loud-speaker.

For a start the price of these midgets is rather on the high side at 15s. each, but with increasing demand from amateurs it will no doubt be lowered [illegible]

FOR bijou and midget sets the latest Marconi and Osram 1-volt battery valves have been recently introduced. They will be widely used in police-radio communication, and the amateur should not overlook their possibilities.

By putting the sealing pip at the top of the glass bulb and doing away with valve pins, the overall size of these midget valves has been kept down to 2 in.

Brighton p a transmit listeni

from POLICE RADIO?

le for ordinary broadcast interesting possibilities of t for his own use, special ew midget battery valves

or two L11 valves for the headphone output.

Ranges up to 50 miles are quite common. This is remarkable when you realise that the police transmitters are themselves only of very low power—certainly nothing approaching even an old-time broadcasting station.

Reliable Range

In practice the reliable range seems to be between 20 and 25 miles. (Curiously enough, the transmitting power is calculated on a basis of *so many watts per policeman*!) As a rule, of course, great range is not needed—the distance between the roving policemen on their various beat seldom being more than a few miles from headquarters or from the nearest transmitting van.

As to the wavelengths used for this tracking-down business, they also are not shouted from the housetops. But from what I have heard at various times when touring around the countryside, the wavelengths vary enormously. Some police systems work on the old amateur band between 100 and 200 metres, while others prefer to go right down to 45 metres.

In America, where they have been police radio-minded for a long time, experiments have been carried right down to the ultra-shorts. News has just reached me, for example, of a duplex system that has proved itself capable of working between 7 and 10 metres. This is in Piedmont, California.

That the radio-equipped "bobby" is not unduly burdened is obvious when I tell you that the average weight of the apparatus is only 6 pounds—and that, don't forget, includes the batteries and the headphone.

Topical photo

olice headquarters is provided with ter that has an extensive range— g to a message by the roadside

Keystone photo

A Los Angeles policeman demonstrates a new belt receiving set developed by local amateurs. The aerial is wound inside the triangular back piece

Keystone photo

Another American police radio outfit. The phone leads are normally run up the shoulder straps to the cap, where the headphone is located

Fiedelholz photo

Portable transmitter used by the Viennese police. The gear is in a box hung from the neck, and in the policeman's hand is a morse key

Severe limitations are imposed on the police equipment owing to the needs for secrecy. Such concealment, except to ultra-sensitive souls, is not essential with the ordinary listener. The scope for overcoat pocket radio or haversack radio is therefore correspondingly wider.

Police Secrecy

Whereas the policeman has to carry his concealed aerial down the leg of his trouser, or across his back, or in some other awkward and hopelessly inefficient position, the lay listener could design the set on the assumption that a short reel of wire would be uncoiled and slung up wherever needed.

Immediately the range of the little pocket radio would go up enormously. And bear in mind, such sets would not be tuning in weak transmissions such as the police make use, but the ever so much more powerful signals from the Regional stations.

Without a doubt the coming of the Marconi and Osram midgets has paved the way for real pocket radio development. These little valves are at the moment inordinately expensive at 15s. a time, but I am sure that is only an initial figure that would come down if any real demand were forthcoming.

Robust Midget Valves

Midget valves are extraordinarily robust in construction. They will stand any amount of rough usage.

By far the most sensible method for the hiker would be to split the batteries from the little set, thus enabling the weight of the whole equipment to be evenly distributed. Moreover, it might be advisable to design the set for fixed tuning.

Hiking to Radio!

More About the Hiker's Headphone Portable, Fully Described Last Week

The "innards" of the Hiker's Headphone Portable, the construction of which was fully described last week

Parts Needed for the Hiker's Headphone Portable

CONDENSER, FIXED
1—Dubilier .0001-microfarad, type 665.
1—Dubilier .0001-microfarad, type 670.

CONDENSERS, VARIABLE
1—Ormond .0005-microfarad, type R506.
1—Ormond .0003-microfarad, type R505.

HOLDERS, VALVE
2—Telsen four-pin.

PLUGS, TERMINALS, ETC.
6—Belling-Lee wander plugs marked: H.T. +, H.T.—, red (2) black (2).
4—Belling-Lee metal sockets.

RESISTANCE, FIXED
1—Graham Farish 2-megohm, type grid leak.

SUNDRIES
Wood for chassis 11 in. by 6 in. (3/16 in. three-ply).
Connecting wire and sleeving.
4 ft. thin flex.
Card for coil former.
24 yd. 30 d.s.c. wire for for coil.
1—Ever Ready 1½-volt cell, type No. 1915.
1—6BA terminal and ½ in. long bolt.
2—Bulgin knobs, type K12.

SWITCH
1—Bulgin rotary on-off, type S91.

TRANSFORMER, LOW-FREQUENCY
1—Igranic, ratio 1 : 5, type Midget.

ACCESSORIES

BATTERIES
1—Drydex 66-volt high-tension, type H1004.
1—Exide 2-volt accumulator, type MR2.

CASE
1—Attaché case inside dimensions 11 in. by 7¾ in. by 3½ in. (Gray's Inn Trunk Stores, type No. 319).

PHONES
1—Pair Lissen, type LN173.

VALVES
1—Marconi HL2 (or Osram).
1—Marconi LP2 (or Osram).

EVEN if you aren't by inclination a hiker, you were no doubt intrigued with the little headphone portable we described last week. Measuring only 12 in. by 8 in. by 3½ in., the little attaché case contains all the essentials for radio reception by headphones—except the aerial and the earth.

We ended our account last week thus: "*Range with this type of set depends very largely on the sort of aerial and earth system you can erect.*"

Now we want to indicate a few ideas about the aerial and earth. Shall we make a start with the earth? Obviously, under normal hiking conditions *earth* is always near at hand—at least there is plenty of soil available, the only difficulty being to make good electrical contact with it.

Why not take inside the attaché case a miniature earth tube? This is quite practicable, as we have proved from actual tests. You can make up quite an effective little gadget with a 11-in. length of 5/16 in. diameter brass rod. File one end to a point, and to the other end attach a terminal. This can be done by drilling a hole right through the rod and then pushing through a short length of threaded terminal shank, with a head at each side.

Fig. 1 of our little group of sketches shows what we mean. And then at Fig. 3 you will see how the idea is carried a step further, with a 15 to 20 feet length of thin flexible wire fixed at one end to the earthing rod and at the other end to the plug that goes into the socket on the set's panel.

So much for the earth. In practice you will often get good results without any earth at all, or to something like a water pipe or radiator. One member of our staff has, as a matter of fact, obtained foreign stations while using a mattress as the aerial and the gas bracket as the earth.

Which brings us to the general problem of the aerial. Here, again, it is a question of expediency. In some locations, as in a camp, a semi-permanent erection will be possible. It goes without saying that the better the aerial the greater the range on such a set—relying as it does on a good signal input to work the 'phones at full strength.

But for hiking and casual reception generally, you can carry along with you a coil of wire, thin flex as before, and about 15 to 20 feet in length. One end of this should be connected to a plug suitable for the aerial socket of the set, and the other end should be connected to one side of some sort of insulator—or if you like to a small piece of ebonite strip with two holes in it.

The remaining side of the insulator or hole in the strip can then be taken to the terminal on a crocodile clip, for attachment to any convenient eminence—such as a branch of a tree or a garden fence. Our Fig. 2 shows you the idea as it works out in practice.

Of course, there is absolutely no reason why you should not connect the set to your standard aerial, in fact when that is possible we strongly advise it. As we emphasise, the better the aerial the better the results on this set.

Arrangement of the parts in the attaché case, which measures only 12 in. by 8 in. by 3½ in.

Sometimes the signals will be quite loud enough to work a couple of pairs of 'phones. Indeed, on many occasions you will want to share the joys of hiker's radio with a companion. There is no reason why you should not.

All you need is to connect your two pairs of phones in series with each other and the phones terminals of the set. As you can see by Fig. 4, the series arrangement is perfectly straightforward and needs no further explanation.

With these few tips to guide you, the set ought to prove a real asset to all in need of a really *portable* portable.

That is a big point about this set, remember—it is utterly *portable*.

The overall weight of the attache case filled with the installation is just about 10 pounds—which is certainly not back-breaking, especially when you consider the neat shape of the carrying case.

As we suggested last week, it is a set that even a small boy could carry without undue fatigue.

Remember that to get the best results from the foreigners you simply must use the reaction carefully. Bring it up to oscillation point and then swing back just below it.

Most distant reception on this set demands the use of careful reaction—but it is an adjustment that even the novice should be able to master within an evening.

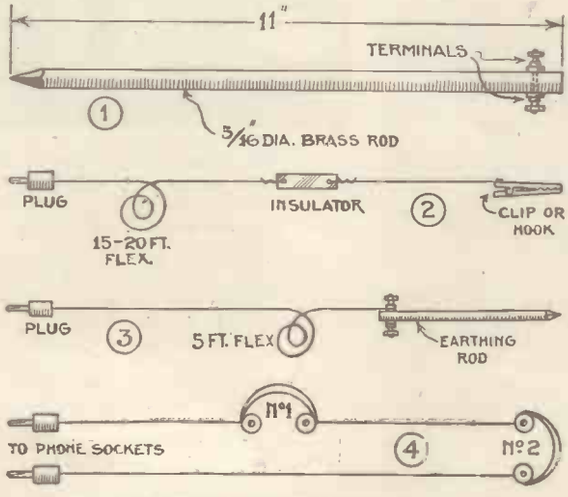


Fig. 1.—Earthing rod to go inside attaché case. Fig. 2.—Suitable aerial arrangement. Fig. 3.—Connecting the earth rod. Fig. 4.—Connecting two pairs of headphones in series for two people to listen

New Mains Valves

More High-voltage Types Available

ABOUT two or three times a year our versatile valve makers seem to have a sudden spurt of energy and altogether introduce a quantity of new valves. At the present moment most of the makers seem to be concentrating on mains or universal valves.

The Mazda people, who are always foremost with novel types of valves, have just introduced the AC/HL/DDD, a triple-diode-triode with a thimble-type cap. This valve is actually three diodes and a triode in one bulb.

Cossor 41MPG mains frequency-changer valve

It rectifies the incoming signal and provides low-frequency amplification as well as quiet delayed and amplified automatic volume control. The three diodes in this valve are completely screened from the triode section.

The valve has a standard 4-volt 1-ampere heater, while the triode section has an impedance of 13,000 ohms with an amplification factor of 35, giving a mutual conductance of 2.7 milliamperes per volt. The price will be 16s. 6d., and the valve is supplied on the new nine-pin base.

The top connection is of the thimble type, which Mazda are going to standardise instead of the screw terminal. The pin connections are as follows: Pin 1, diode anode; pin 2, diode anode; pin 3, blank; pins 4 and 5, heater; pin 6, cathode; pin 7, triode anode; pin 8, third diode; and pin 9, metal coating; top cap, triode control grid.

Cossors have been even more energetic, and they have introduced four new valves all at once. The most interesting is, perhaps, the 210SPT. This is a battery-operated high-frequency pentode with a filament voltage of 2 and a filament current of .1 of an ampere. With a maximum anode voltage of 150 and a maximum auxiliary grid voltage of 80, the slope is 1.3 milliamperes per volt, a very high figure.

It can be supplied with either a four-pin or a seven-pin base with a suppressor grid coming out to a separate connection.

A variation of this valve is the 210 VPT, which has the same characteristics as the 210SPT except that the slope is 1.1 milliamperes per volt, variable down to a negligible quantity. Both types are supplied with metallised bulbs.

A valve that will be very useful for modulating neon lamps in disc television receivers is the 42MPPen. This is a super-power output pentode with an anode dissipation of 8 watts. It has the usual 4-volt heater, taking a current of 2 amperes. It is designed to operate with 250 volts on both anode and auxiliary grid, so obviating the necessity of decoupling in the auxiliary grid circuit.

The mutual conductance of this valve is 7 milliamperes per volt with an optimum load of 8,000 ohms.

A Cossor pentagrid frequency-changer has been long overdue. It has just been released and designated the 41MPG. This is, again, a 4-volt 1-ampere heater with a maximum modulator anode voltage of 250 and 100 volts on the oscillator anode. The 100 volts should be applied to the modulator screen, while the grid bias to the modulator section is variable between 1.5 and 20 volts negative.

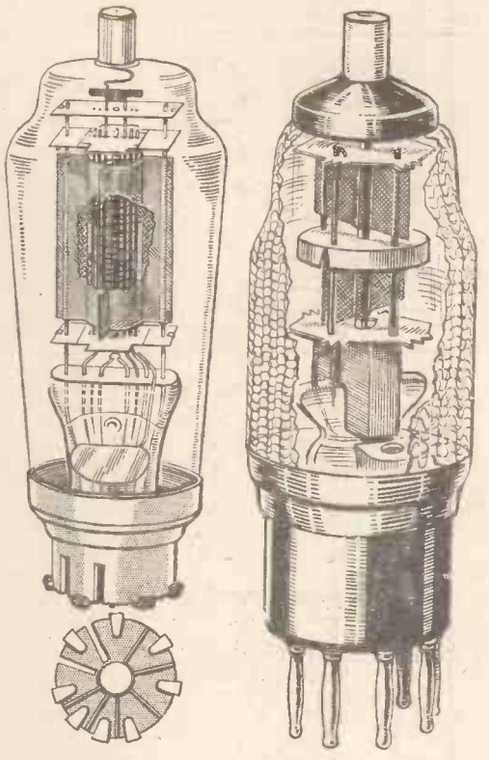
With this valve, a stage gain of between 60 and 100 times can be obtained, while it has the exceptionally high conversion factor of 1.2. It is supplied with a standard seven-pin base.

The high-voltage Ostar-Ganz valves are now well known. This range of valves has now been so greatly augmented that it is possible to construct any type of receiver using them. In addition to the more usual screen-grids, triodes and multi-grid output valves, there are also pentagrids, variable-mu high-frequency pentodes, and so on.

The latest valve in this range is the B2, a special double diode of unique construction. This valve is supplied with a six-pin base and a thimble-type top cap. The two diodes are screened from one another, the screening being brought out to a separate valve pin.

This valve has been designed to provide automatic volume control and diode rectification in superhet and other multi-valve receivers. It is suitable for A.C. or D.C. mains, and is priced at 19s. 9d.

Full details are now available of the latest Mullard universal valves. These are supplied with seven-pin bases of an unusual type, having side contacts instead of valve pins. This results in a considerable saving in overall height, which is very useful in the modern compact receiver.



(Left): Mullard type DB26 26-volt output valve. (Right): Ostar-Ganz B2 A.C./D.C. valve for universal mains sets

The most interesting valve is the octode frequency changer, type FC13. This is a 13-volt .2-ampere heater and is supplied with a special eight-contact base. The electrode assembly consists of six grids and an anode mounted around a common cathode.

The SP13 and VP13A are indirectly-heated high-frequency pentodes, the first with a fixed grid bias and the second with a variable-mu; both are supplied with an eight-contact base.

The 2D13 is a special double diode with a small five-contact base, while the Pen26 is a special output pentode with a 26-volt .2-ampere heater. It has a maximum anode dissipation of 8 watts when used with 200 volts on the anode and 100 volts on the auxiliary grid. It has a mutual conductance of 3.4 milliamperes per volt.

These valves have many uses; in particular they are suitable for universal A.C./D.C. receiver, as well as running from car accumulators.

Notes and Jottings

A NEW and unique service has been introduced by Rothermel, Ltd. It is the re-magnetising of permanent-magnet and reed-type loud-speakers.

Rothermel, Ltd., have an up-to-date magnetising plant which enables them to do the job for the small sum of 7s. 6d., including the cost of packing and return carriage. Readers should send for details of this new service.

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A complete kit of parts for a television receiver of the disc type can be obtained for £3 17s. 6d. The kit comprises a motor, 16-in. disc, motor resistance, tapped resistance, special Bennett metal enclosed double lens holder with viewing tunnel and matched non-distorting lenses, neon holder with reflector, mounts for motor, neon rheostat, slotted base-board, terminal block, flex, and sundries. The kit is supplied by Bennett Television Co., of Redhill, Surrey.

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Kebtex Radio have a very fine range of cabinets at reasonable prices, one of the most outstanding being a portable cabinet of pleasing appearance at 32s. 6d. carriage paid. The address of this firm is Drove Road, Biggleswade, Beds.

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The last lecture of the present session of the British Radio Institution is to be given before members of this Institution, the International Faculty of Sciences and visitors on May 24 at 7 p.m. at King's College, Strand, W.C.2.

The lecture is to be given by Prof. A. M. Low, D.Sc., and the subject is "Sound and Noise." AMATEUR WIRELESS readers are invited to be present; admission is free.

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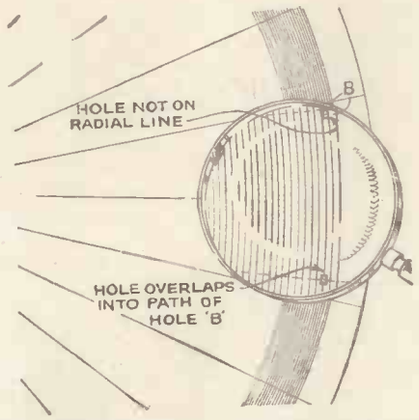
Owing to a clerical error, the prices of the kits of parts for the Lucerne Major in the Peto-Scott advertisement, on page 479 of our May 5 issue, were incorrect. The prices should have been: Kit A, cash or C.O.D., carriage paid, £2 17s. 6d. or 12 monthly payments of 5s. 3d.; Kit B, cash or C.O.D., carriage paid, £5 4s. 3d. or 12 monthly payments of 9s. 6d.; and Kit C, cash or C.O.D., carriage paid, £6 or 12 monthly payments of 11s

AMATEUR TELEVISION

Conducted by H. CORBISHLEY

Correcting Disc Faults



This diagram shows in an exaggerated manner the faults which may be present in a disc

IN the detailed instructions that have been given in these columns for the construction of a scanning disc for television it was pointed out that the making of an accurate scanning disc was a task calling for a very great deal of careful work if really first-class results are to be obtained. No doubt many who have attempted the making of a scanning disc have been disappointed by the appearance of black lines or white spaces which were revealed when the disc was put into use.

It is, however, possible to apply a certain amount of correction and a disc which is obviously faulty can be made to present a reasonably good scan with suitable treatment. With a perfect disc it would be almost impossible to distinguish the scanning lines but this state of affairs is never obtained in practice, and it is assumed that the errors to be corrected do not amount to much more than half the width of a hole.

There are two common faults:

(1) White and black lines due to incorrect radial spacing.

(2) A stepped appearance of the scan owing to incorrect angular spacing.

The first problem is to determine which holes are in incorrect positions and two methods must be used, one for radial errors and the other for those due to faulty angulation. Radial errors can be seen when the neon lamp is alight and the disc is rotated, but it will simplify their location if the neon is replaced with an ordinary electric lamp with a piece of ground glass placed between the disc and the lamp. Careful observation will soon determine which are the faulty holes. Remember that white lines are due to adjacent holes overlapping and that black lines are due to the holes being too far apart. When a general idea is obtained of the condition of the screen it is as well to make a rough sketch in order to decide how to apply the correction. For instance, it may be better to correct the faulty hole at a particular side and the decision as to which side to correct will depend perhaps on other faults. One other point; before actually making any alterations, carefully examine each hole and make sure that there is no dirt in them or that the metal is not burred, if there is any burr it can be removed with emery cloth after which the disc should be given a good brushing with a fairly stiff brush.

Moving the Holes

Assuming that after this treatment the scan is still faulty then we can proceed with the correction. The tools required are a jeweller's needle file and a small punch. The file, of course, is for removing metal from one side of the hole and the punch for spreading the metal. Careful manipulation of a very light hammer of the type used by jewellers may be found easier than a punch. Whichever is used, however, the blows should be commenced a little distance away from the hole it is wished to correct and be gradually worked towards the hole. Do not confine the blows to a very small area as this will cause the metal to bulge at one place and render the disc untrue. It is of course necessary to have a flat metal surface upon which to do the hammering and for this the domestic flat iron will probably serve as well as anything. It will be found that with careful treatment it is possible to move a hole a considerable distance by alternate hammering and filing.

Correcting Angular Faults

The correction of angular faults is more difficult than those due to radial errors, for there is no method by which they can be located other than by accurate measurement; that is, the positions of the incorrectly positioned holes cannot be observed on the screen and the only method of locating them is by carefully measuring the distance between successive holes. The treatment is, of course, the same but in this case the metal must be altered at the top and bottoms of the holes instead of the sides. In either case it is unwise to attempt to correct more than one hole at a time and after each fault is dealt with the disc should be observed before the next is proceeded with.

Blurred Picture

Sometimes it is found that a disc is not running truly and the result is a blurred picture. When this is the case it is usually the best plan to mount the disc afresh by making another set of holes for the securing screws rather than attempting to alter the existing

Faulty angular positioning of the holes results in the picture being stepped and radial faults are revealed by black or white lines according to whether the holes are too far apart or too close together

holes. It may be necessary to enlarge the central hole a trifle so that the disc can be moved to one side or another as required.

Buckled Disc

A disc that is buckled and wobbles badly even at the correct scanning speed is very difficult to remedy. No amount of bending will avail and the correct treatment is beating in order to expand the metal in a certain direction. A bad bulge means that the metal is expanded at that part and so the remedy is to expand the surrounding metal, but it is a task that calls for a great deal of judgment.

German 30-line Transmissions

A REGULAR thirty-line television transmission is being put out at the present time from Zeesen which it is quite practicable to receive with a fair measure of success in this country, though as the scanning is horizontal, a little modification will be necessary to receivers ordinarily used to receive the B.B.C. transmissions. If it is not desired to make any alteration, however, the signals can quite usefully be used for test purposes.

The wavelength is 1,570.7 metres, and the times of transmission are Tuesdays from 9.5 a.m. to 10 a.m., and Thursdays from 1.45 p.m. to 2.45 p.m. Scanning is carried out, as stated before, in a horizontal direction and is from left to right, and the picture ratio is 4 by 3 with the larger dimension horizontal.

This, of course, precludes the possibility of getting a proper picture with a standard disc receiver, though owners of cathode-ray or mirror-screw receivers will not have much difficulty in making suitable modifications for the different conditions.

In the latter case it is only necessary to place the lamp nearer to the screw and reverse the direction of rotation; the picture will, of course, appear horizontally unless the screw is turned over on to its side.

The effect of using apparatus, such as a scanning disc, which has a picture ratio that does not correspond to the transmitter may be likened to a picture which is printed on rubber. If this be stretched one way or another the picture will be distorted, though it still contains the elements of a picture.

A 4-by-3 ratio transmission received on a standard disc will therefore have the appearance of being elongated in one direction and compressed in the other.

Apart from these difficulties the transmissions will be found very suitable for modulation tests even though a correct picture is not received; a good deal of experimental interest can be obtained with any standard apparatus. It is quite an easy matter to recognise the transmissions by their characteristic note.

A REAL Tone Control

By M. G. SCROGGIE, B.Sc., A.M.I.E.E.

THE Americans were the first to make the tone control a standard fitting. Their knobs are seldom marked, but if they were the most appropriate directions would be at one end "Boomy," and at the other end "Very Boomy."

It is so easy to stick a condenser in almost anywhere to cut down the high notes and give the owner of the receiver the impression either that he is eliminating interference or increasing the richness of the bass, or both.

Sepulchral Speech

The "rich" bass—which really is a monotonous exaggeration of one particular note, caused by a convenient defect of cheap moving-coil loud-speakers—may be all very well for dance music, where any tom-tom effect is good enough for most people, but it makes speech sepulchral and totally unlike any living human voice.

This fault is particularly marked owing to the curious delusion of the B.B.C. that listeners like to hear the gentle tones of the announcer put out at the same volume as Foden's Steam-wagon Works Band.

A tone control that only accentuates the original fault of most of our present-day receivers is not a real tone control. To be

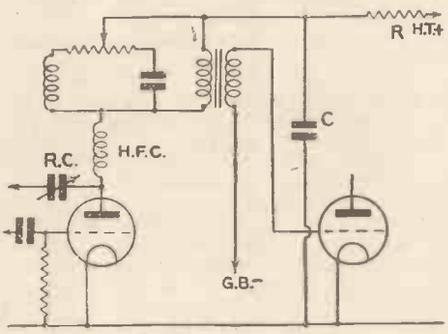


Fig. 2.—Circuit with capacity reaction

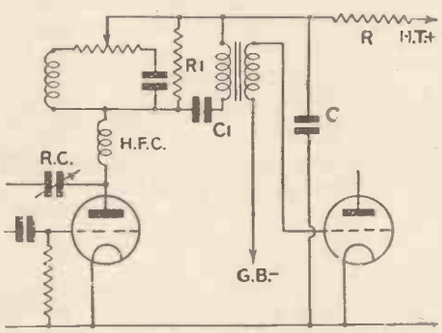


Fig. 3.—Tone-control as applied to a parallel-feed circuit

useful it should be able to "lift" the tone as well as to depress it; to give a brightness and clarity to speech, as well as a depth and power to music. There are some who say that if one takes care to make the amplifier and loud-speaker as "straight-line" as possible, any tampering with the balance of tone is bound to make the reproduction less like the original, and therefore less desirable.

I disagree with the "therefore." For one thing, reproduction can have the same balance of tone only if reproduced at original strength. Even the most blatant "hogs" might draw back before the prospect of releasing the full noise made by the B.B.C. 117-piece orchestra (and perhaps the organ and National Chorus thrown in) within their maisonettes.

On the other hand, an announcer sometimes speaks so quietly as to be inaudible a short distance away, and when his voice is magnified up above life-size it sounds too deep and throaty.

Then outside broadcasts are not always conducted under ideal acoustic conditions. Neither does the listener invariably sit in a specially treated listening room. So for many reasons it is a useful thing to have some control over the balance of tone.

Special low-frequency transformers are to be had which enable a wide range of tone to be obtained; but not everybody wants to go to the expense and trouble of buying a new transformer and scrapping the existing one, which may be doing its job quite satisfactorily.

It is possible, however, to adapt any ordinary transformer to give an almost perfect "tilting" of the amplification in either direction, providing a continuous range of tone from very high to very low in character.

Fig. 1 shows the circuit when the transformer is directly connected: that is, *not* parallel-fed. The extra parts are in heavy line and consist of a .1-microfarad condenser, a 100,000-ohm potentiometer, and a choke of about .3 or .4 henry. The Wearite HFS type of choke is suitable; and the Watmel 100,000-ohm volume control, which should be of the "straight-line" type—not "tapered" or "log. law."

In practice the valve to which the tone control is connected is the detector, so Fig. 2 may be referred to in order to see a bit more of the surroundings. If capacity reaction is used, worked by the condenser RC, it is necessary to have a high-frequency choke (HFC).

Sometimes one omits this choke, relying on the impedance of the transformer to divert enough power into the reaction circuit; but when the tone control is used this little plot fails to work well.

In other sets there is a fixed condenser, usually about .001-microfarad, from detector anode to earth, with or without the high-frequency choke. These can be left unaltered.

Then most receivers have decoupling components, R and C. These also may be left in position, though it is a good thing to have C as large as possible—1- or preferably 2-microfarads—and R not too large. In a mains-driven set, of course, the foot of the transformer secondary generally goes straight to earth, the bias being introduced in the cathode connection.

A very popular type of transformer coupling is the parallel-feed arrangement. There is one rather important point to observe in adding this tone control to it. Except in the few

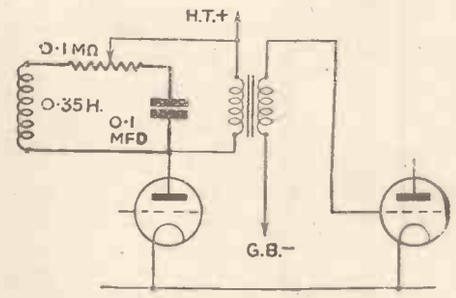


Fig. 1.—Tone control applied to circuit with direct transformer connections

cases where *no* decoupling is necessary, the primary of the transformer should be joined to high-tension positive, not to earth. Fig. 3 shows the circuit.

It is better for R_1 to be not more than about 25,000 ohms, while the usual 1-microfarad is quite correct for C_1.

Minor Disadvantage

There is a minor disadvantage in tone-controlling the parallel-feed circuit. As the slider of the control is moved towards the choke, to obtain high-pitched reproduction, the resistance R_1 is gradually short-circuited, and the valve draws rather more high-tension current. In the process the control is almost bound to be a little noisy when it gets close to that end of its travel.

As this is so only during actual adjustment, and near to the extreme end where it is unlikely to be used, it is not a really serious defect.

Fig. 4 shows the results obtainable. These curves are taken from actual measurements made on a circuit of the Fig. 3 type, in which the transformer was an R.I. Parafeed, R_1 and R 25,000 ohms each; C_1 1 microfarad; C 2 microfarad; the high-frequency choke also a Wearite HFS; and the valve an AC/HL, with 150 volts on the anode.

The vertical scale of the diagram is in decibels: these units may be unfamiliar to some readers, but they are quite simple really. They are just a measure of the amplification given by the valve, together with its transformer coupling; and some idea of things can be got by bearing in mind that 1 DB. is the least increase (or decrease) in loudness that can ordinarily be noticed (see pages 489 and 490 of AMATEUR WIRELESS for May 12).

Curve A applies when the slider is in the mid-way position, and shows practically uniform amplification, with a slight rise towards the top end of frequency. When the slider is right over at the condenser end, there is a progressive fall in amplification as the frequency goes up, as indicated by Curve B. At the opposite extreme, Curve C shows the rising characteristic.

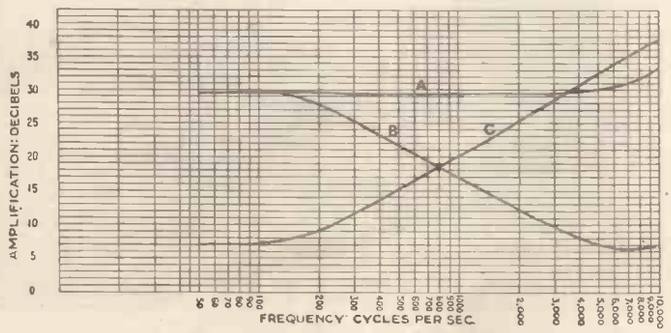


Fig. 4.—Results obtained with tone control in circuit

Everything between the B and C extremes can be got by adjusting the tone control.

An interesting thing to note is that the slope of Curve C is just right for compensating for extreme selectivity obtained by full use of reaction. You probably know, by experience even if you have not read about it, that when reaction is pressed to its limit to get the utmost range and selectivity, the quality of reproduction is very low-pitched.

For every reaction adjustment there is a tone-control adjustment—with this method—that gives just the correct amount of compensation

Short Waves Shine in the South!

Reports on the Latest Reception Conditions: By KENNETH JOWERS

REPORTS received from various parts of the country indicate quite clearly that conditions at the present time are exceptionally good in the South of England, but rather poor in Scotland. In fact, the farther north one gets, the worse become the conditions.

Mr. Jack Wilson, of Newmains, writes to the effect that conditions during this week are very poor. Atmospherics and heavy background noises render the 80-metre band almost useless.

Although the 20-metre band is not brilliant, a few good signals are being consistently received. The two star stations for the week are K4SA at Porto Rico and VE1BE at Canada. He has also logged W2GOQ, G5RV, F8VR, PA0SLB at good loud-speaker strength.

New Zealand and Australia

A letter from Mr. W. A. Clemenson, of Hampstead, covering the same period, tells me that with only a two-valve receiver he heard ten New Zealanders and six Australians in less than one and a half hours. He has also logged TG5JB, K4SA, VP5IS, in addition to numberless American and Australian stations. With the exception of K4SA, all of these stations appear to be on the 40-metre band, either between 6 and 7 p.m., or 6 and 7 a.m. Mr. Clemenson writes to tell me that his log of 114 stations which is published in this paper can be increased to 200.

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During the past week I have been testing a new four-valve short-waver, and although it was not calibrated in wavelengths I had no difficulty in receiving a large number of DX. stations. For example, during one evening I heard thirty stations on the loud-speaker between 14 and 25 metres.

Such stations as Buenos Aires LSY, and PLE Bandoeng were received at enormous strength. In fact if a pair of headphones were plugged in instead of the loud-speaker the diaphragm chattered against the magnet.

W3XAL on the 16-metre channel is really good entertainment value, even though the receiver did not embody automatic volume control. Three fifteen-minute programmes were heard without any appreciable fading, while a slight movement of the tuning condenser brought in the Empire station less than 2 degrees away.

Popular American

W2XAD has now returned to popularity, and can be relied upon to give loud-speaker signals for long periods. The programmes from this station are exceptionally good and usually originate in the Albany studios of the General Electric Company at New York. In view of the exceptional volume of W2XAD it is surprising that W8XK on almost the same wavelength rarely gives anything but poor headphone strength in this part of the country.

It may be that the aerial is not directional to this part of the world as is the aerial of W2XAD. W1XAL, W2XE, W8XK on the 25-metre band, and all the Zeesen transmitters are now coming in very well indeed. The same cannot be said of the 50-metre stations until after midnight.

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R. D. Everard, a member of the I.S.W. Club, living at Standon, Hertfordshire, confirms my remarks as to the good reception in the South of England.

He has just received confirmation of reception from W2EDW of New York, as well as from W9BHT, our old friend Ingersoll of Canton, Illinois and W8CPC, of Buffalo.

He got a great kick out of hearing Dr. Simpson, the operator of W8CPC calling him up over the air.

In addition to these stations he has logged W3BMS, W3AHR, W2BX, W2ALE, to mention but a few of the American amateur stations. So far Mr. Everard has logged amateur stations from practically every country in the world.

Galliland photo

Control panel of the three-range short-wave transmitter at Zeesen. It can be used on 25.5, 31.38, and 49.8 metres

It is worth while, in view of all these reports, and the obvious entertainment value on the 20-metre band to pep up your receiver on this particular waveband. It's a good idea to increase the number of turns on your coil until the 20-metre band can be tuned in round about 10 to 20 degrees on the tuning dial. You will find a definite improvement in signal strength as compared with the same receiver if you have to tune in this band at 80 to 90 degrees on a 100 degree dial.

In my own set I use a two-turn coil of approximately 2-in. diameter with a .00015-microfarad tuning condenser. The coil is air-spaced, the two ends being soldered on to two small plugs which fit into two sockets, so that there is absolutely no loss. I think very shortly that I will make a definite 20-metre band set, with the tuning coils soldered directly on to the tuning condenser.

Such a set will be very easy to tune, because a 50-micro-microfarad will be quite large enough, and the small bands between 19 and 21 metres would be spread over at least 100 degrees. In addition to this advantage you could obtain the last ounce from the set, which you definitely cannot do if you are going to use a two- or three-range coil.

Ultra-shorts—In Cans!

The Stratton people have just introduced a metal can with a hinged lid which is supplied with a 22-to-1 wide-vision tuning scale. I have got one of these cans, and I am going to make up a three-valve battery-operated ultra-short-wave receiver which will tune between 4.5 and 8.5 metres.

There is going to be a lot of interest this summer in the ultra-short waves. All the amateurs seem to be knocking up portable transmitters while the receiving sets will act as a very good guide as to whether you will be in the service area of the B.B.C. or Baird 7-metre television transmissions.

I shall most probably publish the details of the ultra-short-wave super-regenerative set in a few weeks time, so there is no need to write to me and ask for the circuit.

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One reader has written to me giving details of his short-wave aerial, which he has erected specially for 20-metre reception. It consists of 33 ft. top with two insulators in the centre 1 ft. apart and two 16 ft. down leads both spaced 1 ft. apart. This down lead is then attached to a transposed transmission line, all screened, of course, because of local interference, and coupled up to his receiver through a matched-impedance coupler.

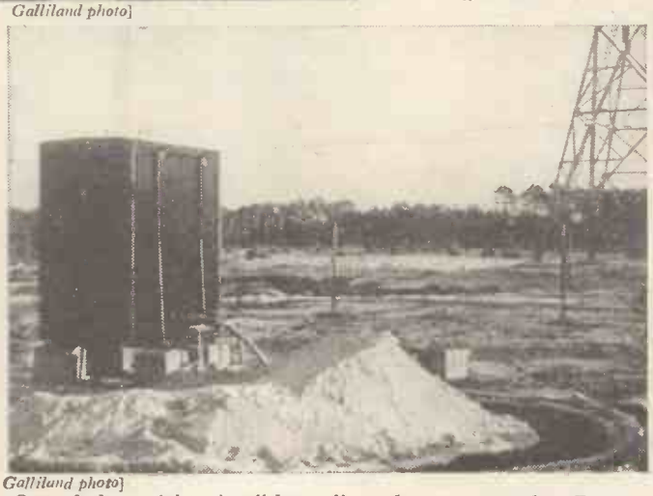
Increased Strength

This reader tells me that with such an aerial he gets a 40 per cent. increase in signal strength over his normal 50-foot inverted L aerial. I pass this idea on to you.

◆ ◆ ◆

What with the introduction of all these new Universal valves by Mullard, Tungsram, and Ostar Ganz, etc., don't forget that you can now make up superhet converters complete with self-contained power pack, to work from either A.C. or D.C. mains without alteration.

One of the main reasons for short waves being unpopular with the average family man is that should he be using a mains set the superhet converter has either got to have a separate power supply, or else he has got to buy or make a self-powered converter which costs anything from £8 to £20. Of course there are exceptions to this, but that is the general rule.



Galliland photo

One of the aerial-tuning "houses" at the very up-to-date Zeesen short-wave station in Germany

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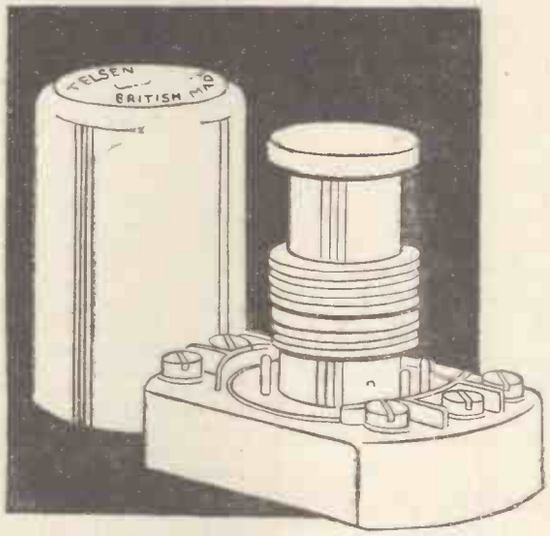
offer you

THE PERFECT *Coil* FOR EVERY PURPOSE



TELSEN IRON-CORED COIL ... 8/6
Twin-Matched 17/-. Triple-Matched 25/6.

TELSEN SCREENED TUNING COILS
Single ... 7/-
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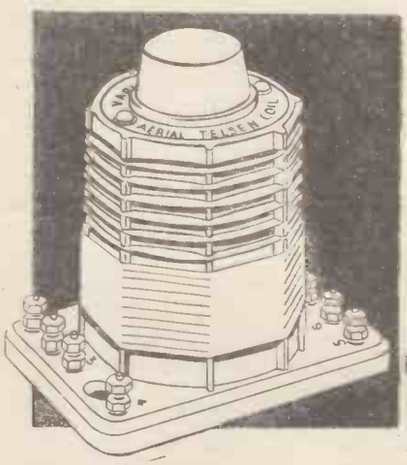
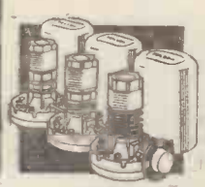
TELSEN Coils cover every requirement — not only in the wide range of types available, but also in the lasting efficiency which they provide and the exceptional value which they offer. Built to the highest mechanical standards, and rigorously tested at every stage of manufacture, each Telsen Coil is the finest of its type it is possible to produce — at the lowest price consistent with quality.

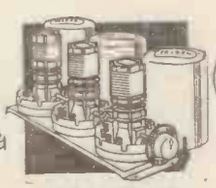


TELSEN
DUAL RANGE AERIAL COIL 7/6

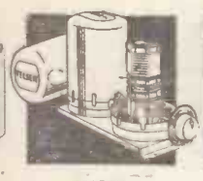


TELSEN
SUPERHET COILS
Type S.330 21/6

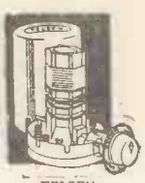
TELSEN H.F. TRANSFORMER COIL
5/6



TELSEN BAND-PASS & OSCILLATOR COIL UNIT
21/6



TELSEN BAND-PASS COIL UNIT
14/6



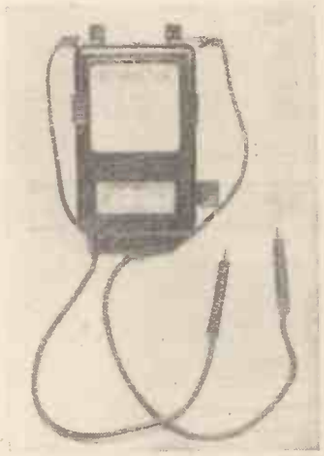
TELSEN OSCILLATOR COIL
7/6

TELSEN FOR EVERYTHING IN RADIO

Announcement of THE TELSEN ELECTRIC COMPANY LIMITED, ASTON, BIRMINGHAM

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

Our Tests of New Apparatus



Pifco Rotameter—a practically universal test meter

PIFCO METER

THIS new meter introduced by the Pifco people is an ingenious attempt to produce a multi-range meter in which compactness, simplicity of operation and low cost have all been combined.

The meter itself is a small moving-iron instrument, the pointer of which operates over a scale just over 1¼ in. in length. This scale is viewed through a window at the bottom of the meter and is actually linked up with the switch knob at the side by means of which the various ranges are selected. Thus the rotation of the switch knob automatically brings into place the correct scale for that range.

There are three voltage ranges, giving full-scale readings of 8, 30 and 250 volts respectively, three current ranges reading to 20, 100 and 250 milliamperes, and a scale for reading resistance up to 4,000 ohms. There is one further scale which is used for testing the batteries contained in the instrument itself.

The whole instrument is housed in a neat bakelite case which measures only 4 in. by 2⅞ in. by 2 in.—a very compact size. The movement is robust, but in order to protect it from accidental damage a fuse is incorporated which is accessible from the back of the meter together with the batteries necessary for the resistance testing.

Two test leads are provided, together with a book of instructions which makes the use of the meter perfectly clear.

Test Results.—We found this instrument operated satisfactorily on all its ranges. The movement is a moving-iron one, and the accuracy is thus naturally limited. In point of fact we found that the accuracy varied at different parts of the scale, reaching an error of some 10 per cent. in parts. Since the instrument is intended for servicing, however, this is not a very serious matter.

The full-scale current on the various voltage ranges was 20 milliamperes, corresponding to a figure of merit of 50 ohms per volt.

Makers : *Pifco, Ltd.*
Price : *£1 9s. 6d.*

GOLTONE STATOFORMERS

THIS new device consists, in effect, of two transformers for insertion in the down lead of an aerial system. One transformer, known as the aerial statoformer, takes the form of a shielded *step-down* auto-transformer which is inserted at the top end of the aerial down lead, which must be shielded.

The second or receiver statoformer is then attached to the lower end of the down lead at the point where it enters the set.

The aerial statoformer consists of a small brass cone, within which the transformer is housed and can be readily attached to the aerial, whilst the receiver statoformer in appearance resembles a plain canned coil.

This is provided with feet in the usual manner to enable it to be screwed down in or nearby the receiver. The makers particularly recommend the use of their own shielded down lead, which is not air-spaced.

Test Results.—Both statoformers were placed in circuit and tested in conjunction with a four-valve super-het. Interference was almost entirely cut out when tuned

Goltone Statoformers

to the London National transmitter, though with some loss of signal strength, which conditions applied also to Radio Normandie.

With increasing wavelength the reduction in signal strength became less marked; in fact, there was no appreciable loss whatsoever when tuned to Brussels, although the interference was practically eliminated.

The makers state that long-wave results are rendered void when using both units and that, in order to restore normal sensitivity for these conditions, it is necessary to detach the down lead from the receiver statoformer, join the lead and metal braid together, and reconnect to the set.

This can, of course, be readily accomplished by means of a simple switch which, for our part, we would prefer to see incorporated in the device by the manufacturers. For those sorely troubled by interference we recommend these units.

Makers : *Ward & Goldstone, Ltd.*
Price : *Aerial statoformer, 4s. 6d. Receiver statoformer, 5s. Shielded down lead, per 50 ft., 4s. 3d.; per 100 ft., 8s.*

SAVAGE MAINS TRANSFORMER

THE Savage mains transformer, known as type A13, has recently been tested and has proved satisfactory. The primary and high-tension windings, assembled on a generous iron core, are brought out to screw terminals mounted on ebonite strips at the top of the transformer, whilst the low-tension windings are terminated in a similar manner on strips mounted on one side of the transformer.

In addition to terminals, soldering tags are provided, but it must be noted that those for connection to the low-tension supplies are a little inaccessible.

The transformer is designed for use with a valve rectifier on 200 to 250 volts and has three input tappings. The high-tension secondary is rated at 250-0-250 volts 60 milliamperes, whilst the low-tension winding provides 2-4 amperes at 4 volts and is centre tapped. A further winding gives 1-2 amperes at 4 volts for a rectifier.

Test Results.—Tests were carried out with a 250-volt 50-cycle supply connected to the maximum tap and output measurements under various loads were made. These showed that the high-tension regulation was good, though not so good in low tension with the sample tested.

The high-tension voltage with full load was 245, but the low-tension supply dropped to 3.6 volts at 4 amperes, whilst the 1.2-ampere winding gave 3.65 volts at 2 amperes. The no-load loss was reasonably low, being only 4.1 watts, and the transformer stood up to all insulation tests.

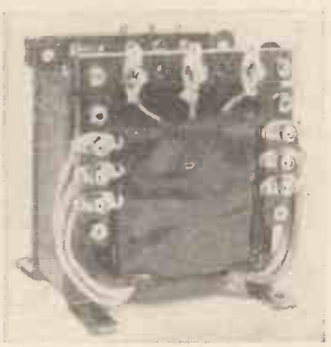
Apart from the slight falling off in the low-tension supply, we consider the transformer to be a good job.

Makers : *W. Bryan Savage.*
Price : *£1 5s.*

MAGNUM MULTI-CONTACT SWITCH

A NEW Magnum seven-contact switch has just been tested from a mechanical and electrical standpoint. In these "ultra-short" days, the makers' claim to the effect that the high-frequency resistance of the contacts does not vary to a measurable degree until frequencies equivalent to 1 metre are reached at once stamps this switch as something out of the ordinary.

The switch consists of an elongated rigid metal frame form-



Savage mains transformer

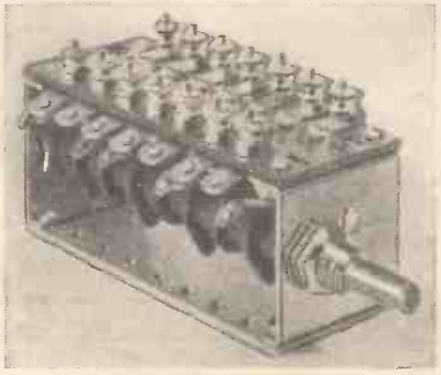
ing three of its sides, the fourth side, that is, the top, consisting of a strip of paxolin or similar material along one edge of which are mounted the contacts.

Actual contact is made by means of cams mounted on an ebonite spindle and upon rotation of which a second set of springs, which are positioned beneath the others, are forced upward to make contact. The cams can be arranged for operating contacts in various combinations to suit requirements.

Gold-silver contacts are employed and the cam operation imparts a "wipe" whilst the pressure is applied. The overall size of the frame is 1⅝ in. by 1⅝ in., the length varying according to the number of contacts. Soldering tags are fitted as standard, but terminals are available if required.

Test Results.—The resistance between contacts was remarkably low, whilst the self-capacity was negligible. Operation is delightfully smooth, the switch locating with a definite click and stop. Altogether a satisfactory component.

Makers : *Burne-Jones & Co., Ltd.*
Price : *5s. 6d. to 6s. 6d.*



Magnum multi-contact switch

Unfamiliar Interval Signals

By Jay Coote

DURING the next few weeks you are liable to pick up some unfamiliar interval signals as, owing to the popularity achieved by the short Smetana melody broadcast by Prague, all Czech studios have decided to adopt an individual musical phrase to identify themselves to home and foreign listeners.

As the Czech capital now enjoys an alternative programme, whereas the high-power Liblice transmitter will retain the harp *motif*, Prague (No. 2) on 249 metres will now give us between items the opening bars of a Sokol Marching Song, in the form of a fanfare of trumpets.

Bratislava has decided upon a carillon rendering of a few notes from a National folk song "Hej Slovaci," but Kosice will give a rendering of another melody "Hej hore hazi," on a Fujar, which, I am told, is a Slovak woodwind instrument.

Finally, Moravska-Ostrava has chosen a local song "Pilek," by its native composer Janacek, and it will be heard through the medium of hammers striking tuned anvils!

Brno, so far, has not announced its intentions in the matter.

◆ ◆ ◆

I take it that no listener in the British Isles has picked up the tests made by the Cairo transmitter; personally I have searched the ether on several evenings in vain. Cairo shares the Brussels (No. 1) channel, and as this station pours into my home at full volume, there is little chance of reaching out to Egypt.

By the time the Belgian announcer has bid me goodnight, in view of the difference in time, the Egyptian has signed off for the day.

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But Lisbon is another matter, and I presume that you have already logged this newcomer. As the station is being erected by British engineers, the call is given out in English. The station will be opened officially on May 28, following an official ceremony by the President of the Portuguese Republic.

In the meantime, Radio Parede, on 291.7 metres—now fairly clear of Heilsberg—is working merrily every night. CT1AA Lisbon has closed down, but is still carrying on its broadcasts on the short waves.

◆ ◆ ◆

The International Broadcasting Union, when it meets in London next month, will find itself faced with some sticky problems to solve, especially as regards channels on the long waves. During the past few weeks several changes have been made on this band, some authorised, others mere arbitrary moves on the part of certain stations.

The continued presence of Eiffel Tower has had a lot to do with this, for it has caused Warsaw and Reykjavik to wander from wavelength to wavelength to avoid interference with their broadcasts. In addition, Vienna Experimental and Madona (Latvia) have turned up in this band, thus increasing the congestion.

It now appears that Eiffel Tower, although it may withdraw from its present position, will remain in the medium waveband, and an attempt is to be made to secure a channel somewhere in the region of 545 metres.

Criticisms by WHITAKER-WILSON

My Broadcasting Diary

Monday

THESE Charlot Hours are getting feebler. I expected a lot of *June*, but was sadly disappointed. No wit, no brilliance. The nonsense about Big Ben was a typical example.

M. Charlot must revise the whole scheme and set it out on better lines altogether. He had it right some time ago. Something has gone radically wrong with it.

◆ ◆ ◆

Beethoven's *Fidelio* gave me some pleasure. More unoperatic opera I never heard, but it was delightfully crisp and tuneful. Tickled to death over Sir Thomas Beecham telling those "savages" to stop talking. Quite right, too.

◆ ◆ ◆

Listened to Lord Elton on the Fall of Kut, which interested me all through. He has a pleasing delivery, which is more than can be said for some of these talkers. Most of them kill their act outright.

Studio Portraits
Muriel Brunskill

Tuesday

TURNED on without looking at the programme soon after eight o'clock. Much attracted to a waltz by Baron d'Erlanger. Really beautiful English music.

◆ ◆ ◆

Was interrupted for a while, but managed to catch Muriel Brunskill later in the evening. There's a singer for you! Words clear; tone well sustained, and pure in quality. Yes, she's one of our best. Said so for a long time.

Wednesday

HANDS Across the Sea made me wish they were at the bottom of it. Definitely a weak show. Same trouble as on Monday evening. Total lack of brilliant lines. Some of the jokes got me down altogether. The soprano sang rather nicely, though.

Everything else of a distinctly poor quality. Seem to have struck a bad patch again.

◆ ◆ ◆

The variety relay from the Pavilion Theatre, Liverpool, much more the right style.

Thursday

LIKED Lance Sieveking's *Airways of Empire* very much. Informative. Struck me as being written with an inside knowledge—I mean it would have struck me that way had I not known he has that knowledge.

Saturday

I LISTENED carefully to Hughie Green and his Gang, because of my bad impression the first time I heard them. That impression now definitely confirmed. Precocious children make poor radio entertainers. I cannot imagine what public this show was aimed at. At any rate I saw nothing amusing or even faintly entertaining in it.

Studio Portraits
Sir Thomas Beecham

Considering there are so many artists with nothing to do, it would not be a bad idea if the B.B.C. thought of them before youngsters of this kind. The show was decidedly silly, and weak from every point of view.

I hope there is not going to be an attempt to create a public for this sort of thing. If we hear this cast of babes in variety again by 1944 it will be soon enough.

◆ ◆ ◆

Compared with *Airways of Empire*, the film-producing affair called *The Private Life of Don Juan* was not worth hearing. It was dull. Far too many stops and noises for which one could not account. A test for this sort of show is whether the listener feels he ought to *see* what is going, or not. If he does, then the show is no good as a radio entertainment. If he can visualise for himself then the show is good entertainment.

In my judgment this was definitely bad for the former reason. John Watt did his best to make it go, but all I got out of it was a vision of John without a clear vision of where he was. A muddle.

◆ ◆ ◆

While endeavouring to extract entertainment out of these shows—and failing—I floated in and out of the Three Valleys Festival at Mountain Ash. Mendelssohn's *Elijah*.

Studio Portraits
Lance Sieveking

I think it must have sounded very much better there than on the air. I tried my set all ways, but got no satisfaction. The quartet of soloists seemed ill-balanced, however good they may have been separately. This I concluded from hearing *Cast Thy Burden*.

The chorus seemed in the wrong position in relation to the orchestra. Altogether unsatisfactory from the radio point of view—but, as I say, that may not have been the case in the pavilion at Mountain Ash.

On the whole, a poor week.

OUR SPECIAL SHORT-WAVE NUMBER

Next week's issue of AMATEUR WIRELESS will devote particular attention to the short waves, a subject that is becoming more and more important as time goes on. Look out for heaps of interesting new ideas!

Broadcast Wavelengths

This week we give details of the principal short-wavers and the European long-wave stations. Next week we shall publish a list of medium-wave transmitters.

Principal Short-wavers

Metres	Kilocycles	Station and Call Sign	Country
16.86	17,790	Daventry (GSG)	Great Britain
16.87	17,772	Boundbrook (W3XAL) NJ	United States
16.89	17,760	Zeesen (DJE)	Germany
19.55	15,340	Schenectady (W2XAD)	United States
19.67	15,242	Boston (WIXAL)	United States
19.68	15,234	Paris (Colonial) (FYA)	France
19.71	15,210	East Pittsburgh (W8XK)	United States
19.73	15,200	Zeesen (DJB)	Germany
19.82	15,140	Daventry (GSF)	Great Britain
19.84	15,120	Vatican (HVJ)	Italy
24.53	12,230	Lisbon (Eddystone)	Portugal
25.00	12,000	Moscow (RNE)	U.S.S.R.
25.25	11,880	Paris (FYA)	France
25.25	11,870	E. Pittsburgh (W8XK)	United States
25.28	11,865	Daventry (GSE)	Great Britain
25.32	11,840	Wayne (W2XE)	United States
25.40	11,810	Rome (2RO)	Italy
25.45	11,780	Boston (WIXHL)	United States
25.53	11,750	Daventry (GSD)	Great Britain
25.57	11,730	Huizen (PHI)	Holland
25.58	11,720	Middlechurch (VE9JR)	Canada
25.63	11,705	Paris (Colonial)	France
30.0	10,000	Madrid (EAQ)	Spain
31.25	9,600	Lisbon (CTIAA)	Portugal
31.26	9,590	Philadelphia (W3XAU)	United States
31.26	9,590	Sydney (VK2ME)	New South Wales
31.297	9,585	Daventry (GSC)	Great Britain
31.33	9,570	Boston (WIXAZ)	United States
31.38	9,560	Zeesen (DJA)	Germany
31.46	9,530	Schenectady (W2XAF)	United States
31.545	9,510	Daventry (GSB)	Great Britain
31.55	9,510	Caracas (YV3BC)	Venezuela
37.33	8,035	Rabat (CNR)	Morocco
38.47	7,797	Radio Nations (HBP)	Switzerland
42.92	6,880	Oslo (LCL)	Norway
43.86	6,840	Budapest (HAT2)	Hungary
45.38	6,610	Moscow (RW72)	U.S.S.R.
46.53	6,447	Barranquilla (HJIABB)	Colombia
46.66	6,425	Boundbrook (W3XL)	United States
48.86	6,140	Pittsburgh (W8XK)	United States
49.02	6,120	Wayne (W2XE)	United States
49.07	6,110	Halifax (VE9HX)	Nova Scotia
49.08	6,112	Caracas (YVIBC)	Venezuela
49.15	6,110	Chicago (W9XF)	United States
49.15	6,110	Boundbrook (W3XAL)	United States
49.19	6,095	Bowmanville (VE9GW)	Canada
49.23	6,090	St. John (NB) VE9EJ	Canada
49.31	6,080	Chicago (W9XAA)	United States
49.39	6,070	Vancouver (VE9CS)	Brit. Columbia
49.39	6,070	Maracaibo (YU5BMO)	Venezuela
49.4	6,073	Skamlebaek (OXY)	Denmark
49.47	6,065	Nairobi (VQ7LO)	Kenya Colony
49.48	6,060	Byberry (W3XAV)	United States
49.48	6,060	Mason (W8XAL)	United States
49.5	6,060	La Paz (CP5)	Bolivia
49.59	6,050	Daventry (GSA)	Great Britain
49.83	6,020	Zeesen (DJC	Germany
49.93	6,005	Montreal (VE9DR)	Canada
50.0	6,000	Moscow (RNE)	U.S.S.R.
50.26	5,969	Vatican (HVJ)	Italy

Long-wave Stations

Metres	Kilocycles	Station and Call Sign	Country	Power (Kw.)
1,107	271	Moscow (RCZ)	U.S.S.R.	100
1,132	265	Madona	Latvia	15.0
1,186	253	Oslo	Norway	600
1,224	245	Leningrad	U.S.S.R.	100.0
1,250	240	Vienna (Exp)	Austria	3.0
1,261	238	Kalundborg	Denmark	30
1,293	232	Kharkov	U.S.S.R.	35.0
1,304	230	Radio Luxembourg	Grand Duchy	200.0
1,312.9	229	Ankara	Turkey	7
1,345	223	Warsaw	Poland	12
1,389	216	Motala	Sweden	30
1,395	215	Eiffel Tower (Paris)	France	8.0
1,442	208	Reykjavik	Iceland	21
1,442	208	Minsk	U.S.S.R.	35.0
1,500	200	Daventry National	Great Britain	30
1,570.7	191	Deutschlandsender	Germany	60
1,621	185	Istanbul	Turkey	5.0
1,648.3	182	Radio Paris	France	50.0
1,724.1	174	Moscow (1)	U.S.S.R.	500
1,807.2	166	Lahti	Finland	40
1,875	160	Kootwijk (Huizen prog.)	Holland	50
1,875	160	Brasov	Roumania	20
1,935	155	Kaunas	Lithuania	7

Are You A Short-wave Fan?

If you are you must not miss our SPECIAL SHORT-WAVE NUMBER next week. It will also appeal to those who have not yet experienced the thrills of short-wave working!

PREPAID ADVERTISEMENTS

Advertisements under this head are charged THREEPENCE PER WORD, minimum charge THREE SHILLINGS. DEPOSIT SYSTEM.

As the publishers cannot accept responsibility for the bona fides of advertisers in this publication, they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to "Amateur Wireless," Advertisement Department, 58/61 Fetter Lane, London, E.C.4.

PATENTS.—Trade Marks. "Advice Handbook" free.—B. T. King, Regd. Patent Agent, 146a Queen Victoria Street, London.

GILBERT INDUSTRIES, LTD.—"Oddments" parcel, not rubbish but the stuff you always want and cannot get at your local shop; it contains 1 die holder, 1 tap holder, 6 gross assorted B.A. screws, ¼ lb. useful B.A. brass nuts, bolts, terminals, washers, tags, sockets, etc.; selection of plain and engraved terminal strips, small insulating strips, ivorine scales, celluloid strips, ebonite formers, wooden and bakelite knobs, rubber feet, gramophone needle cups, condensers, Dubilier resistances, bobbins, rivets, American terminals, mouldings in bakelite, etc., etc.; complete parcel 5/- post paid. As above, but without tap holder and die holder, 3/6. Post paid. Polar Star minor 3-gang, fully shielded and with trimmers, offered at 10/6, post paid; 12 gross assorted B.A. screws, from 10 B.A. upwards, 3/6, post paid. Varley Nichore H.F. chokes, type B.P. 26 (list 4/6), offered at 3/6, post paid. R.I. Parafeed transformers offered at 4/6 post paid. Send 3d. for bargain lists.—Gilbert Industries, Ltd., 519 London Road, Westcliff-on-Sea, Essex.

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Not more than two questions should be sent at any time.

The designing of apparatus or receivers cannot be undertaken.

Slight modifications of a straightforward nature only can be made to blueprints. For more serious alterations the minimum charge is 2/6.

Blueprints supplied by us will be charged for in addition, but, of course, readers may send their own blueprints for alteration.

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Postcard Radio Literature

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. Please write your name and address in block letters.

Ferranti Resistances

LIST No. WA520 is devoted to fixed resistances and variable potentiometers. Two types of fixed resistances are available; wire end and constructor's.

Potentiometers are available with switches.

A colour code is given in this catalogue, and also an abac for estimating current, resistance, voltage or watts when any two valves are known. You should have this catalogue on hand for reference. **162**

Dubilier Condensers

YOU will find full details of condensers suitable for your new receiver in the Dubilier catalogue.

The tubular non-inductive condensers, and low-voltage electrolytics are to be specially noted.

Also included are details of the metallised fixed resistances which were described in AMATEUR WIRELESS last week. **163**

The twenty-four-hour clock system has been adopted by Ferranti, Ltd., and is used in particular in connection with the teleprinter system joining the Hollinwood office with the Bush House branch.

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When ordering, please send Postal Order, NOT STAMPS. Quote the Blueprint number shown below: not the number of the issue.

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Four Station Crystal Set	AW427

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"A.W." Iron-core Two with Q.P.P.	AW396
Big Power Melody Two, with Lucerne Coils (SG Trans)	AW338A
B.B.C. National Two, with Lucerne Coils (D, Trans)	AW377A
Consolectric Two (D, Pen) A.C.	AW403
Lucerne Minor (Det, Pen)	AW426
Screen-grid Two (SG Det, Trans)	WM289
A Two for 7 Metres (D, Trans)	WM295
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THREE-VALVE SETS (1s. each)

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A.C.-D.C. Universal Three (SG. Det, Pen)	AW414
1934 Ether Searcher (SG, Det, Pen) Baseboard	AW417
1934 Ether Searcher (SG, Det, Pen) Chassis	AW419
Lucerne Ranger (SG, Det, Trans)	AW422
P.W.H. Mascot (Det, R.C, Trans)	AW337A
Cossor Melody Maker with Lucerne coils	AW423
Mullard Master Three with Lucerne coils	AW424
Schoolboy's Three (Det, 2. RC)	AW428
Penta-quester (HF, Pen, Det, Pen)	AW431

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Melody Ranger (SG, D, RC, Trans) with copy of "A.W." 4d. postage	AW375
Signpost Four (SG, D, LF, Class B)	AW398
"A.W." Ideal Four (2SG, D, Pen)	AW402
2 H.F. Four (2SG, Det, Pen)	AW421
Lucerne Major (SG, Det, RC, Trans)	AW433

FIVE-VALVE SETS (1s. 6d. each)

The Etherdyne (Super-het)	AW406
Super-quality Five (2 HF, D, RC, Trans)	WM320
Ideal Home Super (Super-het)	WM280
Easytune 60 (Super-het)	WM284
New Class-B Five (SG, D, LF, Class-B)	WM340
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MISCELLANEOUS (1s. each)

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Experimenters' A.C. Mains Unit	AW432

Copies of the "Wireless Magazine" and of "Amateur Wireless" containing descriptions of most of these sets can be obtained at 1s. 3d. and 6d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine." Address letters:

Amateur Wireless Blueprint Dept., 58-61 Fetter Lane London, E.C.

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- Tests of the "A.W." Short-wave World-beater

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News and Gossip of the Week

Relay for North Wales

ONE step nearer to a North Wales relay has been taken by roving B.B.C. engineers.

Of course, the people at the "Big House" won't confirm this news, but you may take it from us that a station is being hatched out.

Meanwhile, the B.B.C. is gracious enough to nod in the affirmative when we coyly ask about that studio for Bangor.

Across Snowdonia

IS it not significant, by the way, that the Post Office has just completed a line across the Snowdonia range?

As yet it is not clear at what point the present S.B. system will be tapped to take the North Wales outlet, but Birmingham is likely.

If they get a relay in North Wales it will have to be synchronised with an existing station, which we opine will be West Regional.

Summer Programmes

ODD news comes to us about summer programmes. In spite of the glad tidings of a contemporary to the effect that Colonel Dawnay had insisted on full alternatives, we now gather from "H.Q." that there will be a drastic *scaling down*.

Starting from July 2, when the B.B.C.'s conception of summer time apparently dawns, there will be only one main programme until the middle of September.

Lighter Fare

ON the credit side we must say the B.B.C. has at last seen the light in that it has decided to cut out evening talks almost entirely.

There will be no talks between 6.30 and 8 o'clock, except for the sports talk on Saturdays. Still further brightening will be effected by cutting out the late evening talks.

As a matter of fact, only two talks per week will be left in the programmes. Jolly, isn't it?

Popular Drive

ALL through the summer the B.B.C. is determined to go out to make broadcasts bright and "happy." Even the very popular St. Michael's, Chester Square, evening service on Thursdays will be suspended during August and September.

A whole-hogging policy of brighter broadcasting would appear to be imminent. Presumably all the B.B.C.'s advisory committees will throw up their black-gloved hands and temporarily retire to homes of rest.

Broadcast "Talkies"

IN a room on the eighth floor of Broadcasting House, where the E.M.I. film television gear but lately rested, the B.B.C. is now busily installing a Western Electric sound-track equipment.

All ready for the "Picture People" broadcast on May 29, of course. Snippets from various talkies will come to us—at least the sound part will—through the B.B.C.

Potted Stars

THIS unique programme will enable us listeners to hear Gracie Fields, Eddie Cantor, Richard Tauber, and Jessie Matthews—all star talkies!

If this idea of using up the sound-track part of popular talking films catches on—and for our part we do not see how it can fail—the B.B.C. will repeat the dose.

It evidently intends to explore talkies, anyway, because that sound-track equipment is quite a costly affair to install.

Burghead—and Before

BEHIND the finding of the North Scottish Regional site at Burghead lies a tale of an almost hopeless search by the B.B.C. mobile van and its satellites.

You see, there are so many conditions to be fulfilled by a regional site.

It must be accessible by road, near telephone lines, have water supply within easy reach, have ground suitable to take high masts and heavy machinery, also to be moderately flat and, if possible high.

Baffling Sub-soil

IN the end the engineers came to the conclusion that their inability to locate a site that would give a decent polar diagram—sorry, reasonable service area!—was due to peculiarities in the sub-soil.

But now, eight miles from (Ramsay Mac) Lossiemouth the indefatigable engineers have found their true delight, and within the next year signals will shoot across the Moray Firth to the redoubtable highlanders.

Topical photo

B.B.C. engineers installing a microphone for the broadcasting of Great Tom in the clock-tower of St. Paul's Cathedral

Empire Gossip

INCLUDED in a new drive to brighten up the Empire service from Daventry is a new feature that will be known as the gossip hour.

Cries of old London and all that will form the *motif*. We are not told whether "stop me and buy one" will be included.

More Bells

DO the bells of Bow Church, as sent to you so often during B.B.C. intervals, depress you? Many people are complaining that way.

Well, here's news! The B.B.C. has recorded the bells of (Oranges and Lemons) St. Clements.

We should not be surprised to hear these delightful bells introduced stealthily and with comment within the next few days.

24-hour Time

IN spite of Press resentment and boycott, the B.B.C. is determined to give the 24-hour system of time a thorough trial, and it is likely to continue all through the summer.

We are rather amused during our visits to the B.B.C. to find that no one refers to the new timing—or if they do it is usually wrong.

Habit is strong—especially when there is no real reason for breaking it. Or is there?

French Scapegoat

SCANNING the latest report of the International Broadcasting Union, we see that Eiffel Tower has undertaken to go down to 206 metres—which is the channel now occupied by Fécamp.

Meanwhile it has promised to reduce power in the evening. Have you noticed it? Nor have we.

American Car Radio

AT the end of 1933 the Americans compute there were 18,000,000 sets in use, of which the surprisingly large number of 950,000 are thought to be car radios.

Our Short-wave Number

HERE it is—an issue devoted to short waves. Now is just the time of the year to "go down."

Don't forget that this issue inaugurates *a weekly section* for short-wave fans.

Semi-television Signals

By MORTON BARR

Marconi photo

Direction-finder on board the s.s. "Queen of Bermuda"

BROADCASTING is, of course, one thing and television quite another, but the method of "visible" signalling now being developed to assist navigators, either at sea or in the air, falls, one might fairly say, between the two.

Wireless first came into the limelight—long before the days of broadcasting—because of its value at sea. It not only keeps the vessel in touch with land throughout its voyage, but in an emergency summons helps by sending out the S O S signal.

Later on the properties of the frame aerial were used to develop the art of wireless direction finding, so that a fog-bound navigator can now find his whereabouts and safely work his way into harbour even though lighthouses, buoys, and similar navigation marks are totally obscured.

Traffic Lanes

More recently still we find wireless transmitters of the beam type being used to assist aerial navigation. They form clear-cut "traffic lanes" through the air, which although visible to the onlooker make their presence felt both audibly and visibly to the pilot. Should he stray off the proper course, instruments mounted on the dashboard of the machine immediately warn him of the fact, and even tell him whether he must turn right or left to get back again.

All this being so, it is not surprising, now that television is making such rapid strides, to find that it is being brought in to help wireless in the navigation game. At sea, for instance, it is necessary to know the morse code in order to take full advantage of radio direction finding. One must be able to identify the particular beacon station on which one is taking bearings, and also to recognise the signals which indicate the different points of the compass.

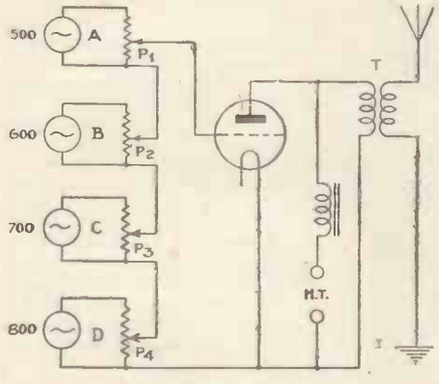


Fig. 1.—Semi-television transmitter

Now many navigating officers, particularly on the smaller vessels, are not sufficiently expert in morse to be able to tackle a job of this sort with that degree of confidence which is essential when the safety of the ship is at stake.

In such cases it would obviously be an advantage to be able to televise the picture of a compass card—or sufficient of it to indicate the ship's bearings—so that the navigator sees the required information thrown on a screen directly before his eyes.

Going a little further on the same lines a scheme has recently been worked out for transmitting a picture of the landing-ground to an aeroplane in flight, so that at times when ordinary visibility is wiped out, say at night or in thick fog, the pilot is able to land safely without crashing into unexpected obstacles, simply by keeping his eyes on a television screen fixed on the dashboard, where he sees not only a picture of the aerodrome, but also an image of his own craft flying above it.

But apparatus of this kind is both complicated and expensive and is scarcely feasible from the commercial point of view—at least until the time when television receivers have been reduced to a mass-production job.

And so we arrive at the new scheme for "visible" signalling, which is actually a combination of ordinary radio with a simplified form of television receiver. The signals are sent out as simple modulations on a carrier-wave, but are received in visible form on a cathode-ray tube.

One special advantage is that no synchronising apparatus is required. In spite of this the system can be used to convey quite a lot of valuable information. It will tell the pilot of an aeroplane, whilst still in the air, (*a*) the direction of the prevailing wind, (*b*) its force, (*c*) conditions of visibility at the aerodrome, (*d*) the height of the "ceiling" of cloud, and (*e*) temperature.

The radiated carrier wave is modulated with from one to four different frequencies, at amplitudes which may vary from zero to full strength, according to the particular information to be transmitted.

On the dashboard of the aeroplane is a cathode-ray tube fitted with an indicator dial showing the various markings required.

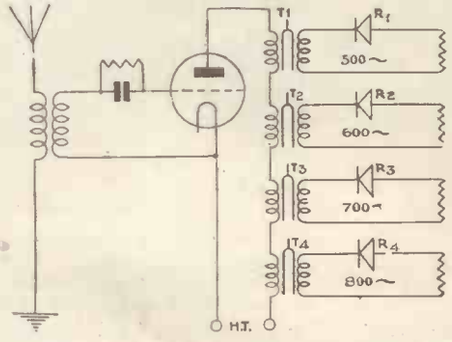


Fig. 2.—Receiver circuits arranged with tuning-fork selectors

Under the influence of the received signal-waves, the electron stream in the cathode-ray tube is rotated over the dial until it comes to rest at a certain point which shows the pilot in visible form the exact message which has been transmitted to him.

Fig. 1 shows the transmitter. The circuits marked A to D supply modulating notes to the carrier wave before it is radiated from the aerial. The amplitude of each modulating frequency is regulated by the potentiometers P_1 to P_4, some of which may be automatically controlled, say by a local wind-vane or anemometer, whilst others are controlled by hand.

Fig. 2 shows the receiving circuits. It will be seen that the different note frequencies are separated out by tuning-fork resonators, T_1 to T_4, so as to keep the tuning simple, and are then rectified at R_1 to R_4.

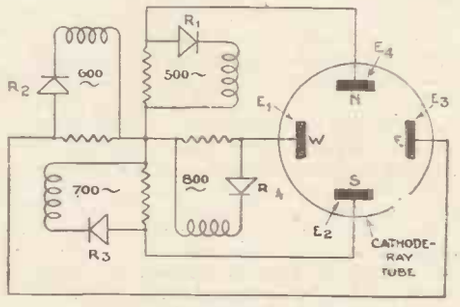


Fig. 3.—Cathode-ray receiver

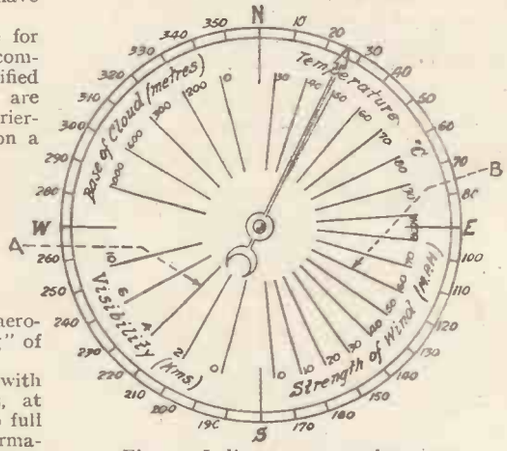


Fig. 4.—Indicator screen and compass

Fig. 3 shows how the various frequencies from the circuits R_1 to R_4 in Fig. 2 are applied to the deflecting electrodes E_1 to E_4 of a cathode-ray tube so as to rotate the electron stream until it points, say, to North, South, East or West, and in addition indicates a particular message marked on the fluorescent screen, shown in Fig. 4.

By varying the coupling at T (Fig. 1), the spot of light on the fluorescent screen is vibrated into a line of light which points, say, to N.N.E. on the compass.

A subsequent signal focuses the spot at a point A to show the degree of visibility, whilst a third signal brings it to a point B, which indicates the strength of the wind.

Other information can, of course, be transmitted in the same way.

The Truth About the Short Waves

By ALAN HUNTER

DON'T imagine for a moment that this is a "thrill" article. Nor is it exactly what the Americans would so expressively term a "de-bunking." Some people talk of the thrill of the short waves, others of the absolute futility of them. Neither extreme view is right. I want, therefore, to tell you the truth about the short waves.

Perhaps the reason I am writing this article—of all the people who might have been approached—is due to the fact that I am not a real short-wave "fan." I have no extreme views about short waves, but I realise what an important part they play in radio communication to-day.

Wrong Assumptions

Very frequently you see exhortations to try the short waves if you are jaded with medium- and long-wave reception. Such advice seems to me to betray a completely wrong assumption; that because you have been interested in twiddling a knob to tune-in ordinary broadcasting, you will, *a priori*, as the lawyers would say, be fascinated with the short waves.

Yet the truth is that an entirely different psychology applies to the short waves and all their peculiar workings. Many a broadcast listener—in fact, it is not too much to suggest the majority—would draw a complete "blank" on the short waves.

Literally, it is another ether world on short waves. A strange etheric world of wave reflections, deflections and absorptions, of skip distances, of transmission and reception vagaries galore.

Coming innocently into such a sphere of radio activity, the broadcast listener might well be bewildered. The danger is that, before this necessary first stage is over, he will turn against the short waves as being—well, futile.

A Bad Name!

It is this sort of listener—the erstwhile jaded broadcast listener plunging down below 100 metres—who gives the short waves such a bad name.

As for the red-hot fans at the other end of the scale, telling tales of wondrous feats of world-girdling reception, who cares for their panegyrics? Their paeans fall on deaf ears—or frankly disbelieving ears.

If you, dear reader, care to think calmly about the short waves, you will very soon come to the conclusion—whether you listen on them or not—that the feats performed on them are not all—er—boloney. You will realise that business men in America do not telephone across the Atlantic to this country through the medium of a myth—they do actually make everyday use of the very tangible short waves.

Similarly, when the President of the United States, or the Boswell Sisters, or the students of Harvard, are heard by listeners on this side through a B.B.C. relay, the short waves have again done something tangible. What is most important to remember is that these short waves have enabled communication by radio telephone to be established under conditions that would very probably have been utterly impossible on any other wavelengths.

In other words, the present immense networks of radio telephones now spanning oceans and continents are entirely due to the unique advantages of the short waves.

Perhaps all this is a little beside the point. What we have to decide, I mean, is how far this admitted superiority of the short waves can be capitalised by the ordinary station-hunting listener.

That brings us right down to brass tacks—to the milk in the cocoanut. Just what can the amateur hear on short waves that he cannot equally well hear on the ordinary wavebands?

To answer that question would take a whole article in itself. Experts better qualified in this particular branch of radio will tell you all that later. My job is to show you that there is something in these short waves—though not necessarily what you may have thought.

Let me put it another way. If the ordinary listener were to fix a short-wave adaptor or converter to his existing set, and tuned the unit at random—both in wavelength and time of day or night—the chances of hearing a good programme of music are extremely remote.

A lot of morse-code signalling would be heard. Perhaps a certain amount of "scrambled" one-sided conversation. Maybe an odd amateur on the Continent. But nothing to justify all the "thrill" articles that have been written about the short waves.

If, on the other hand, an ordinary broadcast listener really would like to extend his range of reception activities, the short waves offer a tremendous field of exciting exploration. That's the word, I think, filling the bill—exploration. But just as intrepid explorers do not set out on their expeditions with no more equipment than they would take for a walk in the park, so the broadcast listener must not plunge into short waves without taking stock of special needs.

Don't think, though, that the short waves entail a great deal of specialised knowledge, or that success on them comes only to those who can afford expensive equipment. Some of the most spectacular feats of short-wave work have been done with "junk-box" sets—one-valvers that would be despised by most broadcast listeners.

Wide World photo

Short-wave transmission to and from an aeroplane on the roof of the N.B.C. building in New York

These junk-box experimenters make contact with all parts of the world—in itself an exciting experience, surely?—because they observe the simple rules of the short waves.

They don't expect to hear anything if they idly twiddle the tuning condenser with one grand swish from top to bottom of the scale. They know that if they sweep through millions of cycles of frequency in this way they will locate precisely nothing.

Furthermore, they don't waste time searching a part of the waveband that is inoperative at that particular time of the day or night.

Careful Choice Necessary

In other words, the "fans" who perform such miracles on the short wavebands choose carefully their wavelength in relation to the time of the day or night. Having done that, they don their headphones and ever so slowly rotate the slow-motion dial of their short-wave condensers—keeping the set as lively as possible by adjusting reaction all the time so that the detector is working just below the oscillation point.

Applying this essentially short-wave technique to the set's operation, such amateurs daily and nightly overhear transmissions emanating from every corner of the globe—America, North and South, Japan, Australia, South Africa—there is no limit.

What they hear is not always high-class programme material, of course. Very often it is local backchat. But it is reasonable to ask whether a bit of backchat from the Antipodes is not sometimes more exciting than a dull programme from the local station.

At first the broadcast listener is appalled at the extraordinary variability of the short waves. After being spoon fed on medium-wavers that hardly ever fail to toe the line, he is apt to be put out by the total non-appearance or extreme faintness of a distant short-waver that only the night before was coming through with a roar.

Gradually, though, the very unexpectedness of the short waves adds piquancy to

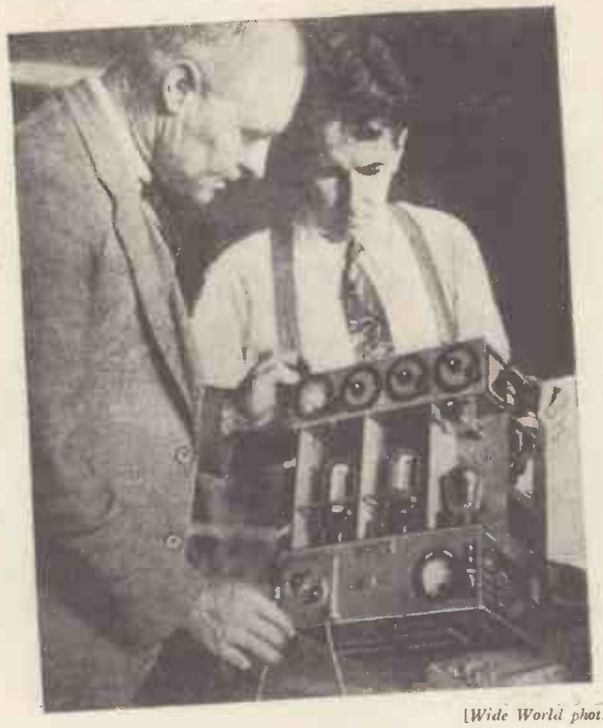
Continued on page 550

This special short-wave number of AMATEUR WIRELESS is no mere flash in the pan. From now on we shall regularly devote two or three pages each week to this fascinating subject. Watch "A.W."—it will lead the way in short-wave activities! And will not forget the needs of the "hams"!

Real-quality Series.—II.

The Output Stage

By NOEL BONAVIA-HUNT, M.A.



[Wide World photo

Combined transmitting and receiving gear for aeroplane use. Of course, long range and reliability are more important than real quality

AMATEUR: Last week we discussed the output valve and agreed that there was a fairly wide choice of valves for anyone who has no difficulty in generating high tension up to 250 volts. Shall we first consider the man who can only afford to purchase high-tension batteries with a maximum of 150 volts and 10 milliamperes?

PROFESSOR: By all means. Such a man has my sympathy and deserves all the attention we can give him. After all, why should he be debarred from real quality because of circumstances over which he has no control? The very least we can do is to see what we can do for him so as to provide him with some real pleasure in listening.

Demonstrating Battery Quality

You will remember that the set I have made up for demonstration of quality reproduction from batteries is intended to show what can be done for this particular class of listener, which numbers many thousands. Of course, it is not all of these that will prefer to make their own set, so that we can only cater for those who do.

AMATEUR: These people are to use a valve of the LP2 or PM2A type in the output stage are they not?

PROFESSOR: I am afraid there is no alternative with the standard dry battery to rely upon for supplying the required plate current. It is, however, quite extraordinary how well this kind of valve works in the circumstances.

AMATEUR: But it is capable of working a moving-coil loud-speaker?

PROFESSOR: Certainly it is. A good permanent-magnet moving-coil is all that is required. The question of loud-speakers must be discussed later. I want to have a talk this evening about the coupling of the output valve to the speech coil of the loud-speaker. This is what is called the "output stage" of the receiver.

AMATEUR: Is this an important stage? I mean, is it a critical one to design?

PROFESSOR: It is and it isn't. What I mean is that once the correct *method* of coupling is discovered the actual values are not as critical as some experts would lead us to suppose.

AMATEUR: I'm surprised to hear you say that. I should have thought that everything in a receiver is highly critical in regard to the values of each component selected to give a definite result.

PROFESSOR: This is not so. There are critical parts which demand meticulous care in their treatment and design, but there are other parts where a certain degree of latitude is admissible.

AMATEUR: This is good news, since components are not invariably precise in their values. However, let us get on with our main subject. What do we place in the anode circuit of the output valve?

PROFESSOR: A suitable type of low-frequency choke.

AMATEUR: I have often wondered why people never use a resistance. (*See Fig. 1.*) Resistances are placed in the anode circuit of the other valves, but never here. Why is this?

PROFESSOR: You must bear in mind that we have to deliver a considerable amount of energy into the loud-speaker. A resistance in the plate of the valve absorbs a lot of this energy and reduces the efficiency of this particular stage. The great advantage of the inductance coil is that it possesses both impedance and inductance, so that a high D.C. resistance is not necessary.

Far From Real Quality

But even if we had at our disposal unlimited volts and current so that we were able to apply 1,000 volts through a 100,000-ohm resistance to the plate of our output valve we should find that we were as far as ever from the attainment of real quality.

AMATEUR: Why?

PROFESSOR: Because we *must* have an inductance here. If we use a high value of resistance, we lose the higher frequencies, and if a low value, we lose the bass.

AMATEUR: Then how is that we don't get this dilemma in the case of pure resistance coupling in the earlier low-frequency stages?

Frequency Response

PROFESSOR: Because we are not bound to pass high current charges through the resistances. And even in these earlier stages we have found how difficult it is to produce the kind of frequency response curve we want for reduced volume levels if pure resistance coupling is employed.

AMATEUR: Well, this is the first time I have ever had explained to me why we have to choose a choke for the plate load of the output valve. I really have learnt something to-night.

PROFESSOR: Not of much value, since everyone uses choke coils in the last stage either in the form of a transformer primary or as part of the coupling between the output valve and the loud-speaker.

One way of looking at the question is this: if you try to pass 200 volts through a resistance

Continued on page 538

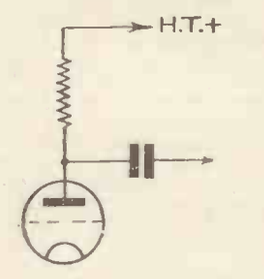


Fig. 1. Resistance-coupled output stage

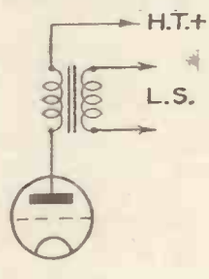


Fig. 2. Transformer-coupled output stage

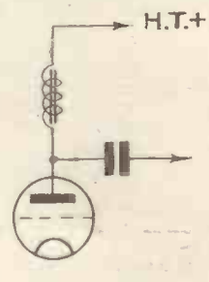


Fig. 3a. Choke-coupled output stage

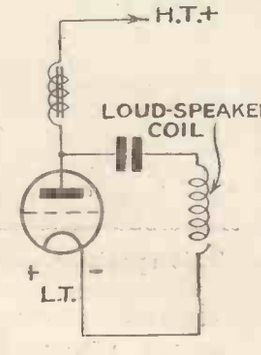


Fig. 3b. Choke-feed loud-speaker coupling

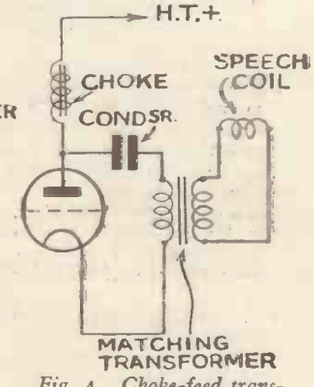


Fig. 4. Choke-feed transformer coupling

Twenty-four Hour Time

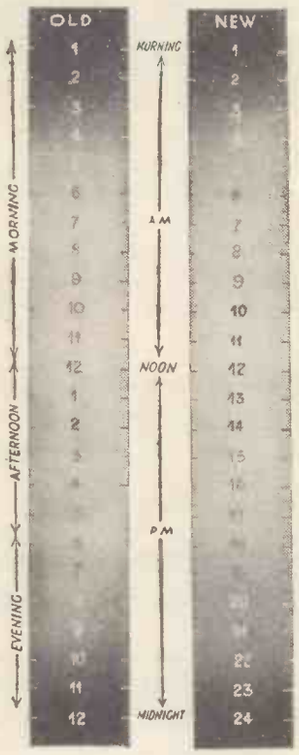
CAN you talk in 24-hour-clock language? If you are keen about short waves you had better study its grammar here and now, for all short-wave stations use this system.

First of all midnight, when written, is indicated by 2400 (*twenty-four hours*), the word *o'clock* disappearing altogether. There is, by the way, no such time as 0000 hours.

Midday is written 1200. Notice that it is 1200, not 12.00. No dots necessary.

The hour from noon until one o'clock is the simplest to deal with; it is identical with the old arrangement except, when written, the dots are omitted; 1215, 1220, 1250, etc., are just the same up to 1259. A minute later it becomes thirteen hours and is written 1300.

In fact, there is nothing very difficult right on to midnight, once you have become used to the simple addition of twelve. If you have been accustomed to talking about 3.40 p.m. it is not difficult to say you now have it at 1540, even though you may feel you are back in Tudor days.



Dinner may have been at eight o'clock—no doubt in most homes it always will be—but a transmission beginning at 2000 (twenty hours) ought not to be difficult to grasp.

The awkward part is between midnight and midday. Nine minutes past midnight, for example, is written 0009 and spoken *oh, oh, oh, nine*. A quarter past twelve (midnight) is written 0015 and spoken of as *oh, oh, fifteen*. Quite simple if you remember that four figure-spaces must be indicated either by the cipher which you call *oh* and never *nought*, or by an actual numeral.

Just to make this clearer. Twelve-twenty (midnight) is 0020 (*oh, oh, twenty*). Half-past eight (breakfast-time) is 0830 (*oh, eight-thirty*). Eleven o'clock (coffee-time) is 1100 (eleven hours).

Of course, 0100 (one hour), being what is called technically *one of the clock ante meridiem*, and also being an hour when we are (or ought to be) asleep, hardly matters to us at all—unless we are such keen short-wave fans that we sit up listening all night! W.-W.

The Output Stage

Continued from page 536

to the plate of a LP2 valve, the resistance, in order to dissipate the required current, could not be more than the D.C. resistance of a low-frequency choke, which is usually from 300 to 600 ohms.

You can imagine the miserable result of using so low a pure resistance in this circuit. With the choke it doesn't matter, because, as I have already told you, we are helped out by the inductance.

AMATEUR: You have made the matter quite clear. The question now arises as to whether we should employ a transformer coupling or a choke and condenser coupling; or even employ both, namely a parallel-fed transformer.

Constant Inductance

PROFESSOR: Let us go through these various points. To begin with, there is no objection to transformer coupling provided the primary of the transformer is well designed. It should be capable of maintaining a constant inductance of 20 henries at the current in milliamperes passed through its winding, and its D.C. resistance should not be less than 300 ohms or more than 1,000 ohms.

AMATEUR: The actual resistance depends on the output valve used, doesn't it?

PROFESSOR: To a certain extent. With very large output valves, the resistance should be 1,000 ohms if you want a good bass response. This rule does NOT apply to output choke coils with their coupling condensers forming a tuned circuit. It only applies to transformer coupling where the coupling depends on the currents being induced through an iron core.

AMATEUR: What is the best type of transformer primary to use in connection with our LP2 or PM2A valve with 120 to 150 volts high tension?

PROFESSOR: A 300-ohm 20-henry winding, serves best for this valve, the current passed being about 8 milliamperes (*See Fig. 2*).

AMATEUR: Could we not substitute a choke and condenser? (*See Fig. 3a*).

PROFESSOR: And what after the condenser?

AMATEUR: Well, I suppose the loud-speaker coil would come next. (*See Fig. 3b*).

PROFESSOR: But this would necessitate our using a high-resistance speech coil. Otherwise we have no way of matching the valve to the loud-speaker.

AMATEUR: Is there any objection to a high-resistance coil?

PROFESSOR: None at all so long as there is plenty of current available. Personally I much prefer the high-resistance coil (1,000 turns) for heavy-duty work; but with so small an output current as 8 milliamperes, or for that matter, for any current dissipation below 25 milliamperes, it is better to have a low-resistance speech coil, since this does not require very much current. I am referring to alternating current in this case of course.

AMATEUR: Then we are committed to a matching transformer so as to couple the valve to the speech coil and secure the correct load.

PROFESSOR: That is so.

AMATEUR: What is the objection to employing a choke and condenser feed in the output circuit and making use of the transformer simply for the purpose of matching the impedances of valve and speech coil? (*See Fig. 4*).

PROFESSOR: The objection is that the inductance of the choke should be higher than the inductance of the transformer primary to secure the best results from this system of coupling. This is awkward, because we don't want a very high resistance in the anode circuit.

AMATEUR: But there is the question of long loud-speaker leads. If the transformer is placed in the set near the output valve, I cannot see that it matters about the length of the leads, but most permanent-magnet loud-speakers have their matching transformers attached to the magnet, like a mother carrying her baby. . . .

PROFESSOR: I don't know why you should think it necessary to favour me with such an obvious simile. I fancy I have a fairly intimate acquaintance with the arrangement you describe with such superfluous lucidity.

In fact, since you tempt me in this particular direction, I find myself able to improve on your simile, by referring to the native woman who carries her baby in a basket strapped to her back.

However, we are discussing transformers, not babies.

Using Long Leads

AMATEUR: I know. Now to continue what I was saying, if the transformer is strapped to the loud-speaker we shall be compelled to employ long leads with high tension flowing through them, unless the loud-speaker is placed quite close to the set.

PROFESSOR: It is best to take the transformer off the loud-speaker, and to place in the set. But you must first make sure that the transformer is worth using; very often it isn't. It is much safer to use one specially designed, and thus insure satisfaction.

Also, I am opposed to the loud-speaker being placed too near to the amplifier, and it should never be placed in the same cabinet as the receiver.

AMATEUR: But my wife objects to the idea of multiplying cabinets in the room.

PROFESSOR: In that case, you must either give way to her and take the risk of losing the real-quality reproduction you are striving to obtain, or else you must try and get her to see your side of the question. Much can be done with tact, you know.

AMATEUR: Well, perhaps I can persuade her to accept a separate cabinet for the loud-speaker, with an artistic grille. . . .

PROFESSOR: But you ought not to have a cabinet at all. You want a baffle board.

AMATEUR: Great Scott! Now the fat will be in the fire

PROFESSOR: The baffle front need not be more than 2 feet square, and it is easily possible to arrange for hinged panels at each side, so that the area of the baffle can be increased if desired. . . .

AMATEUR: You mean, when she's out of the room?

PROFESSOR: My dear sir, I really must leave you to manage your own little domestic problems. This is a discussion on wireless topics, not on the question of how to be happy though married.

AMATEUR: I fear it is sometimes rather difficult to dissociate the two.

PROFESSOR: Cheer up! Women are not so bad as all that. What they don't like is the way we men mess up their furniture schemes and have nothing decent to show them in the way of sweet sounds.

That "Best" Make

AMATEUR: What is the best make of output transformer?

PROFESSOR: Now it's *my* turn to be tactful. I have found that a transformer normally used for heating A.C. valve filaments works extraordinarily well.

AMATEUR: But what about the ratio of primary to secondary turns? The LP2 valve has an impedance of approximately 4,000 ohms, while, if the resistance of the speech coil is, say, 15 ohms, we have to find the correct ratio for matching the one to the other.

PROFESSOR: I have investigated this matter very carefully, and I find that this impedance matching is far less critical than is generally supposed. The usual rule followed is to take the optimum load in ohms (which you will get from the valve makers) and to divide the

Continued on page 556

On Your Wavelength

By Thermion

Tophole Programmes

NOT even the most confirmed grouser, I am sure, could have had a grievance about those two splendid items, "Scrap Book for 1914" and the Royal Command Variety Show—though, of course, a real dyed-in-the-wool grumbler might have felt justly grieved that he had nothing to grumble about!

Have you ever heard a better programme item than the "Scrap Book for 1914"? I am quite sure that I never have. The whole thing was perfectly designed and perfectly produced. And what an inspiration it was to get Lady Oxford to give us those first-hand reminiscences of hers.

It was a pity that one of those "slight technical defects" held up the London National transmission for a while during the Command Variety broadcast, but I expect that most listeners were fly enough to flick over quickly to the Midland.

What a show it was: if only all variety programmes could be even a little like that!

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Motor-car "Static"

WHETHER or not motor-car radio will ever be as popular here as it is, just now, in the U.S.A. is a moot point. I see, however, that there is already a movement on foot to persuade American makers to fit static-silencers to all cars—even where they are not intended to carry receiving sets.

One reason given is the growing popularity among listeners generally of the ultra-short waveband, where interference from a passing car can be quite troublesome.

Another point is that 7-metre waves are also coming into use for mobile police work, as well as for navigating aircraft in the vicinity of aerodromes, and in both cases it is important that such signal traffic should be free from "static" interference.

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Some Set!

FOR the past week or two I have been using something rather marvellous in the way of receiving sets—an eleven-valver, if you please. There is a delightful Rolls-Royce feeling about using a set of this kind which has such lashings of power in hand to meet all occasions. Of course, it has S.A.V.C. and if S.A.V.C. is to be really effective when fading is fairly severe, you must have an ample reserve of amplification.

This Philco set has more than S.A.V.C. It is fitted with Q.S.A.V.C., which means that as you are passing from one station to another you have complete silence in between; the Q stands for quiescent. It has also an uncanny but very effective form of shadow tuning. The shadow is fat when you are off tune, but undergoes slimming as you approach resonance and is quite thin when you are on the spot.

All Waves, Too

ONE of the delights of this set is that it covers all wavelengths from 13 to a bit over 550 metres and it is simplicity itself to operate. The wave-change switch has five positions, so that you can pass instantly from, say, 20 metres to 450. Each range has its own specially calibrated tuning scale and only the scale in use is lit up.

The tuning on all wavelengths is equally easy, for it is all done by the same single knob.

My hat! What a revelation a set like this is after the old straight type of short-waver with its many knobs and the hairs-breadth adjustment it needed of both tuning and reaction condensers.

It is a wonderful experience to use on the short waves a fat superhet with Q.S.A.V.C. Until you do so, you don't fully realise how good and how easy short-wave reception can be.

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Our Funny Wireless Terms

MOST heartily do I agree with the Clapton correspondent who calls attention to the misleading nature of many of our wireless and general engineering terms. He mentions a few, but there are heaps more. A condenser, for instance, doesn't condense any more than an accumulator accumulates.

And talking about that micro- prefix, I suppose that a micrometer is the millionth of a meter!

Why do we speak of a high-tension battery, though we always use the terms "pressure" or "voltage," and never tension when thinking in volts?

And then that word "plate." Not much resemblance, is there, between the plate of a valve, the plate of a condenser, and the plate of a filament battery?

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Which Switch is Which?

WHY, I wonder, is it so fashionable nowadays to give no indication of what the various switch knobs on the receiving set do? It is really rather a nuisance, for you never quite know where you are when twiddling a new receiver unless you have got the book of the words by you.

And talking of switches, "Disgruntled," who got his complaint off his chest in last week's "A.W.," is absolutely right in one way: we do want much better switches in our wireless sets. Ask any service man, and you will find that more than half the trouble that occurs in receivers is due to faulty switches.

I cannot, though, understand why "Disgruntled" finds such a big voltage drop across his filament switch. He complains that he loses from .3 to .4 volt in a set requiring 1 ampere. I have made lots of battery sets with a similar low-tension current drain, and I have never been bothered by loss of volts in the switch. I think that if he tries good-quality toggle switches his troubles will be at an end.

H.M.V. photo

A Customs official makes certain that nothing is smuggled inside the portable set!

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Set Guarantee Question

LAST week I mentioned that the guarantees accompanying receiving sets were not always very satisfactory, for even though you get free replacement of defective parts, you may run up a whacker of a bill for extracting the old ones and putting in the new. Since then I have made further inquiries, with interesting results.

Most manufacturers undertake to supply new parts in place of defective ones within the guaranteed period, but they look to the local retailer to carry out any necessary adjustments. They make a *labour charge* for work done by themselves, because if they didn't, local dealers might shoot back to them every set that developed a defect, no matter how trifling.

You can see the point of this. The thing I grouse about is that the labour charges are apt to be too high. It seems to me that there should be one definite price, whatever the job. Why not state in the guarantee that if the set is returned to the makers on account of a defective component the entire job of replacing it will be carried out for an inclusive charge of 7s. 6d. or, perhaps, 10s.?

A guarantee on those lines would lead to good business, for the customer would know exactly where he stood.

G.E.C. photo

Photoelectric cells foil the smash-and-grab raider by actuating a steel shutter

Retailers AND Retailers

THE root of the trouble is really that where some retailers are jolly good and give really excellent service when required, others, of the "dabbler" kind, know little about the innards of wireless sets and cannot tackle quite simple repair jobs.

When one of the latter kind is called in to look over a set which isn't up to the mark he may fail to find a perfectly straightforward defect—I have known many cases of this—

Marconiphone photo

Reception is so good that these listeners don't mind sitting on the floor!

and insist upon the set's being sent back to the makers.

If you buy your set from a knowledgeable dealer your service guarantee means a lot; if your dealer makes merely a side-line of wireless his servicing probably won't be up to much, and the word "free" may be misleading.

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Interference Committee

WHAT is the Committee on Electrical Interference doing during the sittings which are at present taking place? I confess that I don't feel quite happy about its attitude towards man-made interference. Certain signs seem to show that it is devoting more consideration to interference-stopping devices for fitting to receiving sets than to the suppression of interference at its source.

This is exactly what I thought would happen when our Government delayed so long the taking of any steps to prevent electrical interference. The longer you put it off, the more thousands of pounds there are invested in domestic and commercial machinery of the radiating type. Then when you try to do something there is a howl from interested parties who say with one voice: "Oh, it would be a frightful hardship to make us scrap some of our machinery and fit the rest with anti-radiating devices. Just think what it would cost."

So, instead of tackling the trouble at its roots, it is quite possible that we shall have regulations which will mean that it is the wireless user who has to spend the money, and not the man who causes all the trouble.

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Car Radio is Jolly

HAVE you ever travelled in a car fitted with wireless? I have often taken a portable set with me on long drives and had it working for a good part of the time on the back seat.

The other day I made acquaintance for the first time with an up-to-date wireless set designed specially for cars. I was driving in a friend's car and as we bowled along I noticed him flick over a switch. Nothing happened for some seconds (valves warming up). Then the car was filled with really excellent reproduction of the local programme. I was so taken with car wireless that I went straight away and ordered a similar set.

It is the jolliest thing you can imagine on a lonely drive and, as my friend pointed out, it has another unsuspected advantage.

"My wife," he said, "is one of the nervous sort who keeps on saying 'Look out,' or 'Not so fast.' When I switch on the wireless, she stops talking."

Quiescent self-adjusting volume control for the human loud-speaker, what?

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Short Waves on the Long

IN a recent issue a Tunstall listener raises an interesting problem. He had been listening to the long-wave Daventry station and after the close of the evening programme he was surprised to hear faintly the voice of an announcer giving out two different short wavelengths—those of the Empire transmitter. He wonders whether the National aerial was picking up signals from the neighbouring short-wave transmitters.

I don't think it was that. What probably happened was something that does sometimes occur. Owing to induction effects between the lines from the various studios, impulses intended for one transmitter are occasionally picked up faintly by another.

Daventry's carrier was still "on" at the time, and what this correspondent heard was a land-line pick-up from the Empire studio.

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The Old Set Problem

ONE of the little worries about buying a new wireless set is that there is no fixed standard of value for the old one that you want to hand over in part exchange. Those who have the bargaining spirit sometimes visit a variety of wireless shops to see which of them will make the best offer.

It is not at all satisfactory from either the buyer's point of view or the dealer's. With old cars you do more or less know where you are, for the trade-association publishes each month a list of secondhand values, and the man to whom you go refers to this before making his offer.

Something of the same kind is badly needed in wireless circles and, it is to be hoped that the Radio Manufacturers' Association will take the initiative before long.

Now that good sets have reached such a high standard as regards selectivity, sensitiveness and quality, present-day models should not be utterly out of date for some years, and the secondhand market may be a big one.

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Moravska Says It with Anvils

CZECHOSLOVAKIA, I hear, is shortly to inaugurate a new series of interval signals that will put Bow Bells and pretty well everything else right into the shade. Prague, as you may have discovered, has already adopted a twiddly bit played on the harp and all the others are doing their best to go one better.

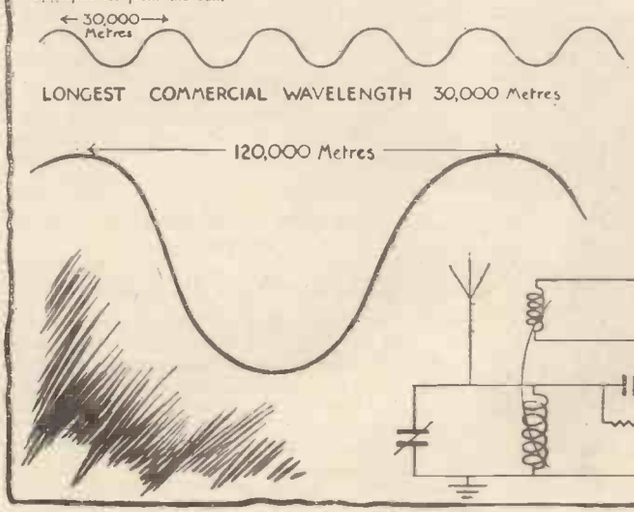
Bratislava will shortly treat us to an air whose name looks like a cross between a sneeze and a cough. This will be played on a glockenspiel—one of those multi-tube things that the bandmaster or some other chappy whacks with a hammer.

Kosice is going to treat us to a little tune played on a flute, but Moravska-Ostrava gets my vote. Its interval signal is to be the melody of a Czechoslovakian song played on—tuned *anvils*!

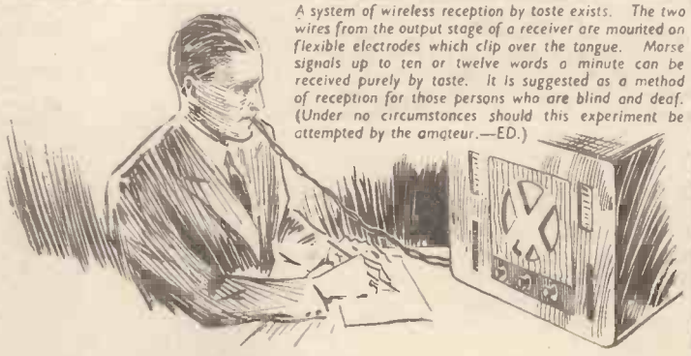
I am waiting to hear that one of the American stations is to adopt "Hail Columbia" played on thumped tubs!

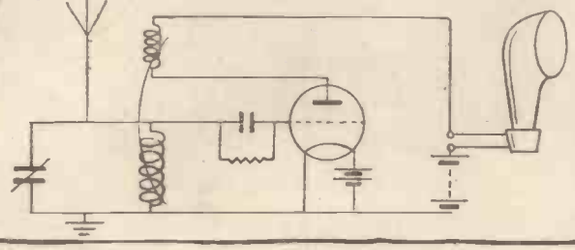
Would You Believe It? . . . . . Asks G. H. DALY

Marconi once built a set which would tune from 80,000 to 120,000 metres. With this set he heard the mysterious "S" signals which were thought to come from beyond the earth. Many papers published headlines with the query, "Do the messages come from Mars?" Most probably they were atmospherics from the sun.



A system of wireless reception by taste exists. The two wires from the output stage of a receiver are mounted on flexible electrodes which clip over the tongue. Morse signals up to ten or twelve words a minute can be received purely by taste. It is suggested as a method of reception for those persons who are blind and deaf. (Under no circumstances should this experiment be attempted by the amateur.—ED.)





Any receiver which embodies reaction is a potential transmitter. When reaction is used the valve becomes a generator of oscillations, which in turn energise the aerial and set up weak wireless waves. In the old type of set where a horn type of loud-speaker was used, anyone shouting into the loud-speaker would cause weak speech to be radiated. The use of reaction in this way is against the law unless a transmitting licence is first obtained.

The Lure of the Short Waves

By J. GODCHAUX ABRAHAMS

In this article our special contributor, who is an acknowledged expert in broadcast reception on all wavelengths, makes out a good case for the short waves. He shows how world-wide reception of signals free from atmospherics and other interference can be obtained on quite inexpensive apparatus —and without specialised knowledge or tricky operation. Short waves, with their boundless possibilities of future development, most certainly offer a unique lure—a lure to which more and more ordinary broadcast listeners are likely to succumb in the near future

Wide World photo

Short-wave station being operated by members of the German-Austrian Alpine Club. The transmitter keeps in touch with search parties

CAN you still recall the thrill experienced when you first heard a broadcast transmission? Wireless entertainments in this country date back only some ten years or so, and yet to-day, due to progress and development, listening to entertainments from most of the European capitals has become a daily and matter-of-fact occurrence.

Hardened to Reception

The possession of a radio receiver may afford pleasure, but it no longer supplies the thrill of the early days. We are accustomed to tuning-in to stations some hundreds of miles away and the mere fact that on a favourable night or in the early morning we succeed in capturing on the medium waves a broadcast from a studio on the other side of the Atlantic Ocean, does little to tickle our jaded palate.

Moreover, on such occasions it is not infrequent that atmospherics and kindred electrical disturbances render the reception both difficult and fitful. Generally speaking, there is no *certainty* in these captures; they are merely lucky dips in the ether.

Wide World photo

An American portable short-wave transmitter and receiver which weighs only 14 lb. The equipment is used for reporting forest fires.

It is in these circumstances that the short waves score every time, and the owner of apparatus capable of tuning to the higher frequencies or channels below, say, 50 metres, may confidently expect to pull in transmissions at better volume, with more regularity and subject to less interference than when working with a broadcast set.

Moreover, in view of the continually increasing energy of the short-wave experimental transmitters and the fact that many countries have now installed powerful stations for the relay of their main programmes, the need of expensive multi-valve sets is no longer a necessity; the possessor of a properly constructed two- or three-valve set has the world at his elbow.

Even the modest one-valver will permit its owner to listen on headphones to signals from most quarters of the globe.

We are exploiting a new field which, in the near future—as it does to some extent already —will offer boundless possibilities. Curiously enough, the mere mention of short waves arouses in the minds of some people a vista of difficulties, such as expensive components, skilled construction and, when the set is completed, tricky handling and laborious tuning.

This is a fallacy, as any short-wave fan can clearly demonstrate. Providing some little care is taken, the making of a short-wave set is an easy matter, and if judgment is used in regard to the choice of wavelengths and times of transmission, even the tyro will not fail to log some broadcasts at his first attempt.

The capture of a musical item from Canada or the United States, speech from some studio in a Central or South American city, added to the innumerable calls and conversations emanating from amateur stations and others, combined with the fact that, if conditions are only passable, the noisy background is conspicuous by its absence, soon arouses the enthusiasm of the listener.

Wide World photo

Portable short-wave apparatus being used in America for a running commentary of a golf championship match

The short-wave set allows you to pick up programmes which are not available to listeners on the broadcast band.

In radio generally it is the unexpected which pleases, and it is not necessarily the man who works with the multi-valve super-het who is able to show the biggest log. On short waves, in particular, distance is no object; the ether is full of signals and a short sitting on most days or nights will furnish interesting items.

You will soon get to feel the lure of the short waves; it is one that never palls!

Who's Who on

The Television Committee

COMPOSED exclusively of chiefs of the Post Office and the B.B.C., with an ex-Postmaster General as chairman, the television committee has now been formed.

It will, in the terms of reference of the Postmaster General, "consider the development of television and advise the Postmaster General on the relative merits of the several systems, and on the conditions under which any public service should be provided."

The chairman is Lord Selsdon, who, as Sir William Mitchell Thomson, Postmaster General from 1924 to 1929, was intimately connected with the beginnings of broadcasting in this country.

The committee consists of the following:—

Sir John Cadman, the oil magnate, vice-chairman.

Vice Admiral Sir Charles Carpendale, Controller of the B.B.C.

Col. A. S. Angwin, assistant engineer in chief of the Post Office.

Noel Ashbridge, chief engineer of the B.B.C.

O. F. Brown, of the Department of Scientific and Industrial Research.

F. W. Phillips, assistant secretary of the Post Office.

All these representatives of science and industry are men of action—so an early decision is quite likely.

The World's Short-wave Stations

An Up-to-the-minute List Specially Compiled by J. GODCHAUX ABRAHAMS

Call Sign	*Station*	*Metres*
CJRO	Winnipeg (Canada)	48.75
CJRX	Winnipeg (Canada)	25.58
CNR	Rabat (Morocco)	23.39
COC	Havana (Cuba)	49.92
CP4	La Paz (Bolivia)	19.61
CP5	La Paz (Bolivia)	32.8
CT1AA	Lisbon (Portugal)	31.25
CT1CT	Lisbon (Portugal)	24.53
CT3AQ	Funchal (Madeira)	26.83
DJA	Zeesen (Germany)	31.38
DJB	Zeesen (Germany)	19.73
DJC	Zeesen (Germany)	49.83
DJD	Zeesen (Germany)	25.51
EA4AQ	Madrid (Spain)	43
EA8AB	Tenerife (Las Palmas, Canary Isles)	41.6
EAJ25	Barcelona (Spain)	50
EAQ	Madrid (Spain)	30
FYA	Pontoise, Paris (France)	19.68 / 25.2 / 25.63
GSA	Daventry (Great Britain)	49.59
GSB	Daventry (Great Britain)	31.55
GSC	Daventry (Great Britain)	31.3
GSD	Daventry (Great Britain)	25.53
GSE	Daventry (Great Britain)	25.28
GSF	Daventry (Great Britain)	19.82
GSG	Daventry (Great Britain)	16.86
GSH	Daventry (Great Britain)	13.97
HBL	Prangins (Switzerland)	31.26
HBP	Prangins (Switzerland)	38.47
HC2RL	Guayaquil (Ecuador)	45.02
HCJB	Quito (Ecuador)	73
HIX	Santo Domingo (Dominican Republic)	50.42
HI1A	Santo Domingo (Dominican Republic)	47.8
HIZ	Santo Domingo (Dominican Republic)	47.5
HJ1ABB	Barranquilla (Colombia)	46.53
HJ4ABB	Manizales (Colombia)	41.9
HJ3ARD	Bogota (Colombia)	40.5
HJ4ABE	Medellin (Colombia)	50.6
HVJ	Vatican City (Italy)	19.84 / 50.26
I2RO	Rome (Italy)	25.4
JIAA	Tokio (Japan)	30.4
LCL	Jeloy (Norway)	42.92
LSX	Buenos Aires (Argentine Republic)	28.98
OER2	Vienna (Austria)	49.4
ORK	Ruysselede (Belgium)	29.04
OXY	Skamlebaek (Denmark)	49.5
PHI	Huizen (Holland)	16.88
PRA3	Rio de Janeiro (Brazil)	36.65
PRADO	Riobamba (Ecuador)	45.31
RNE	Moscow (U.S.S.R.)	25
RV15	Khabarovsk (U.S.S.R.)	70.2
RV59	Moscow (U.S.S.R.)	50
VE9BJ	St. John, New Brunswick (Canada)	49.26
VE9CS	Vancouver (British Columbia)	49.43
VE9DR	Drummondville (Canada)	49.96
VE9GW	Bowmanville (Canada)	49.22
VE9HX	Halifax (Nova Scotia)	49.1
VE9JR	Winnipeg (Canada)	25.6
VK2ME	Sydney (Australia)	31.28
VE3ME	Melbourne (Australia)	31.55
VQ7LO	Nairobi (Kenya Colony)	49.5
VUC	Calcutta (British India)	49.1
W1XAL	Boston (U.S.A.)	19.67 / 25.45
W1XAZ	Boston (U.S.A.)	31.35
W2XAD	Schenectady (U.S.A.)	19.56
W2XAF	Schenectady (U.S.A.)	31.48
W2XE	Wayne, New Jersey—(U.S.A.)	25.34 / 49.02
W3XAL	Boundbrook, New Jersey (U.S.A.)	16.87 / 49.18
W3XAU	Philadelphia (U.S.A.)	49.5
W8XAL	Cincinnati (U.S.A.)	49.5
W8XK	East Pittsburgh (U.S.A.)	13.93 / 19.72 / 25.27 / 48.86
W9XAA	Chicago (U.S.A.)	49.34
W9XF	Chicago (U.S.A.)	49.18
XETE	Mexico City (Mexico)	31.23
YV1BC	Caracas (Venezuela)	49.08
YV3BC	Caracas (Venezuela)	48.78
YV5BMO	Maracaibo (Venezuela)	49.42
ZGE	Kuala Lumpur (Federal Malay States)	48.9
ZTJ	Johannesburg (South Africa)	49

Hour-by-hour Listening Guide

The times stated hereunder are given in B.S.T. and are based on the 24-hour system.

Metres	*Station*
0000—0100	
25.27	W8XK
25.45	W1XAL (Sun. and Mon.)
25.53	GSD
25.58	CJRX
25.6	VE9JR
26.83	CT3AQ (Wed. and Fri., closes 0030)
30	EAQ
31.3	GSC
31.38	DJA
31.48	W2XAF (opens 0045)
38.47	HBP (Sun.)
48.75	CJRO
48.86	W8XK
49.02	W2XE
49.1	VE9HX
49.18	W9XF (ex. Sat.) W3XAL (Sun.)
49.22	VE9GW
49.26	VE9BJ
49.34	W9XAA (ex. Tues., Thur., and Sat.)
49.5	W8XAL
49.96	VE9DR
0100—0200	
25.27	W8XK
25.45	W1XAL (Sun.; closes 0130 Mon.)
25.53	GSD
25.58	CJRX
25.6	VE9JR
28.98	LSX
30	EAQ (closes 0130)
31.3	GSC
31.38	DJA
31.48	W2XAF
36.65	PRA3 (closes 0130)
38.47	HBP (closes 0115 Sun.)
47.8	HI1A
48.75	CJRO
48.86	W8XK
49.02	W2XE
49.1	VE9HX
49.18	W3XAL (Sun.)
49.22	VE9GW
49.26	VE9BJ (closes 0130)
49.34	W9XAA (ex. Tues., Thur., and Sat.)
49.43	VE9CS
49.5	W8XAL
49.5	W3XAU
49.96	VE9DR
0200—0300	
25.27	W8XK
25.45	W1XAL (Sun.)
25.58	CJRX
25.6	VE9JR
31.48	W2XAF
31.55	YV3BC (opens 0230)
40.5	HJ3ABD
48.75	CJRO
48.86	W8XK
49.02	W2XE
49.1	VE9HX
49.18	W9XF (ex. Sun.) W3XAL (Sun.)
49.22	VE9GW
49.3	W9XAA (Wed., Fri., and Sun.)
49.43	VE9CS
49.5	W8XAL W3XAU
49.96	VE9DR
0300—0400	
25.45	W1XAL (Sun.)
25.51	DJD
25.58	CJRX
25.6	VE9JR
31.48	W2XAF
45.02	HC2RL (Tues.)
48.86	W8XK
49.02	W2XE
49.1	VE9HX
49.18	W9XF (ex. Sun.) W3XAL (Sun.)
49.22	VE9GW
49.3	W9XAA (Wed., Fri., and Sun.)
49.5	W8XAL W3XAU
49.58	CJRO
49.83	DJC
49.96	VE9DR
0400—0500	
25.51	DJD
25.58	CJRX
45.02	HC2RL (Tues.)
47.5	HIZ (Sun.)
48.75	CJRO
48.86	W8XK
49.18	W9XF (ex. Sun.) W3XAL (Sun.)
49.22	VE9GW
49.3	W9XAA (Wed. Fri., and Sun.)
49.5	W8XAL and W3XAU
49.83	DJC
49.96	VE9DR (closes 0415)
0500—0600	
25	RNE (Sun.)
25.51	DJD (closes 0530)
45.02	HC2RL (Tues.)
47.5	HIZ (Sun.)
48.86	W8XK (closes 0530)
49	ZTJ (opens 0545, ex. Sun.)
49.18	W9XF (ex. Sun.)
49.5	W8XAL W3XAU
49.83	DJC (closes 0530)
0600—0700	
19.73	DJB (opens 0635)
25.53	GSD (opens 0615)
31.55	GSB (opens 0615)
49	ZTJ (closes 0630, ex. Sun.)
49.18	W9XF (ex. Sun.)
49.5	W8XAL (closes 0630)
0700—0800	
19.73	DJB
24.53	CT1CT (Fri.)
25.53	GSD
31.28	VK2ME
31.55	GSB
0800—0900	
24.53	CT1CT (Fri.)
25.53	GSD (closes 0815)
31.28	VK2ME
31.55	GSB (closes 0815)
70.2	RV15
0900—1000	
49	ZTJ (opens 0930)
49.5	VQ7LO (Tues.)
70.2	RV15
1000—1100	
30.4	JIAA
49	ZTJ

Metres	Station
70.2	RV15
1100—1200 (midday)	
13.93	W8XK
13.97	GSH
19.84	HVJ (closes 1115)
30.4	J1AA
31.28	VK2ME
31.55	VK3ME (Wed. and Sat.)
49	ZTJ
50.26	HVJ (Sun.)
70.2	RV15
1200—1300	
13.93	W8XK
13.97	GSH
16.88	PHI
19.82	GSF
23.39	CNR (opens 1230 Sun.)
25	RNE (Sun.)
30.4	J1AA
31.28	VK2ME
31.35	W1XAZ
31.38	DJA (opens 1245)
31.55	VK2ME (Wed. and Sat.)
48.9	ZGE (Tues. and Fri.)
49	ZTJ (ex. Sun.)
49.5	W8XAL (opens 1230)
49.96	VE9DR (ex. Sun.; opens 1230)
50.26	HVJ (Sun.)
50.42	HIX (opens 1240 Sun.)
70.2	RV15
1300—1400	
13.93	W8XK
13.97	GSH (closes 1430)
16.88	PHI
19.68	FYA
19.82	GSF
23.39	CNR (Sun.; opens 1330)
31.28	VK2ME
31.38	DJA
47.8	HI1A (closes 1330)
48.78	YV3BC (opens 1330 Sun.)
48.9	ZGE (Tues., Fri., and Sun.)
49.5	W8XAL
49.96	VE9DR (ex. Sun.)
50.26	HVJ (closes 1330 Sun.)
50.42	HIX (Sun.)
70.2	RV15
1400—1500	
13.93	W8XK
16.87	W3XAL
16.88	PHI
19.61	CP4
19.68	FYA
19.82	GSF (opens 1445)
25.28	GSE (opens 1445)
25.6	VE9JR
31.28	VK2ME
31.38	DJA
48.78	YV3BC (Sun.)
48.9	ZGE (Tues. and Fri.; closes 1430)
48.9	ZGE (Sun.)
49	ZTJ (Sun.)
49.4	OER2 (Tues. and Thur.; opens 1430)
49.5	W8XAL
49.5	VQ7LO (Thur.)
49.96	VE9DR (ex. Sun.)
1500—1600	
13.93	W8XK
16.87	W3XAL
19.61	CP4
19.67	W1XAL (Sun.)
19.68	FYA
19.72	W8XK
19.82	GSF
25.28	GSE
25.58	CJRX (Sat. and Sun.)
25.6	VE9JR
31.28	VK2ME (opens 1530)
31.38	DJA (closes 1545)
48.75	CJRO (Sat. and Sun.)
48.78	YV3BC
49	ZTJ
49.1	VUC (Fri.; opens 1530)
49.4	OBER2 (Tues. and Thur.)
49.5	W8XAL
49.96	VE9DR (ex. Sun.)
1600—1700	
13.93	W8XK
16.87	W3XAL
19.63	W2XE
19.67	W1XAL (Sun.)
19.72	W8XK
19.82	GSF
25	RNE (Sun.)
25.28	GSE
25.4	I2RO
25.58	CJRX (Sat. and Sun.)
25.6	VE9JR
26.83	CT3AQ (Sun.)
31.28	VK2ME
48.75	CJRO (Sat. and Sun.)
48.78	YV3BC (ex. Sun.)
49	ZTJ (closes 1615 Sun.)
49.1	VUC (opens 1630, ex. Fri. and Sat.)
49.34	W9XAA (Sun.; opens 1630)
49.4	OER2 (Tues. and Thur.)
49.5	W8XAL (closes 1630)
49.96	VE9DR (ex. Sun.)
1700—1800	
13.93	W8XK
16.87	W3XAL
19.63	W3XE
19.67	W1XAL (Sun.)
19.72	W8XK
25.20	FYA
25.28	GSE
25.4	I2RO
25.58	CJRX (Sat. and Sun.)
25.6	VE9JR
26.83	CT3AQ (Sun.)
31.28	VK2ME (closes 1730)
31.28	W3XAU
31.55	GSB
47.8	HI1A (opens 1730)
48.75	CJRO (Sat. and Sun.)
48.78	YV3BC (ex. Sun.)
49	ZTJ (ex. Sun.)
49.1	VUC (ex. Fri. and Sat.)
49.34	W9XAA (Sun.)
49.4	OER2 (Tues. and Thur.)
49.5	VQ7LO
49.96	VE9DR
73	HCJB
1800—1900	
13.93	W8XK
16.87	W3XAL
19.72	W8XK
25.2	FYA
25.28	GSE (closes 1845)
25.4	I2RO
25.51	DJD (opens 1830)
25.58	CJRX (Sat. and Sun.)
25.6	VE9JR
29.04	ORK
31.28	W3XAU
31.55	GSB (closes 1845)
42.92	LCL
47.8	HI1A (closes 1830)
48.75	CJRO (Sat. and Sun.)
49	ZTJ (opens 1830 Sun.)
49.1	VUC (ex. Fri.; opens 1845 Sat.)
49.18	W9XF (Sun.)
49.34	W9XAA (Sun.)
49.4	OER2 (Tues. and Thur.)
49.5	VQ7LO
49.96	VE9DR
73	HCJB
1900—2000	
16.87	W3XAL
19.72	W8XK
25.20	FYA
25.4	I2RO (closes 1930)
25.51	DJD
25.53	GSD
25.6	VE9JR
30	EAQ (Sat.)
31.23	XETE (opens 1930)
31.28	W3XAU
31.55	GSB
42.92	LCL
49	ZTJ
49.1	VUC (Sat.)
49.18	W9XF (closes 1930 Sun.)
39.34	W9XAA (Sun.)
49.4	OER2 (Tues. and Thur.)
49.5	OXY
49.5	W8XAL (opens 1930)
49.5	VQ7LO
49.96	VE9DR
2000—2100	
19.72	W8XK
25.34	W2XE
25.51	DJD
25.53	GSD
25.6	VE9JR
30	EAQ (Sat.)
31.23	XETE
31.28	W3XAU
31.55	GSB
37.33	CNR (Sun.; opens 2030)
41.9	HJ4ABB (Sun.)
42.92	LCL
48.78	YV3BC (Sun.)
49	ZTJ (closes 2100 Sun.)
49.1	VUC (Sat.)
49.18	W9XF (ex. Sat.)
49.18	W3XAL (Sat.)
49.22	VE9GW
49.34	W9XAA (Sun.)
49.4	OER2 (Tues. and Thur.)
49.5	OXY
49.5	W8XAL
49.5	VQ7LO (Sat.)
49.96	VE9DR
50.26	HVJ (closes 2015)
2100—2200	
19.56	W2XAD (ex. Tues., Thur., and Sat.)
19.72	W8XK (closes 2115)
25.27	W8XK (opens 2130)
25.34	W3XE
25.51	DJD
25.53	GSD
25.6	VE9JR
25.63	FYA
28.98	LSX
31.23	XETE
31.25	CT1AA (Tues. and Fri; opens 2130)
31.28	W3XAU
31.55	GSB
37.33	CNR (Sun.)
41.6	EA8AB (Sat. and Sun.)
41.9	HJ4ABB (Sun.)
42.92	LCL
48.78	YV3BC
48.86	W8XK (opens 2130)
49	ZTJ (Sat.)
49.1	VE9HX
49.1	VUC (Sat.)
49.18	W9XF (opens 2130 Sun.)
49.18	W3XAL (Sat.)
49.22	VE9GW
49.34	W9XAA (opens 2130 Mon., Wed., and Fri.)
49.4	OER2 (Tues. and Thur.)
49.5	OXY
49.5	W8XAL (closes 2130)
49.92	COC
49.96	VE9DR
50	EAJ25 (Sat.; opens 2130)
2200—2300	
25.27	W8XK
25.4	I2RO
24.53	CT1CT (Sun.)
25.45	W1XAL (opens 2230 Sat.)
25.53	GSD
25.6	VE9JR
25.63	FYA
31.25	CT1AA
31.28	W3XAU
31.55	GSB
41.6	EA8AB (Sat. and Sun.)
42.92	LCL
47.5	HIZ
48.78	YV3BC (ex. Sun.)
48.86	W8XH
49	ZTJ (Sat.; closes 2245)
49.08	YV1BC (opens 2215)
49.1	VE9HX
49.18	W9XF (ex. Sat.)
49.18	W3XAL (Sat.)
49.22	VE9GW
49.34	W9XAA
49.42	YV5BMO (opens 2230)
49.5	OXY
49.92	COC
49.96	VE9DR
50	RW59
50	EAJ25 (Sat.; closes 2230)
2300—2400 (midnight)	
24.53	CT1CT (Sun.)
25.27	W8XK
25.4	I2RO
25.45	W1XAL (opens 2330 Sat. and Sun.)
25.53	GSD (closes 2330)
25.58	CJRX
25.6	VE9JR
25.63	FYA
26.83	CT3AQ (Tues. and Thur.)
30	EAQ (opens 2330)
31.23	XETE (opens 2330)
31.25	CT1AA
31.26	HBL (closes 2345)
31.38	DJA
31.55	GSB (closes 2330)
38.47	HBP (opens 2330 Sat.)
41.6	EA8AB (Sat. and Sun.)
43	EA4AQ (Tues. and Sat.)
45.02	HC2RL (Sun.)
48.75	CJRO
48.78	YV3BC (closes 2330 Sun.)
48.86	W8XK
49.02	W2XE
49.08	YV1BC
49.1	VE9HX
49.18	W9XF (ex. Sat.)
49.18	W3XAL (Sat.)
49.22	VE9GW
49.34	W9XAA
49.42	YV5BMO
49.5	OXY
49.96	VE9DR
50	RW59

NOTE.—Where transmissions only take place on certain days the fact is indicated in the list.

Du Barry photo

W. A. Clemenson testing out the "Amateur Wireless" Short-wave World-beater at Hampstead. His two-days' log is reproduced opposite

Testing "A.W

Here we introduce to all short-wave enthusiasts some p test reports of our new short-wave four-valver. Full d will be published next week. It should be noted t this set will tune from 12 to 800 metres and f

Introducing Our New Short-waver

By the AMATEUR WIRELESS Technical Staff

IF you are sold on short waves you will want, more than anything else at this moment, a really *good* short-wave receiver.

We have one ready for you. A *sound* four-valver, designed by men who have had years of practical experience on the short waves.

A four that we shall leave others to praise—as some indeed do this week—while we tell you something of its underlying principles. A four that we are especially happy to be able to offer you at this milestone in the paper's career—the beginning of the regular short-wave section.

World-girdling Possibilities

Every reader, whether sold or not on the short waves, ought to read about this set. It is the sort of set you don't often come across—a set designed to prove the world-girdling potentialities of short-wave reception.

Not that four valves are essential to span, say, the Atlantic Ocean—such a feat could be done, indeed frequently is done, on puny one-valvers. But four valves arranged as we have arranged them in this set do more than merely log the distant short-wave station—*they bring it up to full-bodied loud-speaker volume.*

Feast of Interest

We should say that this is a very good set for the short-wave tyro to equip himself with. It will give such a listener the maximum chance of proving conclusively that the short waves offer a feast of interest—if not of sustained entertainment—at all times of the day and night.

Short waves, as we in a changing world understand them, mean waves between roughly 12 and 200 metres. Future articles will tell you how these limits sub-divide themselves into bands for the different services, for broadcast relays, for the amateurs—for the hundred and one denizens of this vast frequency gamut.

In designing a short-wave set, then, our very first problem is to decide what wavebands we are going to cover. We can hardly hope to cover the whole range with a single coil—or even with a tapped coil.

It is quite possible to cover two or three of the small bands by tapped coils, say from 12 to 80 metres, but cumbersome and inefficient to try to do so with a more extensive waveband.

For all-round use we have acted on the assumption that the short-wave fan will want a set with a really wide waveband range. We have therefore arranged the set to cover from 12 to 170 metres with two sets of four coils of the plug-in type.

Flexible Wave Range

Each band is thus efficiently handled. The trouble of coil changing is compensated for by the very flexible range of the set under all conditions. It is relevant to remind you here that at any given time only one waveband in the complete short-wave gamut is likely to produce signals. You will not always be changing coils once you have arranged for the correct waveband for your sitting.

To tune these coils we have departed from the accepted practice in using a two-gang condenser. Until now it has been widely held that on the high frequencies of the short waves any sort of ganging is impracticable.

Our experiments show that ganging, with the great boon of instantaneous adjustment of two tuning circuits, is perfectly simple on the short waves—so long as proper provision is made for an easy variation of the aerial load on the first coil.

To make certain of this we have employed a variable condenser in the aerial lead, panel mounted on an extension handle so that it can be controlled whenever necessary in conjunction with the gang tuning condenser.

Control in a short-wave set is much more vital than in an ordinary broadcast set. This applies not only to the tuning but to the reaction.

In this set, therefore, the reaction condenser is driven by a slow-motion knob—in order to provide accurate adjustment. Without this the short waves are as nothing.

Talking of control, the tuning scale is exceptionally wide, being semi-circular so as to spread out the readings as much as possible. Fast- and slow-motion drives are applied to the gang condenser, the slow motion giving a 100-to-1 reduction.

Four-valve Sequence

So far we have said little about the circuit. It is a four-valve sequence of screen-grid high-frequency amplifier, detector with reaction, resistance-capacity low-frequency amplifier and transformer-coupled output stage.

Certainly a "hefty" combination—especially on the short waves, where one is used to rather simpler circuits. But the short waves are growing up, so to speak, and there is no reason why we should now limit reception below 100 metres to the hit-and-miss action of a too utterly ingenuous circuit.

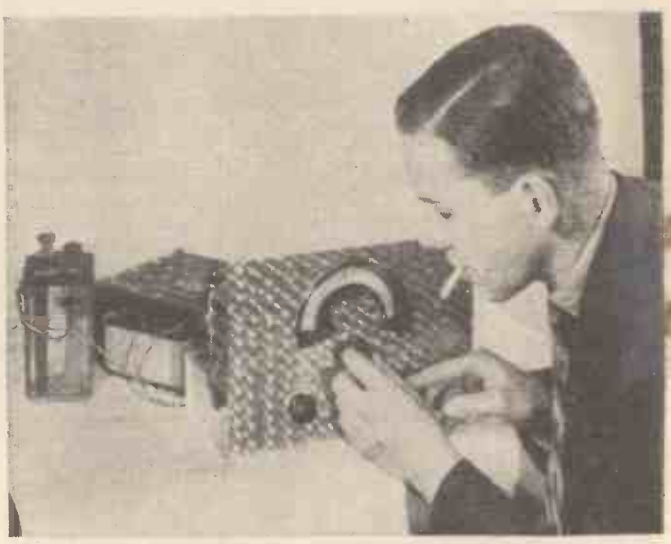
Of course, screen-grid valves have been used before on the short waves. Many short-wave sets have been designed with what is called a "buffer" stage of screen-grid amplification whose function has been to smooth reaction by removing the aerial load from the reaction circuit.

In doing this, though, true reaction has been sacrificed—for the intervalve coupling circuit of such sets has been made aperiodic, that is to say untuned.

Properly-tuned Stage

We have gone a step further in using a properly-tuned screen-grid stage. A high-frequency pentode type of screen-grid valve has been adopted, with a high-frequency transformer as coupling. This is similar to the aerial-tuning arrangement—which is also a transformer. Ganging is thereby made possible.

Some real amplification at high frequency can be claimed for this first pentode stage, while the effect of the reaction on a properly tuned intervalve circuit instead of aperiodic



Note the large open tuning scale used on the Short-wave World-beater. Full constructional details will be published next week

"s" Short-wave World-beater

reliminary details and independent etails of construction and operation hat by buying the necessary coils rom 1,100 to 2,000 metres

choke coupling also adds greatly to the sensitivity.

Please don't think we are trying to make out this is the world's most *pukka* short-waver—all we are saying is that it is definitely a cut above the average. The theoretical circuit proves that to the technical fan without further analysis.

In laying out this circuit as a practical job for the amateur we were guided by the special needs of the short waves—the need for complete freedom from "hand capacity" effects, for example.

It is fundamental in short-wave technique that your body must not affect the tuning and reaction adjustments—as it so easily can when your hands are brought near the controls.

Complete Metal Chassis

That is why the set has been made up on a complete metal chassis, with full screening at all vulnerable points. We admit it is not such an easy set to make as a simple panel and baseboard type—but then we are appealing to readers who are prepared to go to a little extra trouble in order to make something worth while of the short waves.

We shall give very complete constructional details of the set next week. Meanwhile, we have said enough to show that our technical men have evolved something rather good in short-wavers. If you are going to whole-hog with the "shorts," you really ought to look into *this set*—it is the best battery short-waver we have ever evolved.

A Short-wave Record

By W. A. CLEMENSON

I HAVE been very pleased to try out this new set, which gives very satisfactory results.

You will see from the list on the right that I have logged many stations in each section of the short-wave band except 80 metres, where during the test period the high background caused by atmospherics prevented my hearing more than three.

I found the receiver perfectly stable right down to 12 metres and I could put my hand right down inside the chassis without upsetting the tuning adjustment.

That slow-motion device is simply marvellous. When tuning even down at 20 metres this control makes it seem as though one is on 200 metres.

But for the fact that I had the set only two days I could have logged many more stations. It is, I heard more stations during that time than I have ever heard before in five days. *Is this a record?*

I hope the dial readings, especially of the short-wave broadcasting stations, will be of use to constructors of the set.

The output is amazing. When I first came on W3XAL on 49 metres I had to cut down the volume control because the loud-speaker was overloaded. As for Moscow, the set and the loud-speaker nearly jumped off the table.

I used the set with a 66-ft. aerial and 120 volts high tension. On my own short-waver DX is poor—so your design must be very good.

Two Days' Reception Log

Stations shown in bold type represent exceptional reception

Stations Heard on 20-metre Amateur Band

W2DI	Calling CQ
VE3JV	Calling CQ DX
LYIJ	Calling CQ
WIGLF	Working PAOOK
K4SA	**Working CTIBY (Sat. 2305, 1050 6LB)**
W2GOX	Calling CQ
WIME	Calling LU3CG
W2GJB	Working W5CYY
WIHM	Calling G6GC
VE2BF	Calling CQ
VP5PZ	**Working F8WB**
WICDW	Working G6GC
W2GLZ	Calling CQ
VE3JV	Calling CX2AM
VE2BG	Calling XIAY
VE2HG	Calling CQ DX
W3MD	Calling PY2BW
W2AMH	Calling CX2AM
YU7VV	Calling CQ
U2KT	Calling CQ
W8DHC	Calling F8LK
W2BLV	Calling G5SR
W2CVJ	Calling Test G
W3AFR	Calling CQ
W8ZY	Working CX2AM
W8DPO	Calling G5RX
WIDJX	Working G6VP
W3CGU	Calling G2GR
W8EMC	Calling CQ DX
W3BPH	Calling CQ DX
W9AKW	Working W2AHC
W9GF	Calling CQ
W3BFH	Calling G5CV
WIDET	Calling VE4GU
WIGLE	Calling CQ
W8UV	Calling Test
W9BMX	Calling G5RX
WIFEJ	Calling G5BJ
VE3TW	Working J2HI
WINET	Working G5IZ
W8LKK	Calling CQ
WIFEJ	Calling G5BJ
SUISG	Calling CQ
WIBJT	Calling CQ DX
WITW	Calling CQ DX
WIEWA	Calling CQ
W3AFW	Calling IIIP
W2GPV	Calling CQ
W3BSC	Calling VE4GU
W2GMR	Calling CQ
W4CFD	Calling CQ
W3ENL	Calling OK1BC
W2FAB	Calling OK1BC

Stations Heard on 40-metre Amateur Band

EA3EG	Calling CQ
W3BZB	Calling CT2BK
W2CSB	Working W8RRO
W2FAR	Calling W6AMC
WIDSF	Calling CQ
W8ASE	Calling CQ
W4OG	Calling CT2BK
W2AOA	Calling CQ
WIGIZ	Calling W7BJY
W8FZZ	Calling W9JG
W2BWM	Calling Test
W3AHU	Calling D2LR(?)
W2EVZ	Calling CQ
W3EIA	Calling W3ATJ
W2EDJ	Calling W7EET
W2EIN	Calling CQ DX
W4CRG	Calling CQ
ZL3AN	**Calling CQ**
W3DSH	Calling W6FZL
W8AAX	Calling CQ
W2ANO	Calling CQ
W3ANT	Calling CQ
WIGCL	Calling CQ
W9IEH	Working W6EQY
W4CAM	Calling W3EJU
W2FOP	Calling D4BIU
W8HSV	Calling W6JBN
W3CQU	Calling W9GQL
WIBKL	Calling CQ
WIDXL	Working W6UD
CT2BK	Calling W8FIP
W2FSN	Calling ZL1CE
W2FJG	Working W2DEI
WIBWP	Calling W7AUP
W8DXN	Calling CQ
W2DXO	Calling W2CSO
WIBKO	Calling OK1NR
W3CBR	Calling W5DUS
W2GUU	Calling W9CKY
W2LUQ	Calling CQ
W2FJX	Calling CQ
W2EPY	Calling W4PF
W4APF	Working W8ISN
WILK	Calling 8KVM
W4GRW	Working W9PV
W8LMW	Calling CQ
W2ANO	Calling CQ
SUSNK	Calling W2BIC
W8CBC	Calling X2A
W3EEZ	Calling CQ
WIBRB	Calling IIMD
EA3DL	Calling CQ DX
W2BIC	Working W8FNZ
W2DFI	Working W9CLT
W2GSN	Calling CQ
W4CQA	Calling CQ
VE2DV	Calling W3DSY
W2WT	Calling OE1JH
WIEVJ	Calling W9KMA
WIDZE	Working W8KYW
W2FLT	Calling CQ
W2ERJ	Calling CQ
TI2RC	**Calling CTIAZ at 0720**
W4BKA	**Calling CQ at 0730**
W2BQK	**Calling CQ at 0740**
W7DVY	**Calling CQ at 0750**

Stations Heard on 80-metre Amateur Band

WIVP	Calling CQ
WIGEJ	Working WIIBM
WICCO	Calling W2DXB

(Atmospherics were too severe to identify any more stations on this band.)

Broadcast Stations

Name	*Metres*	*Dial*	*Coil in use.*
Moscow	50	34	6R
W3XAL	49.18	31	
W8XK	48.86	30	
W3XAU	49.5	33	
W2XAF	31.48	71	6Y
W1XAZ	31.35	70	
Rome	25.4	150	6LB
Daventry	25.57	151	
Zeesen DJB	25.51	96	
W8XK	19.72	90	6LB
W3XAL	16.87	58	6LB

(All stations identified by call.)

Components Needed for the Short-waver World-beater

CHASSIS
1—Peto Scott aluminium, 12 in. by 6 in. by 3 in. with aluminium panel 12 in. by 9 in.

CHOKES, HIGH-FREQUENCY
2—Stratton, type 948.

COILS
2—Sets Stratton, types 6LB (2), 6Y (2), 6R (2), 6W (2), with bases, type 904.

CONDENSERS, FIXED
2—Telsen, type tubular, values: .0001-, .0003-microfarad (or British Radiophone).
4—Telsen type 250-volt working, values: .02-, .04-, 2-microfarad (2) (or Dubilier, T.C.C.).

CONDENSERS, VARIABLE
1—British Radiophone .00017-microfarad two-gang, type 612.
1—Stratton .00025-microfarad with slow-motion drive, type 957.
1—Stratton .0001-microfarad, type 900.

DIAL, SLOW MOTION
1—Polar, type Micro-drive Semi-circular.

HOLDERS, VALVE
1—Clix seven-pin, type chassis mounting.
3—Clix four-pin, type Airsprung chassis mounting.

PLUGS, TERMINALS, ETC.
6—Belling Lee wander plugs, marked: H.T.+1, H.T.+2, H.T.—, G.B.—1, G.B.—2, G.B.+ (or Clix, Eelex).
2—Belling Lee spade terminals, marked: L.T.+, L.T.— (or Clix, Eelex).
4—Belling Lee sockets with wander plugs, type 1077, marked: Aerial, Earth, Pick-up (2).

RESISTANCES, FIXED
6—Siemens-Schukert, type SS½-watt, values: 30,000-, 40,000-, 60,000-, 100,000-ohm, ½-, 2-megohm (or Telsen, Erie).

SUNDRIES
1—Peto Scott aluminium screen, 4¾ in. by 4 in.
1 ft. brass strip ½ in. by 3/32 in.
5 plywood 3 in. by 2¾ in.
2—Bulgin single circuit jacks, type J2.
2—Bulgin plugs, type P15.
1—J. B. coupler, type 2003.
1—Insulated bush to take ¼ in. spindle.
2 in. length ¼ in. diameter rod.
1—British Radiogram 2 in. metal mounting bracket.
Connecting wire and sleeving.
4 yds. thin flex.

SWITCH
1—Bulgin on-off toggle, type S80T.

TRANSFORMER, LOW-FREQUENCY
1—Telsen, type Radiogrand (or Varley, Lissen).

ACCESSORIES

BATTERIES
1—Lissen 120-volt high-tension, type LN539 (or Drydex, Ever Ready).
1—Lissen 9-volt grid-bias, type LN758 (or Drydex, Ever Ready).
1—Lissen 2-volt accumulator (or Exide, Fuller).

LOUD-SPEAKER
1—Blue Spot, type 44R.

A Report from Rayleigh

By J. E. NICKLESS

MAY I say right away that, with all my experience, I was surprised at the good results of this straight four-valver for short waves?

Firstly, the set has practically no background. By this I mean no noise when listening to the distant stations. Then I must remark upon the positively uncanny control of reaction—it is so smooth you can hardly tell when the set is going in and out of oscillation.

What specially impressed me about this reaction was that its adjustment did not in any way affect the tuning. In this respect the set is a distinct advance in short-wave sets using capacity reaction.

Strength and quality of all the well-known phone stations below 20 metres was very good. Amateurs on the 20-metre band were particularly good. Canadian VE2CA was R5, for example; Americans also coming in at this strength.

The 80- and 160-metre bands are equally satisfactory—Dutch, Belgian, French, and German stations coming in at full loud-speaker strength.

Undoubtedly this set is a first-rate design, especially for those who want to log short-wavers *consistently* at good strength.

The Set at Letchworth

By KENNETH JOWERS

WITHIN the space of twenty minutes I heard no less than twenty-three amateur and commercial phone stations. This was a pretty good start to my evening's test of the four-valve short-waver.

At six o'clock in the evening I was just in time to log W3XAL on the loud-speaker before it began to tale off. I quite expected to have to do a little juggling with the tuning controls down below 20 metres, but to my surprise the single tuning dial was almost as easy to handle as my broadcast set.

GSH, the Empire station on 13.97 metres was tuned in at 22 degrees on the dial, which means that the minimum wavelength was about 12 metres. Between this station and 52 degrees, where I heard W3XAL and the second Empire station, there were at least half a dozen South and North American stations at good loud-speaker strength. Between 16 and 19 metres there was a gap, except for some scrambled Atlantic phone and some very loud Morse which threatened to wreck the loud-speaker cone.

On the 19-metre band W2XAD was at full strength relaying a short programme of organ music. W8XK, two degrees higher up the scale, could be heard faintly on the loud-speaker, although all the speech could be followed on headphones. Zeesen and Radio Coloniale had shut down, but they were heard the following day at an earlier hour.

It would have taken far too long to have logged all of the amateur stations on the 20-metre band. During the course of the evening I must have logged round about sixty different stations from all over the world. K4SA of Porto Rico, the Canadian VE1BG the Czechoslovakian OK1BC and the American W9BHT were typical examples of some of the stations that were heard on the loud-speaker.

Buenos Aires on 28 metres were transmitting a telephone call to Paris. On the 30-metre band between 8 o'clock and midnight Zeesen, Lisbon, W3XAU and Zeesen DJA were all heard at varying strength on the loud-speaker.

The 40-metre band was full of French amateur phone stations, mixed with a few Swedish, German and Dutchmen. There was not very much going on the 50-metre band, until after 11 o'clock, when W8XK, W3XAL and W3XAU all came in one after the other. The Moscow station on exactly 50 metres was at full loud-speaker strength all the evening until about 11 o'clock and was much louder than the big broadcast station on 1,700 metres odd, which I tuned in on another set.

Tuning was very simple, only one knob and a trimmer which only has to be adjusted once in a while, and anyone who has handled an ordinary radio set should be able to tune in a fair percentage of the stations I have mentioned, without any difficulty. As one gathers experience so the log will be increased.

At Southend

By S. RUTHERFORD WILKINS

ALTHOUGH I am not exactly a short-wave "ham," I have more than one efficient short-wave set at my laboratory down at Southend, and I was naturally keen to compare the latest "A.W." four-valver with them.

I can say at once that it equals anything I have? And in many ways the World Beater shows its superiority over standard sets.

My test aerial is about 40 feet total length—not particularly efficient, and therefore all the more of a trial for any set. The earth is fair, though not wonderful.

When I had fixed up the new set and applied a maximum high-tension of 120 volts, I at once obtained amazingly good results.

Especially good were the signals on the 40- and 80-metre bands, while on the 20-metre band the results were well up to scratch. On the bands above 150 metres efficiency was well maintained, but owing to a lot of background I could not log much.

Reaction Control

Reaction control was very smooth down to 20 metres, where at first I found it inclined to be just a little "ploppy." But on experimenting with the screen voltage of the high-frequency valve I found that a slight reduction cured this little trouble.

About the tuning I can really enthuse. The fast- and slow-motion control is admirable—the slow-motion part being a real dream of easy precision. Control even at the low wavebands was almost as easy as on medium waves—which is high praise, as anyone who knows anything of the short waves will agree.

Hosts of amateur signals from all parts of the world figured in my logs over two nights of testing—but as a well-known amateur has apparently compiled a mighty list for "A.W." I was not asked for mine!

American broadcasting relays also came through very well, three of them being heard at full loud-speaker strength, and others coming through at good phone strength.

From these comparative tests with standard short-wave sets I am convinced that the World Beater is an ideal set for short-wave tyros and experts alike—its sensitivity and ease of control being most certainly much above the average.

Wide World Photo

Short waves come to the rescue in the Alps! The German-Austrian Alpine Club use two small short-wave transmitters for weather forecasts to tourists

Readers' Views on This and That

Listeners' Letters

SHORT-WAVE MIX-UP

To the Editor, AMATEUR WIRELESS.

WITH reference to G. F. Broad's letter in your issue dated May 12 (re-hearing the Empire transmissions).

I have heard this strange mix-up myself and have carefully checked this for several nights at the conclusion of programme, but can only hear it while Daventry's carrier wave is on.

As soon as Daventry closes down no more of Empire broadcasts can be heard.

I have therefore drawn the conclusion that it is due to Daventry National picking up the Empire radiations from the short-wave aerials not far away.

J. H. SPARSHOTT.

Bognor Regis, Sussex. [1085

HOME-MADE HIGH TENSION

I HAVE read with interest Thermion's notes on the five-bob battery, and I am glad he is sticking to his word. I am a milk roundsman by trade, and hear some astounding reports about these cheap batteries.

I wish Thermion could accompany me on my rounds. He would get some idea of the quality some folk can sit and listen to. It's too bad to describe in decent language.

I have tried some of these batteries myself, and the average life for good reception was about two nights. My set takes 14 milliamperes.

I live in the country, and we have no gas or electric light. So perhaps some of your readers would like to know how I get a good supply of high tension. I save and collect a good supply of small glass jars—those that have contained meat paste.

These jars measure about 3⅝ in. in height, and will take a sac of the No. 3 size, obtainable from the Standard Battery Co. at 2¼d. each. For zinc I buy clippings from the local tinsmith at 1s. 6d. per stone.

After connecting up zinc and sac I have a good battery that will stand a lot of hard work for at least nine months (with quality listening). The fluid added to the sac is made from sal-ammoniac (1 teaspoonful to a jar).

Many thanks for the series on television. I am going to make up the one described in "A.W."; also for the short-wave notes. Thanking you for an excellent paper.

W. GARBUTT.

Marrke-by-Sea, Yorks. [1086

THOSE CRYSTAL SETS

IN reply to an article in your journal for May 2 concerning the crystal set, I am very much in favour of this gallant little receiver, which has been so stupidly driven off the market.

There is one point about which I beg to differ, that is about the crystal used. It is mentioned in the article that a carborundum detector was the more favoured type of detector in the place of one using a catswhisker.

But I have obtained several pieces of crystal made by different firms, nearly all composed of Hertzite, which are very sensitive indeed.

With this form of crystal and with a good thin catwhisker there is no need to hunt for a sensitive spot; the whole crystal is sensitive.

I do not expect many people have been "station hunting" with a crystal set and so may be inclined to disbelieve these results, which I obtained with a home-made set with a perfectly straightforward circuit and no form of amplification.

I used a slow-motion condenser (not at all necessary, but it was the only spare one I had), a plug-in coil for medium waves and another for long waves, and a coil of 75 turns (used for getting one German station I could not identify) and a detector of the catwhisker type.

I got the following stations: Fécamp, very faint; London National, loud; French station, I could not identify, faint; Post Parisien, very good, as loud as Regional; London and Midland Regionals, very good; Post Parisien, not fading at all at night; Radio Paris, fair; and Daventry 5XX, good.

Foreign stations came in only at night. I was using a good 50-ft. aerial and a sound earth.

My home is in Essex, seven miles north of Colchester. I do not know if this is a good place for foreign reception; it seems to be.

These results are not exceptional. I know many people who have done this in the same district. Selectivity was not very good, but if you want selectivity and to cut out damping you can use a loose-coupled circuit.

The crystal set is excellent for those people who wish for a bedside set and if they fall to sleep with the earphones on no harm is done and no current wasted.

It is a pity the crystal set is so much out of favour and I hope it will soon return.

F. M. RODWELL.

Slough. [1087

NEW MOVING-IRON LOUD-SPEAKER

I HAVE built a new type of moving-iron loud-speaker and its results are so good I think your readers may be interested. It has been designed essentially for the two-valve set and where a large output is not available.

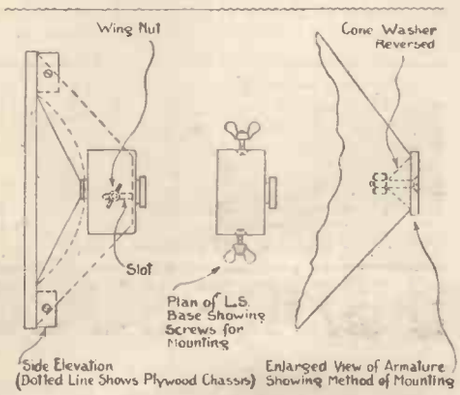
Briefly, the idea is this: all springs, etc., are done away with and the armature is fixed directly on the cone, thus giving a true push-pull movement; also all the energy from the drive is transmitted to the cone.

It may be thought that the armature would immediately stick on the magnets; this only happens when trying to operate in a too-sensitive position. Good results can be obtained with 1/16 in. between armature and polepieces.

Much depends on the flexibility of the cone, which should be attached to the baffle with a ring of linen—on the loose side as it can easily be stiffened with coat of size.

The drive used was the base of an old horn loud-speaker, which is ideal and a suitable one can be bought for a very modest sum. Enclosed sketch shows method of mounting, etc.

The armature should be of soft iron, not less than 1/8 in. thick and attached to the cone by slicing off the apex, leaving a hole about ¼ in.



Alterations to moving-iron loud-speaker suggested by a reader in letter 1088

H.M.V. photo

Arthur Rubinstein, the well-known pianist, listens in during a concert interval

When the nut is tightened the armature will bed itself down on the cone.

The cone should be made from stencil paper, not less than 9 in. in diameter.

O. J. LANG.

Finchley, N.3. [1088

REAL-QUALITY SERIES

I HAVE been reading the last article (May 5) in the real-quality series by Noel Bonavia-Hunt, and I am amazed that these articles ever passed your technical editor's waste-paper basket.

Mr. Bonavia-Hunt seems to have developed his own theories at every point, and these theories are so ridiculous that they justify the series being read as the wanderings of a lunatic.

He develops amazing theories to explain the simplest circuits, and I can only believe that he pays the paper to print them, as I feel certain that no paper would pay for such contributions.

I am a designing engineer with one of the leading sound-film equipment manufacturers, and consequently have considerable experience in designing, manufacturing and testing of high-quality sound-producing equipment, and I think my qualifications cannot be questioned.

It is impossible to pick out any single item in the series as being particularly bad, because the whole lot is absolute "tripe," to put it very mildly.

I hope you will not ignore this letter, because it is not written in any carping spirit, but is intended as serious criticism.

JAMES MOIR, Grad.I.E.E.

Rugby. [1089

[Noel Bonavia-Hunt has seen this letter and prefers to make no comment. Readers can easily test out the value of Mr. Bonavia-Hunt's theories for themselves in a practical way. After all, we all know that the proof of the pudding is in the eating!—ED.]

COMPONENTS IN THE MAKING

IN your issue dated May 12 there is an article on "Little Components in the Making." Might I suggest that the subject be repeated in a future issue?

The subject would not only be of interest to the beginner, but also to the more advanced reader. Such components as electrolytic condensers, Mansbridge condensers, compression condensers, potentiometers, wire-wound resistances and toggle switches are but a few. Many people look upon bakelite cases as boxes of mystery. Such an article as suggested would clear matters up.

In passing, I would like to thank you for the real-quality series.

ALBERT PLEDGER.

Hackney, E.2. [1090

Down on the Short Waves—

Kolster Brandes short-wave converter for A.C. mains working

ALL the arguments in favour of the short waves are apt to fall on deaf ears when you already have a good broadcast set and don't know how to convert it to tune below 100 metres.

Yet it is surprisingly easy. Most of the theoretical snags disappear in practice. For example, many owners of mains-driven broadcast sets seem perfectly certain that it is impossible to add on a unit for short waves—owing to the difficulty of obtaining the necessary extra power.

In this article, therefore, we shall try to show you just what can be done, not only with mains-driven sets but with ordinary battery sets—all of which can easily and cheaply be made to give first-rate results.

Converting to a Super-het

Let us assume, for a start, that you own a good type of mains-driven set and would very much like to try short-wave reception. Leaving out the power question for a moment, the best type of unit is one that converts the straight broadcast set into a short-wave super-het.

This is done by using the high-frequency stage or stages as the intermediate-frequency part of a super-het formed by the addition of a combined oscillator-detector valve in the unit.

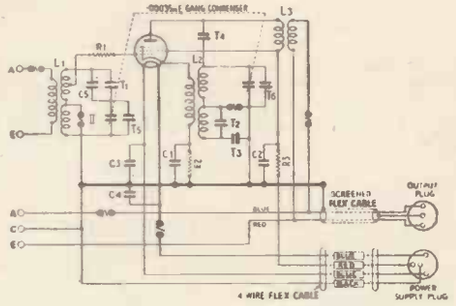
With such a unit all the existing apparatus is wanted and the set is not altered in any way—simply take off the aerial lead, plug it into the converter and link the converter to the aerial terminal of the set with just one wire.

Then the broadcast set is tuned to a suitable long wavelength and the short waves brought in by the short-wave tuning circuit of the add-on unit.

As a rule, the existing power supply for the set can be used for the unit—always assuming you can get at it. This is by no means always possible, though, in a factory-built set. That is just the snag many readers are complaining about.

Actually, the snag is largely illusory, because in these enlightened days there are several super-het converters with integral power supplies.

It is obviously quite easy to provide a unit of one or two valves with its own complete mains supply—but, of course, the duplication



Circuit of the Kolster Brandes short-wave unit

of mains transformer, rectifier and other apparatus is very extravagant. That is why the new unit introduced by Universal High-voltage Radio is so interesting—it runs directly from the mains but does away with the complicated mains-supply apparatus.

This is effected by using universal mains valves running directly from the mains—that is with filaments of high voltage, either for A.C. or D.C. mains.

True, a separate rectifier is needed, but this also runs directly from the high mains voltage without any intermediate mains transformer. On A.C. mains this valve acts as a half-wave rectifier and on D.C. it acts passively as a conductor.

With this simple mains equipment, which, of course, includes the usual smoothing condensers and choke, the add-on unit for converting to short waves is entirely self-contained. It can be plugged into any mains of any voltage, irrespective of type—that is A.C. or D.C.—and it will then turn any straight mains set into a really efficient all-mains short-wave super.

High-frequency Stage

This unit contains a pre-detector high-frequency stage and the usual combined oscillator-detector, tuning from 12.5 metres upwards. The price of the unit complete with valves is only 6 guineas, which we consider is very reasonable in view of its wide adaptability.

You can make up for yourself just such a unit, using the Ostar Ganz valves incorporated in the model we have been talking about. Our

Without a Short-wave Set

circuit (page 550) shows the way. You will see that it consists of a screen-grid valve stage, with an untuned aerial circuit and a tuned-grid coupling between the first valve and the triode oscillator-detector.

As the short-wave coil is of the plug-in type, you can cover any waveband you choose—down to about 12 metres, or even lower if you make up your own coil.

Provision of Special Power Socket

Some firms send out their broadcast mains sets with the power supply already prepared to take the additional load of a short-wave converter. Kolster Brandes, for example, provide a socket at the back of the chassis, into which the mains plug of the converter is plugged. In this way the set's power supply works the set and converter, thus saving any duplication of apparatus.

If you have a Kolster Brandes set, or can easily get at the power pack of your set, the K.B. short-wave converter is a good proposition.

It is a simple unit, with a combined oscillator-detector circuit making use of a high-frequency pentode. It tunes from 14 to 80 metres in two steps, has a fast- and slow-motion drive on the tuning, and provision is made for adding on the well-known K.B. Rejectostatic system of aerial screening.

Admirable Oscillator-detector

From our tests we can assure you that the high-frequency pentode makes an admirable oscillator-detector, bringing in short-wave stations from all over the world, even when hooked on to a simple three-valve kit set.

Only one knob has to be controlled—and so long as it is turned slowly you cannot help logging the world's broadcasters. That, anyway, was our experience. We thought at the time what a good little gadget it would be for short-wave beginners. The circuit is shown for the benefit of readers who want to know all about it. The price complete is only £4 10s.

We have shown you now how simple it is even with mains sets to work on the short waves. Of course, so far we have dealt only with those having straight-circuit mains sets, which leaves us with mains super-hets and battery sets of all types.

If you are using a super-het, whether battery or mains, it is probable that you will have to fit a plug-in type of unit, which will make use only of the low-frequency stages of the broadcast set. The detector valve of the existing set will have to be removed and put into the holder of the unit, while the four- or five-pin plug from the unit will then go into the detector-valve holder of the set.

Plugging into Detector Circuit

Such a unit is the Eelex Duplex model, price £2 12s. 6d. This plugs into the detector-valve holder of the set as explained, and it works for either battery or mains set.

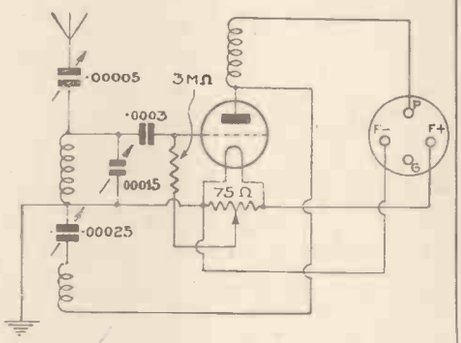
A little switch inside the unit provides the alternative filament connections for battery or mains operation.

Another useful little idea in this Eelex unit is the arrangement of the coil, which is of a special reversible type. When the coil is plugged in one way round so that the portion marked "long" faces the panel, the tuning range is from 28 to 60 metres. If you take the coil out and turn it round so that the portion marked "short" faces the panel the wavelength range is approximately 16 to 30 metres.

You must understand that with this type of unit the complete hook-up is only a very simple sort of receiver. It consists of the short-wave detector with tuning coil in the unit, and just the low-frequency amplifying part of the existing set. Even so, it will give quite good results on short waves, especially if there are two stages of amplification after the detector.

Continued on next page

Eelex short-wave adaptor for A.C. or battery sets



Circuit of simple short-wave plug-in adaptor

Note the workmanlike appearance of the chassis-built Universal High-voltage Radio converter for A.C. or D.C. mains

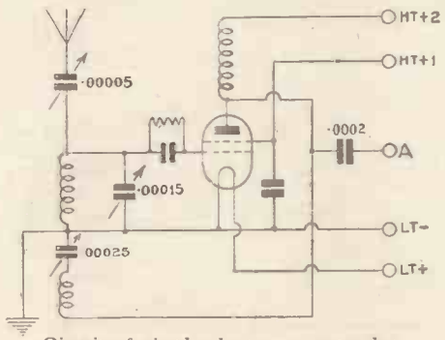
Australia and America are well within the range of such an arrangement, as the detector can be made very sensitive as the oscillation point is gently and smoothly approached.

With battery sets the problem of converting or adapting for short waves is, of course, simpler than with mains sets. Perhaps you would be interested in a battery-operated short-wave converter circuit? If so, our theoretical diagram will help.

Short-wave Super-hetting

It shows a single valve as it has to be arranged for short-wave super-hetting. We make use of a screen-grid type of valve for the combined functions of oscillator and detector.

You will see that there are two low-tension connections but no high-tension negative. In practice the two filament leads are taken either to the low-tension terminals on the set or to the accumulator itself. There is no need for a separate supply but if for any reason you do arrange for that, of course a negative high tension will be needed. Otherwise you simply take the two positive high-tension leads from the screen-grid valve to the high-tension battery already in use.



Circuit of simple short-wave super-het converter

Very often when such a unit is connected to a set it is forgotten that high-tension negative is common and an unnecessary lead is used.

We have just tested a very ingenious short-wave unit made by Unit Radio. It consists of a single valve wired up to a tuning and oscillating circuit, for use as a plug-in adaptor or a super-het converter, in either A.C., D.C. or battery sets.

It tunes between 15 and 100 metres by means of two plug-in coils. The price is £1 17s. 6d. and 2s. 6d. for additional coils.

All the circuits we have given this week can be made up by the home constructor to cover wavebands between 12 and 200 metres. By using smaller components, such as coils, condensers and chokes, the same circuits will be suitable for ultra-short-wave experiments on 7 metres.

Converters and Adaptors

We should like to make clear to you the distinction between a *converter* and an *adaptor*. The word converter has come to mean a unit that, when added to a broadcast set with one or more high-frequency stages, makes it a short-wave super-het.

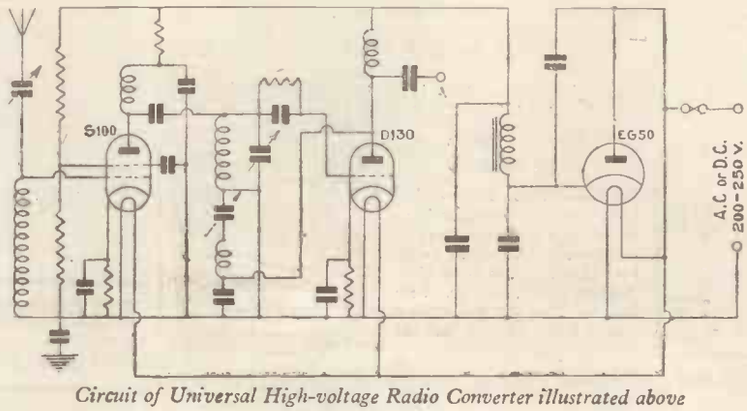
On the other hand, the word adaptor has come to mean a simpler type of unit, though possible with the same tuning arrangement, which when plugged into the position at present occupied by the detector valve, makes the broadcast set a simple, straight short-waver, with a short-wave detector with reaction and low-frequency amplification.

It should be emphasised that to-day there is no need for anyone with whatever type of set they may be using to miss the scope of short-wave working. Usually, the conversion to short waves is not only easy but cheap.

Much work has been put into the design of units and the circuits we give with this article are thoroughly reliable.

To sum up, we hope that we have been able to convince you of the very great facility with which existing broadcast sets can be adapted or converted for short-wave working.

The best type of set for conversion is the straight circuit with one or more high-frequency stages. But of course any type of set—however simple—can be readily adapted.



Circuit of Universal High-voltage Radio Converter illustrated above

The Truth About the Short Waves

Continued from page 535

the ether raking. You sit down at the dials, never quite knowing what will turn up—or fail to. It is always a gamble. Not as to whether you will hear anything at all, of course, for there is always something doing if you know where to look; no, the gamble is whether you will hear a particular station at any given time or wavelength.

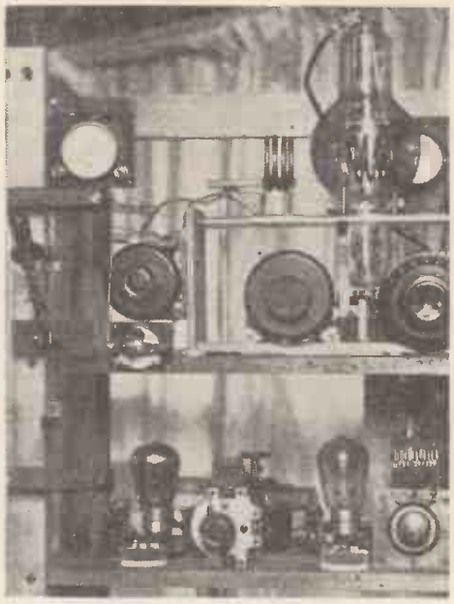
Short waves are not everyone's fun. If they were, this journal would not be running just a section on short waves—a whole magazine would be wanted. At present, in this country, anyway, the short waves are still caviare to the general listening public. But a high percentage of the readers of AMATEUR WIRELESS must be potentially keen on the short waves—for nearly all of you are more than mere listeners. You are enthusiasts in the *modus operandi* of reception.

Most of you, at the moment, are ordinary broadcast listeners, without any knowledge or "bent" on the short waves. I should be the last to try to convince you against your judgment that the short waves are worth a trial. But, all ballyhoo aside, are you sure there is nothing for you personally on the short waves?

Read this week's special short-wave articles. Read them without prejudice. Ask yourself what your main interest in this radio game really is. If the answer is just programmes and then some more programmes, why, leave the short waves alone.

For the short waves, fascinating though they can be to the fan, are not the best medium for the conveyance of programmes. They will convey intelligence admirably—and in a way that other waves would not—but consistency is not their strong point.

Post Office engineers and other commercial organisations counteract the vagaries of the short waves with elaborate and expensive automatic gain controls, extensive multiple aerials and everlasting changes of transmitting channels. Such methods are denied the ordinary amateur, who must perforce put up with inconsistency—making sport of an inherent limitation all too often carefully ignored by writers trying to "boost" short waves.



Part of an amateur-built 10-metre transmitting station

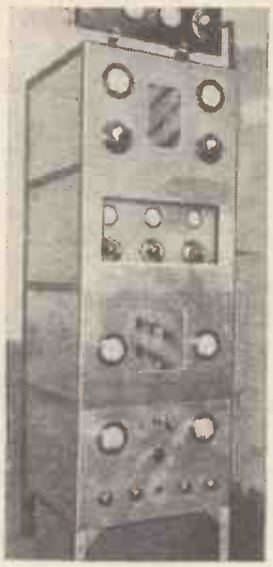
Unit Radio's A.C., D.C., or battery short-wave converter or adaptor

With the Amateurs on the Short Waves

By KENNETH JOWERS

FOR the last few days I have been using a new short-wave super-het with great success. It may be that I have been fortunate in getting home at the right time, or, on the other hand, it might be that the set itself is more efficient than my own one. At any rate, the 20-metre stations have been coming in extraordinarily well.

In common with every other short-wave listener in the country, I have logged K4SA with monotonous regularity. This most amazing station comes over at good loud-speaker strength on quite small sets. I have asked Mr. Bartholemew, the operator, to let me have some details of his station, also photographs which I will publish in due course, so that you can all see from where these signals originate.



The 20-metre telephony station of W2GX, New Jersey; the power is 100 watts

There have been quite a number of other 20-metre amateur stations which are worth mentioning, as they are so very consistent and should be received by almost anyone with a two or three-valve short-waver.

For example, W2BGD, of New York, W3QV of Roslyn, Pensylvania, the Canadian station VE1BV of Novo Scotia, W2OA of New Rochelle and W3HC of Delaware are all stations that should be logged. Incidentally reports are welcomed if they are of value.

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An interesting waveband which should be carefully searched is the 72-metre shipping channel. During the last fortnight some of the Atlantic boats have been sending out messages during the early afternoon which have come over at colossal strength, while the replies *via* Rugby have been received almost as well. The 70-metre channel is one which is inclined to be overlooked. Most readers take the trouble to listen to the 80-metre amateur band, but skip the intermediate wavelength between 50 and 80. There are quite a number of surprising transmissions on these wavelengths, particularly on week-days. So don't forget next time when searching round, if you have nothing in particular, that this band is worth a visit.

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W2GX who has been received all over the country, has sent a letter and he asks me to thank all of his listeners who have written such nice reports to him on his transmissions.

His outfit consists of a home-built eight-valve receiver, using a high-frequency stage followed by a first detector and separate oscillator, two intermediate-frequency stages, second detector, and power output.

The transmitter is for 20 metres, with a half-wave aerial and twin matched impedance transmission lines. The first stage is a crystal oscillator with a frequency of 3554.4 kilocycles, using a type 47 valve. This frequency is then doubled to 7108.8 and again to 14217.6 kilocycles. The power amplifier is a type 203A 100-watt valve with two 50-watt valves in parallel as modulators. The modulator is driven by three stages of resistance capacity coupled amplification with push-pull output.

Separate Power Supply

There is a separate power supply for receiver and speech amplifier and a special method of filtering enabler the microphone to be energised from the voltage applied to the speech amplifier.

This station is on the air very regularly and so far has made contact with Great Britain, France, Poland, Brazil, Holland, Spain, Switzerland, Republic of Dominico, Belgium, New Zealand and Australia. So go right ahead and let me have your reports on W2GX.

◆ ◆ ◆

D. A. Hogg, of Cosham, tells me that in his locality the 20-metre band is best, but only between 2200 and 2400. In one evening he heard all the nine U.S. districts and three Canadian. He goes on to say that the 40-metre band is definitely falling off, while the 80-metre band is improving, particularly in the early mornings.

Best Set for Amateurs

Mr. Hogg uses a two-valve receiver with screen-grid detector and pentode output, which he finds to be the best type of receiver for amateur use.

◆ ◆ ◆

Very few listeners have reported reception of W5AFV, of Houston, Texas. This station, owned by Monte Rusche, is heard in this country quite well, but reports are wanted very badly by the operator, who has not been able to hold two-way conversations with any English amateur transmitters.

This station uses a maximum of 400 watts, but has worked DX with only 28 watts. The circuit is quite conventional, consisting of an 80-metre oscillator, doubling to 40 metres, and redoubling to 20 metres. The output valve consists of a pair of 210's in push-pull.

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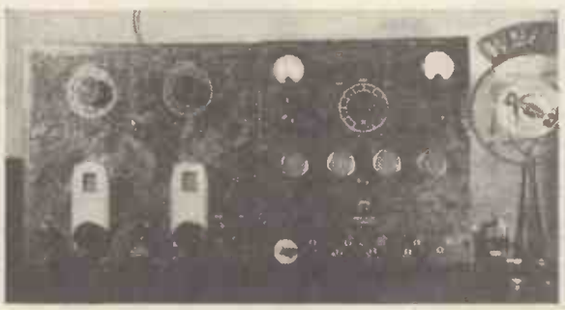
By the way, aren't you all bucked to find "A.W." so full of short waves? And there's a lot more to come!



Receiver and speech amplifier at W2GX, a modern crystal-controlled station working on 20 metres

Criticisms by WHITAKER-WILSON

My Broadcasting Diary

Sunday

A PLEASING concert to-night with the London String Quartet (leader Jean Pougnet) conducted by Herbert Menges. It is not every string quartet that excels in accompanying. This one does. A point in its favour.

Carroll Gibbons

Leon Goossens is, I suppose, one of the finest oboists in Europe. He completely won me both in the Handel and the Ticciati concertos, but a good deal of my pleasure was derived from the way the quartet played for him. And again when they played for Elsie Suddaby who sang Bach so delightfully in German.

Monday

I WASTED (rather than spent) some time in listening to Hindemith's ugly work *Das Unaufhörlische* and fell to wondering to whom it could possibly appeal. It must have cost a good deal to produce though (I trust) not £800, the price of *Wozzeck*.

A cast comprising Adelheid Armhold, Parry Jones, Harold Williams, Arthur Cranmer, the B.B.C. chorus, and a chorus of boys from St. Margaret's Westminster, cannot have been an inexpensive one. It seems to me rather like placing the emphasis in the wrong place. It made very bad broadcasting.

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However, there was a good compensation in *Scrapbook for 1914*—one of the best broadcasts ever. Leslie Baily's book did him credit and Charles Brewer's production was easily the finest thing he has done thus far. He can afford to be proud of his work.

These historical chronicles, especially when recent enough to have some of the people concerned in the studio, are really part of the B.B.C. service. This particular one must have brought home memories to many listeners.

I thought Harry Tate very amusing, but I wondered at the time whether amusement was what I really wanted just then. That is my only criticism of an excellent show.

Tuesday

WHAT I liked about the Command Performance was the evident good will of the artists. Sir Henry Wood wrote a fanfare; Haydn Wood wrote music for John Drinkwater's prologue and Frank Bridge for his epilogue. These men are not variety artists at all, and there is something pleasant about their readiness to help the cause.

The show itself did not make good broadcasting, but it could hardly be expected to. Listeners had to extract what radio entertainment they could and lump the rest. They must have realised that the B.B.C. made some attempt to replace items with visual value only when they sent Norman Long down to Brinsworth House to *compère* the veterans. He was charming to them.

[Photopress Photo
Leslie Baily

Lucan and McShane managed to produce a good deal that was acceptable by wireless; so did Murray and Malone. I quite liked George Clarke's sketch and also Hardwicke's *Carrier Pigeon*, but felt all the time I should be seeing it. The same with George Robey, of course. Billy Bennet came nearer to radio requirements than any of the male entertainers.

Naturally both Henry Hall and Jack Hylton were acceptable in the wireless sense, but quite the best turn in my view (and, as I have found out since, in that of several others) was given by Elsie and Doris Waters.

Christopher Stone made the most of rather a bad business in the strictly wireless sense, and my final conclusions were that seven-minute turns in radio variety are *right*. The length of some of these, though acceptable in the theatre, were wrong in the radio sense.

Wednesday

HOROWITZ, playing the Tchaïkovsky piano concerto, took Queen's Hall by storm. I have heard that work more times than years I have lived, but I have never heard it played as he played it. He is not yet thirty. A genius, pure and simple.

Thursday

THE audienceless variety quite good. Perhaps the Palladium affair overshadowed it. Davy Burnaby might give his limericking a rest for a bit, and Janet Joye might find some new people to imitate; also Alec Templeton (who is brilliant at times) might take care to be as good in future as he was *last* time.

I liked the Three Admirals, and Elsie and Doris Waters were again as good as ever.

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Rather attracted to that Magyar Orchestra of Walford Hyden's, and no less so to Segovia playing a guitar in a fashion quite new to me.

[Collins photo
Arthur Cranmer

Saturday

CARROLL GIBBONS' show quite good, but his *compère* feeble. John Tilley on the Army Estimates, on the other hand, was very funny. Carroll as a conductor infuses a good deal of first-class rhythm into his band. A modern version of Gibbon's *Rise and Fall?*

John Henry

ALTHOUGH John Henry has not been heard a great deal the last two or three years, most of us remember him with admiration and affection as a variety artist.

The last time I saw him was in St. George's Hall at a rehearsal of the *First Twelve Years* vaudeville. On the stage he seemed to be as jovial as ever, but when I talked to him in the hall later, I found him a little sad.

He will be missed as an artist whose sense of humour was as original as it was often subtle. All the deeper is our sympathy after having read of the sadness of his life. *R.I.P.*

W.-W.

Leaves from a Short-wave Log

By J. GODCHAUX ABRAHAMS

ONE of the greatest disappointments encountered by a short-wave enthusiast is that experienced when, after spending some time in tuning his receiver to a definite frequency, he fails to pick up the wanted transmission.

Putting aside any question of inefficiency on the part of the receiver—a matter with which I am not dealing in these notes—the most probable causes are (*a*) that at the time chosen the station is not working, or (*b*) alternatively, that in view of the hour of day or season of the year, another frequency is being used for the broadcast.

Summer Conditions

Although the spring and summer months, as a whole, will probably not produce the log one would secure during the autumn and winter periods, there still remains a number of foreign transmissions to be heard.

In the first instance, if a scheduled list of transmissions is available much loss of time and patience is avoided; in the second, although many stations carry out broadcasts experimentally, apart from a few exceptions the channels adopted are advertised in advance or announced in the course of the tests.

Generally speaking, the frequency band to be searched varies with the hour of the day or night. During May, June and July and possibly also August, we may assume that North and South American stations will be found from B.S.T. 2300 until 0530, on wavelengths between 30 and 50 metres; from 0530 until 0800 Australian broadcasts may be captured, also from the West coast of U.S.A. and South American States.

From the Far East

From roughly 0600 until about 2100 all waves from 200-500 metres; from the Far East (19-25 metres) and from the Western American coasts on the same band. Later in the evening we may remain mostly on the 40-55 metre band, as may be seen from the tables on pages 542-543 of this issue.

European amateur experimental transmitters are heard at odd times and in particular on Saturday afternoons and Sundays. They will be found on the 20 and 40 metre and 75-80 metre bands.

As regards U.S.A. stations, probably one of the easiest to identify is W2XE, Wayne (N.J.), the main short-waver of the Columbia system, which usually relays the WABC, New York, programmes. By means of a gramophone record the call is now put out at intervals in English, German, Spanish, French and Italian.

The exact wording of the first named is: "This is station W2XE, the experimental transmitter of the Columbia Broadcasting System, in the City of New York, United States of America." Alternatively, from time to time you will hear, "Your station is W2XE, New York, on . . ." and the frequency and wavelength are stated, namely, 25.34 metres or 49.02 metres.

One of the broadcasts worthy of capture is that which it carries out every Saturday night towards 10 p.m. E.S.T. (B.S.T. 0300 Sunday morning) when it relays messages from the Byrd Antarctic Expedition. You may also be lucky enough to hear them through LSX, Monte Grande (Buenos Aires) which, as a rule, is used as the half-way house. (When working on the 21-metre band as an experimental transmission, the call letters are W2GOQ.)

From W2XAF, Schenectady (N.Y.) on 31.48 metres, programmes destined to the members of the expedition are transmitted every other Sunday night from 11-11.30 p.m. E.S.T. (B.S.T. 0400-0430 Monday); they are also taken by over fifty stations in the N.B.C. network.

From 0430 the medium-wave stations close down, but W2XAF carries on with a reading of private letters and messages as this is the only channel through which the explorers can receive intimate news from their families and acquaintances.

It is an interesting fact to note that for the purpose of these special broadcasts the station has been equipped with a directional aerial which has made the transmitter in that particular direction almost equal to one of an energy of over 300 kilowatts!

Lucerne Plan Troubles

By JAY COOTE

IN view of the period of time the Lucerne Plan has been in operation, it is now possible to examine carefully its weakest points. On the long waveband many deviations from the original allotment of frequencies have taken place, and we have been saddled with two or three difficult problems to solve.

In the first place, the separation between Oslo (254 kilocycles) and Leningrad (245 kilocycles) is not sufficient considering the distance between these stations, and in addition interference is caused by Scheveningen-Haven (Holland) during part of the day. (Leningrad has since moved to 242 kilocycles.)

More Disturbances

Warsaw and Kharkov now both on 223 kilocycles (1,345 metres) are bad partners and spoil each other's broadcasts; with Eiffel Tower on 215 kilocycles and Motala on 216 kilocycles the position has become untenable although the French transmitter has seen its power reduced. The swamping of Kalundborg by Radio Luxembourg still persists; this 200-kilowatter is a disturbing element.

The return of Vienna Experimental on 240 kilocycles, notwithstanding the fact that it only works on three nights weekly, has not made matters easier; Austria was never given a channel in the "long-wave" band. Another intruder is Madona (Latvia) on 265 kilocycles, separated from Moscow (271 kilocycles) by 6 kilocycles.

No doubt some, if not all, of these troubles will be cured at the next meeting of the International Broadcasting Union in June.

As regards transmitters on the medium waveband, generally speaking, conditions are pleasanter, although, here again, in certain sections we find serious interference. Vienna, working on 592 kilocycles, is complaining that its programmes are marred by two Russian stations, Astrakhan and Archangel, which have adopted this channel. It does not appear credible, and yet observers confirm the heterodyne.

The French stations, no doubt due to their own "wobble," interfere with each other, as, for instance, Poste Parisien and Grenoble; Radio Toulouse is unhappy with Helsinki as an active partner on the same channel. Brussels (No. 1) now finds that Ivanovo-Vosnesensk (U.S.S.R.) causes a "whistle" and wishes to be freed from it.

Photopress photo

Brush Up That MORSE!

By F. D. CAWLEY
(Amateur Radio G5FC)

"WHAT is the quickest way of learning morse?" my friend Frank asked me last night. We had tired of listening to the American broadcasting on his short-wave receiver, and had been amusing ourselves for a few moments logging some of the liners' call-signs on the 35-metre band.

"There is no quick way," I replied, truthfully. Although I had no desire to discourage him, I saw no reason why I should beat about the bush. "You just have to keep at it until you know it."

"And how long does that take?"

"Naturally it depends entirely upon yourself and the amount of time you put in at the receiver. Normally, after a few months you should be able to pick out the amateur calls, even though you may not be able to get the message."

Frank looked pleased with himself.

Picking Up Amateur Calls

"I can pick out most of the amateur calls already," he said. "It is just a matter of knowing when to expect them. Amateurs either send *test* or *CQ* and then *de*, after which they send their call, and it is often repeated half a dozen times."

"That's right," I acknowledged, pleased to hear that he had already learnt the alphabet off by heart, for it seemed that it was going to save me quite a lot of trouble.

"Sometimes, too, you hear an amateur answering a test call or a *CQ*, in which case he will send the other fellow's call about twenty times, followed by *de* and his own call repeated three or four times."

"Does not that take a long time?" queried Frank.

"It does," I replied, "and you do not often hear British amateurs doing it. In fact it is one of the conditions of the British transmitting licence that when calling up the sign of the station being called is sent three times only, followed by *de* and the calling station's sign sent once, the whole sequence being repeated three times."

"And is that system as effective as the other one?"

"Oh, quite. No doubt you miss one or two contacts, but the majority are there. But this is not learning morse, is it? You are quite familiar with the alphabet?"

"As I say," answered Frank, "I can put down a call if it is sent several times, and not too quickly."

"You have got over one difficulty, then," I assured him. "All you need now is practice in recognising the letters immediately you hear them. One of the best ideas for you at the present stage is to find an article in the newspaper, and sing right through it, converting the words into the morse code as though you were actually sending them out over the air.

"When I say *sing*, I mean the *dah-di-dah* method, not *dash-dot-dash*. For instance, if you were sending the word *radio*, you would sing to yourself *di-dah-dit di-dah da-di-dit di-dit dah-dah-dah*. See what I mean?"

"By Jove, yes!" exclaimed Frank, heartily. "That sounds a fine idea! But that only helps in the sending part, doesn't it?"

"Not at all," I went on, encouraged by his enthusiasm, "it is helping you to recognise the letters more quickly. Of course, you ought to have about half-an-hour at the receiver each evening, and you should make it a rule that you will always listen-in to some morse stations at the same time every night."

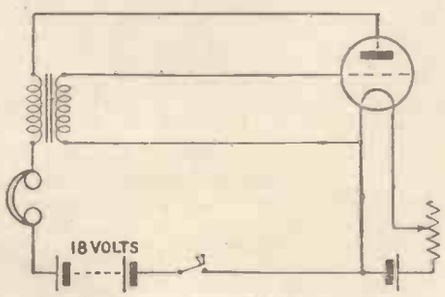
"Yes, but they all go too fast for me," Frank argued.

"It does not matter how much you put down on paper," I continued. "The point is that you are listening to morse, and getting thoroughly used to the sound of it. You will need a lot of patience to spend a whole half-hour listening to what seems like a foreign language, but in quite a short while you will begin to be able to put down odd letters here and there, and occasionally you will recognise a group of letters, such as *and* and *the*. When this stage is reached, it will not be long before you are able to take down quite long passages before you get lost."

"Oh, I'll manage that all right," said Frank, confidently. "I am game for as much practice as you like, if it has anything to do with wireless!"

"That's the spirit!" I smiled.

Then I suddenly remembered the single-valve oscillator circuit on which I used to spend many hours whilst learning morse. I drew a diagram of it, and handed it to my friend.



Circuit of oscillator for morse-code practice

"Have you got the parts handy to make up this oscillator?" I asked him.

Frank studied it for a moment.

"Why," he said, "there is nothing in it except a transformer and a valve! Certainly, I can fix this up in a few moments!"

"That's fine," I replied. "Go ahead, then, and build it up while I slip along home for my spare transmitting key."

◆ ◆ ◆

When I returned he had got it going and was enjoying himself tapping out the code by breaking the high-tension connection with the wander plug. It was the work of a moment to connect up the key, and I was soon putting Frank through his paces.

My friend was delighted with the way in which the note could be varied in pitch by adjusting the filament rheostat.

"I'll let you have this key for a little while," I said. "I daresay it will be quite a help to you."

"It certainly will," agreed Frank. "Thanks very much!"

"There is one thing you must be very careful about, though, if you intend to practise on a key."

"What is that?" he asked.

"You must be sure to start in the correct way," I continued. "If you get into the habit of holding the key incorrectly, you will find that after sending for a very short time your arm will become dead, making any further attempts at sending quite impossible."

"What causes that?"

"It is an effect known as 'glass arm,' and it is caused by the muscles of the wrist and arm contracting and refusing to function because the arm is being held in an unnatural position."

Practical Demonstration

By way of demonstration, I placed the key about a foot from the edge of the table, at a slight angle.

"If you sit at the table and rest your right arm on it, like this," I explained, "you will notice that in the most comfortable position your arm points slightly to the left. The key should be placed so that its arm points in the same line of direction as that along which your arm lies. The elbow must always rest on the table whilst you are keying."

"I see," remarked Frank. "But how about the key itself—which is the best way of holding that?"

"Oh, just whichever way you find it most convenient," I replied. "Most people tell you to grasp the knob with the thumb on the left-hand side, the middle finger on the right, and the forefinger along the top. The remaining fingers are then allowed to hang limply beneath the knob.

"Which way do you use?" Frank asked.

"I have a style of my own!" I replied, laughing. "You probably remember that I have one of those old 3-in. diameter ebonite tuning dials screwed beneath the knob of my key? Whilst keying, I have hardly any hold at all on the actual knob, the fingers resting comfortably all over the dial!"

"I think I shall try that style," remarked Frank.

"No," I went on, "find out the best way for yourself—do not rely on anyone else's method."

Medium-wave Broadcasters

This week we give details of all the important European medium-wave stations. Next week we shall publish a list of short- and long-wave transmitters.

Metres	Kilocycles	Station and Call Sign	Country	Power (Kw.)
203.5	1,474	Flymouth	Great Britain	.3
203.5	1,474	Bournemouth	Great Britain	1
204.2	1,469	Pecs	Hungary	1.25
206	1,456	Fecamp	France	20 0
208.6	1,438	Miskolez	Hungary	1.25
209	1,435.7	Beziers	France	1.5
209.9	1,429	Newcastle	Great Britain	1
211.3	1,420	Tampere	Finland	1.2
214	1,402	Sofia	Bulgaria	5.0
215	1,395.4	Radio Lyon	France	.7
216.8	1,384	Warsaw (2)	Poland	2.0
218.2	1,375	Basle, Berne	Switzerland	.5
221.1	1,357	Turin (2)	Italy	.2
222	1,351	Dublin (2)	Irish Free State	1.2
222 6	1,348	Koenigsberg	Germany	.5
222 6	1,348	Bordeaux S.O.	France	3.0
223.7	1,341	Milan Vigentino (2)	Italy	.7
224	1,339	Montpellier	France	.8
224.2	1,338	Lodz	Poland	1.7
225.6	1,330	Hanover and other Hamburg relays	Germany	1.5
227.1	1321	Magyarovar	Hungary	1.25
230.2	1,303	Danzig	Germany	.5
231.8	1,294	Linz and other Vienna relays	Austria	.5
233.5	1,285	Aberdeen	Great Britain	1
234.3	1,280	Dresden	Germany	1.5
235.1	1,276	Stavanger	Norway	0.5
236.8	1,267	Nurnberg	Germany	2
238.5	1,258	San Sebastian (EAJ8)	Spain	.6
238.5	1,258	Rome (III)	Italy	1.0
240.2	1,249	Juan-les-Pins	France	2.0
241.9	1,240	Cork	Irish Free State	1
243.7	1,231	Gleiwitz	Germany	5
245.5	1,222	Trieste	Italy	10
247.3	1,213	Lille PTT	France	1.4
249.2	1,204	Prague Strasnice (2)	Czechoslovakia	3
251	1,195	Frankfurt-am-Main and relays	Germany	17
253.2	1,185	Kharkov (2)	U.S.S.R.	35
255.1	1,176	Copenhagen	Denmark	10.0
257.1	1,167	Monte Ceneri	Switzerland	15
259.1	1,158	Moravska-Ostrava	Czechoslovakia	11
261.1	1,149	London National	Great Britain	50
261.1	1,149	West National	Great Britain	50
263.2	1,140	Turin (I)	Italy	7
265.3	1,131	Hoerby	Sweden	10
267.4	1,122	Belfast	N. Ireland	1
267.4	1,122	Nyiregyhaza	Hungary	6.25
269.5	1,113	Kosice	Czechoslovakia	2.5
269.5	1,113	Radio Vitus (Paris)	France	1.0
271.7	1,104	Naples	Italy	1.5
271.7	1,104	Madona	Latvia	15.0
273.6	1,096.5	Madrid EAJ7	Spain	3.0
276.2	1,086	Falun	Sweden	.5
277 2	1,082	Zagreb	Yugoslavia	.75
278	1,079	Bordeaux PTT	France	13
280.9	1,068	Tiraspol	U.S.S.R.	10
283.3	1,059	Bari	Italy	20
285.7	1,050	Scottish National	Great Britain	50
288.6	1,040	Leningrad (2)	U.S.S.R.	100
288.6	1,040	Rennes PTT	France	1.3
291	1,031	Heilsberg	Germany	60
291.7	1,028.5	Parede	Portugal	5.0
293.5	1,022	Barcelona (EAJ15)	Spain	2.0
296.2	1,013	North National	Great Britain	50
298.8	1,004	Bratislava	Czechoslovakia	14
301.5	995	Huizen (Hilv. prog.)	Holland	20
304.3	986	Genoa	Italy	10
304.3	986	Cracow	Poland	1.7
307.1	977	West Regional	Great Britain	50
312	962	Grenoble PTT	France	3.0
312.8	959	Poste Parisien, Paris	France	60
315.8	950	Breslau	Germany	60
318.8	941	Algiers	North Africa	13
318.8	941	Goeteborg	Sweden	10
321.9	932	Brussels (2)	Belgium	15
325.4	922	Brno	Czechoslovakia	35
328.6	913	Limoges PTT	France	.7
331.9	904	Hamburg	Germany	100
335.2	895	Radio Toulouse	France	8
335.2	895	Helsinki	Finland	10
338.6	886	Graz	Austria	7
342.1	877	London Regional	Great Britain	50
345.6	868	Poznan	Poland	17.0
345.6	868	Agen	France	0.4
349.2	859	Strasbourg	France	15
350	857	Bergen	Norway	1.0
352.9	850	Valencia	Spain	3.0
356.7	841	Berlin	Germany	100
360.6	832	Moscow (4)	U.S.S.R.	100
362.8	827	Radio LL, Paris	France	1.2
364.5	823	Bucharest	Roumania	12
368.6	814	Milan	Italy	50
373.1	804	Scottish Regional	Great Britain	50
377.4	795	Lwow	Poland	21.5
378.8	792	Barcelona (EAJ1)	Spain	8
382.2	785	Leipzig	Germany	120
386 6	776	Fredriksstad	Norway	0.7
386.6	776	Toulouse PTT	France	.7
391.1	767	Midland Regional	Great Britain	25
395.8	758	Katowice	Poland	16
400.5	749	Marseilles PTT	France	2.5
405.4	740	Munich	Germany	100
410.4	731	Seville	Spain	1.5
410.4	731	Tallinn	Estonia	11
414.4	724	Madrid (Espana)	Spain	1.0
417.2	719	Kiev	U.S.S.R.	36
420.8	713	Rome	Italy	50
426.1	704	Stockholm	Sweden	55
431.7	695	Paris PTT	France	7
434.8	690	Fredriksstad	Norway	0.7
435	683.9	Belgrade	Yugoslavia	2.8
443.1	677	Sottens	Switzerland	25
449.1	668	North Regional	Great Britain	50
455.9	658	Langenberg	Germany	60
463	648	Lyons PTT	France	15
470.2	638	Prague (I)	Czechoslovakia	120
476.9	629	Trondheim	Norway	1.2
476.9	629	Lisbon (tests)	Portugal	20.0
483.9	620	Brussels (I)	Belgium	15
483.9	620	Cairo (tests)	Egypt	20.0
491.8	610	Florence	Italy	20
499.2	601	Sundsvall	Sweden	10
499.2	601	Rabat	Morocco	6
506.8	592	Vienna	Austria	100
514.6	583.2	Riga	Latvia	15
514.6	583	Agen	France	0.5
522.9	574	Muhlacker	Germany	100
531	565	Athlone	Irish Free State	60
539.6	556	Beromunster	Switzerland	60
549.5	546	Budapest	Hungary	120
559.7	536	Wilno	Poland	16
569.3	527	Viipuri	Finland	13.0
569.3	527	Ljubljana	Yugoslavia	7
578	519	Innsbrueck	Austria	0.5
696	431	Oulu	Finland	1.2
724.8	413.9	Ostersund	Sweden	.6
748	401	Geneva	Switzerland	1.5
748	401	Moscow	U.S.S.R.	20.0
775.2	387	Boden	Sweden	.6
824	364	Smolensk	U.S.S.R.	10.0
833.4	360	Budapest (II)	Hungary	3.0
845	355	Vadso	Norway	10.0

NOTE:—The following wavelengths are common to several transmitters: 206 m. (1,456 kcs.); 207.3 m. (1,447 kcs.); 208.6 m. (1,438 kcs.); 211.3 m. (1,420 kcs.); 218.2 m. (1,375 kcs.); 221.1 m. (1,357 kcs.); 225.6 m. (1,330 kcs.); 228.7 m. (1,312 kcs.); 235.1 m. (1,276 kcs.); 236.8 m. (1,267 kcs.); 251 m. (1,195 kcs.).

Notes and Jottings

WORK on the Langenberg (Cologne) station is being hurried forward but, as certain improvements necessary for an increase in power to 100 kilowatts demand considerable alterations and additions to the existing plant, the station will be closed down from about the middle of May for three to four weeks.

The broadcasts will be carried out by the old 15-kilowatt transmitter during that period. By the end of June, both the new aerial tower and station will be ready to function again.

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Fluxite, Ltd., manufacturers of Fluxite soldering paste, have now moved to larger premises at Dragon Works, Bermondsey Street, London, S.E.1.

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A complete range of short-wave apparatus, suitable for use in the tropics or at the Poles, is shortly to be placed on the market by Wright and Weaire, Ltd. The short-wave amateur will find in this range every component he requires for any receiver or converter.

◆ ◆ ◆

Throughout the seven years of publication of the Braille *Radio Times* there has been a steady weekly increase in circulation. The sales for the week ending the seventh year were 2,740.

◆ ◆ ◆

A series of four lectures on television is to be given by H. J. Barton-Chapple at the Polytechnic, 309 Regent Street, London, W.1, on Wednesdays, from 6.30 p.m. to 8 p.m., starting on May 30.

The fee for the course is 6s. and leaflets giving details of the lectures are available from the above address

INFORMATION BUREAU

Will every querist please observe the following revised rules?

Please write concisely, giving essential particulars.

A fee of **one shilling**, postal order (not stamps), a stamped, addressed envelope and the coupon on this page must accompany all queries.

Not more than two questions should be sent at any time.

The designing of apparatus or receivers cannot be undertaken.

Slight modifications of a straightforward nature only can be made to blueprints. For more serious alterations the minimum charge is 2/6.

Blueprints supplied by us will be charged for in addition, but, of course, readers may send their own blueprints for alteration.

Modifications to proprietary receivers and designs published by contemporary journals cannot be undertaken. Readers' sets and components cannot be tested by us. Queries cannot be answered by telephone or personally. Readers ordering blueprints and requiring technical information in addition should address a separate letter to the Information Bureau and should see that their remittance covers the price of the Blueprint and the amount of the query fee.

We do not answer queries in cases where the fee is omitted.

Queries should be addressed to the Query Dept., "Amateur Wireless," 58/61 Fetter Lane, London, E.C.4.

The Output Stage

Continued from page 538

square root of this by the resistance of the speech coil in ohms.

Thus, the optimum load at 256 cycles for the LP2 valve is 7,100 ohms; the square root of this is approximately 84, and 84 divided by 15 is 5.6. The ratio will thus be about 5½ to 1. I can assure you that this is too low. From 15 to 20 to 1 is much nearer the mark.

AMATEUR: Is there any rule by which we can be guided?

PROFESSOR: You must remember that the ratio of valve impedance to speech-coil impedance works out on a wide scale, and that matching is not critical within limits.

A fairly safe rule, however, is to take the optimum load of the valve, find the square root, multiply the result by three, and divide this by the resistance of the speech coil.

AMATEUR: In short, the formula is:

$$\frac{\sqrt{(\text{optimum load}) \times 3}}{\text{resistance of speech coil.}}$$

PROFESSOR: You will find that this formula works. The matching ratio for the LP2 or PM2A thus becomes 17 to 1.

AMATEUR: So we can choose a transformer with this ratio.

PROFESSOR: As long as the inductance of the primary winding is not less than 20 henries, with a D.C. resistance of not less than 300 ohms and not more than 400 ohms, the ratio can be anything between 15 and 22½ to 1 to match a speech coil of 15 to 20 ohms.

AMATEUR: And suppose the resistance of the speech coil is less than 15 ohms?

PROFESSOR: You have the formula, so there is no difficulty in working out the ratio.

Correction

On page 523 of the May 19 issue of "A.W." we referred in a caption to the Mullard "DB26" valve. No such valve exists and the reference should have been to the "Pen 26."

NEXT WEEK!

Full constructional and operating details of the "A.W." Short-wave World-beater, a preliminary announcement of which appears on pages 544-546 of this issue.

Noel Bonavia-Hunt will conclude his real-quality series with an article going into details for a battery-set design for the best possible reproduction.

A new type of visual tuning indicator—of which neon forms the basis—will be described by J. H. Reyner.

Percy W. Harris will discuss a subject of importance to every set owner—whether the receiver has been built or bought.

✳ FULL-SIZE BLUEPRINTS ✳

When ordering, please send Postal Order, NOT STAMPS. Quote the Blueprint number shown below: not the number of the issue.

CRYSTAL SETS (6d. each)

1931 Crystal Set	AW308
Four Station Crystal Set	AW427

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Easy-to Build One	AW304
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B.B.C. One-valver	AW387
S.W. One-valver for America	AW429

TWO-VALVE SETS (1s. each)

Home Station A.C.2 (D, Pen)	AW374
B.B.C. National Two (D, Trans)	AW377
Melody Ranger Two (D, Trans)	AW388
"A.W." Iron-core Two (D, Trans)	AW395
"A.W." Iron-core Two with Q.P.P.	AW396
Big Power Melody Two, with Lucerne Coils (SG Trans)	AW338A
B.B.C. National Two, with Lucerne Coils (D, Trans)	AW377A
Consolectric Two (D, Pen) A.C.	AW403
Lucerne Minor (Det, Pen)	AW426
Screen-grid Two (SG Det, Trans)	WM289
A Two for 7 Metres (D, Trans)	WM295
New-style Radiogram (D, Trans)	WM299
A.C. Quality Gem (D, Trans)	WM312

THREE-VALVE SETS (1s. each)

Everybody's Home Radiogram (SG, D, Trans)	AW381
Our Up-to-the-Minute Three (SG, Westector, LF, Trans)	AW384
Class B Three (D, Trans, Class B)	AW386
"Up-to-the-minute Three" with Class B, 1/6	AW384B
A.C. Triodyne (SG, D, Pen)	AW399
Home-built Coil Three (SG, D, Trans)	AW401
Fan and Family Three (D, 2LF)	AW410
£5. 5s. SG. 3 (SG, D, Trans)	AW412
A.C.-D.C. Universal Three (SG. Det, Pen)	AW414
1934 Ether Searcher (SG, Det, Pen) Baseboard	AW417
1934 Ether Searcher (SG, Det, Pen) Chassis	AW419
Lucerne Ranger (SG, Det, Trans)	AW422
P.W.H. Mascot (Det, R.C, Trans)	AW337A
Cossor Melody Maker with Lucerne coils	AW423
Mullard Master Three with Lucerne coils	AW424
Schoolboy's Three (Det, 2. RC)	AW428
Penta-quester (HF, Pen, Det, Pen)	AW431

FOUR-VALVE SETS (1s. 6d. each)

"A.C. Melody Ranger" (SG, D, RC, Trans)	AW380
Home-lover's New All-electric 3 for A.C. mains (SG, D, Trans)	AW383
Melody Ranger (SG, D, RC, Trans) with copy of "A.W." 4d. postage	AW375
Signpost Four (SG, D, LF, Class B)	AW398
"A.W." Ideal Four (2SG, D, Pen)	AW402
2 H.F. Four (2SG, Det, Pen)	AW421
Lucerne Major (SG, Det, RC, Trans)	AW433

FIVE-VALVE SETS (1s. 6d. each)

The Etherdyne (Super-het)	AW406
Super-quality Five (2 HF, D, RC, Trans)	WM320
Ideal Home Super (Super-het)	WM280
Easytune 60 (Super-het)	WM284
New Class-B Five (SG, D, LF, Class-B)	WM340
Class-B Quadradyne (2 SG, D, LF, Class-B)	WM344

SIX-VALVE SETS (1s. 6d. each)

1934 Century Super (Battery super-het)	AW413
1934 A.C. Century Super (Super-het)	AW425

SEVEN-VALVE SETS (1s. 6d. each)

Super Senior (Super-het)	WM256
Seventy-seven Super (A.C. Super-het)	WM305

PORTABLES (1s. 6d. each)

General-purpose Portable (SG, D, RC, Trans)	AW351
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Everybody's Portable (five-valve Super-het)	WM291
Spectrum Portable (SG, Det, QP21)	WM357

AMPLIFIERS (1s. each)

Universal Push-pull Amplifier	AW300
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Universal A.C. Amplifier (3-valve)	AW411
Five Q.P.P. Output Circuits	WM315

MISCELLANEOUS (1s. each)

"A.W." Trickle Charger	AW352
Add-on Band-pass Unit	AW359
Plug-in Short-wave Adaptor	AW382
Experimenters' D.C. Mains Unit	AW430
Experimenters' A.C. Mains Unit	AW432

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

Amateur Wireless Blueprint Dept., 58-61 Fetter Lane London, E.C.

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DOES YOUR DOG ENJOY THE RADIO?

Dog lovers may wonder how their pets really react to the radio . . . they may ponder on the puppy who whines when the radio soprano breaks a top note, while other dogs sit in silence. Then there are some pets who can recognise their master's voice on the radio, while others do not seem to recognise the familiar tones when relayed through a loud-speaker. Craven Hill, F.Z.S., in a domestic interest article, in Friday's *Radio Pictorial*, tells you as much as can be humanly known about the reaction of domestic pets to radio : so if you have a cat or dog of your own you cannot fail to be interested.

The following are some of the other fine contents of this Issue :—

WANDERING MINSTRELS LIMITED
A thriller by A. J. ALAN in his usual inimitable style.

A FULL-PAGE PORTRAIT OF HARRY HEMSLEY
—the popular radio child impersonator.

AT HOME WITH LEONARD HENRY
—We take you to the famous comedian's home and disclose the secrets of his private life.

THE STORIES OF MY LIFE
by LEW STONE. This popular dance band director has written this exclusive feature specially for *Radio Pictorial*.

WHAT THE B.B.C. PAYS ITS ARTISTS
By PAUL HOBSON

ETC., ETC.

There are pictures of the favourites you listen to, a corner for the children and a splendid feature of interest to every woman. A great two-penny worth !

Take a copy home with you—the rest of the family will enjoy it too!

2D

ON SALE FRIDAY NEXT—MAY 25

RADIO PICTORIAL