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Amateur Wireless

and Radiovision

3d Every Wednesday

HOW TO BUILD YOUR OWN LOW-FREQUENCY TRANSFORMER

A Special Article by "The Experimenters"

MICRO-RAYS NOW SPAN THE CHANNEL

WHAT IS THIS KILOCYCLE BUSINESS?

USING THE H.F. PENTODE

THREE WAYS of PUTTING YOUR DETECTOR RIGHT

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News and Gossip of the Week

Future of Studio BB

As soon as the television signals have finished on Friday, February 16, B.B.C. engineers will get busy converting studio BB back into something fit for Henry Hall and his boys to play in.

As you may know, this temporary BB studio was built for the dance-band broadcasts, but they were elbowed out about eighteen months ago.

Too Lively Acoustics!

Sound engineers want to cut down the reverberation period of the BB studio before Henry takes it over again. It is now .85 second, only exceeded by the 1.1 seconds of the Military Band studio.

They think .85 second is much too lively for a dance band. Let's hope they don't damp Henry's ardour as much as the acoustics.

Noises in BA?

Perhaps Henry will never settle down in this BB studio, for near by is the BA vaudeville studio. Already they have had trouble in BA through the sounds of tube trains running underneath.

Possibly "Tiger Rag" and such-like numbers will prove even more interfering with the shows in BA. You might listen for any sign of cross talk when the band moves into BB.

Television Hiatus

No television on the 30-line system will be broadcast from Friday, February 16, until Monday, February 26, while the gear is transferred from studio BB to No. 16 Portland Place along the road.

Ardent lookers will have to concentrate on the ultra-short-wave signals from the B.B.C. and from Baird's show on the top of the Crystal Palace.

Towards Better Images

When the new studio is fitted up with the two television sets—standard and miniature—you will probably look in to better images.

For this reason: The new studio will be the large room on the first floor of No. 16, which is oblong like BB studio, but with the great advantage of a wide recess at one end.

This will enable the projectors to get a wider sweep, thus enlarging the permissible background.

Ship's Morse Again

Here is a queer offshoot of trade revival. More ships are being released from long sojourns in dock, and much more traffic is going up and down the Channel as a result.

Many of these ships are using old-fashioned spark transmitters, as London Regional listeners have been finding to their chagrin of late. Tatsfield is busily trying to track down the offenders.

Polite to Pirates!

Why is the B.B.C. so polite to ether pirates?

After all the fuss about Eiffel Tower heterodyning Daventry National, we should have thought relations between the B.B.C. and the Frenchman would be somewhat strained.

Not a bit of it! The other night we sent them one of our symphony concerts from Queen's Hall over land-line. What next?

Care-free Luxembourg

What a jolly country Luxembourg must be. It does not seem to be bothered with such onerous responsibilities as copyright laws, anyway.

Recently the Radio Luxembourg sponsors have been building up programmes of Henry Hall records—fooling many listeners into thinking Henry was over there.

Protests from the recording company fall on deaf ears.

That B.B.C. Film

What a shame they have decided to drop the "love interest" from the much-discussed film of Broadcasting House. We should worry!

John Grierson has this film in hand, and is busy taking shots of such exciting events as a meeting of the Programme Board, a radio play in progress, broadcasts to schools, and vaudeville shows.

Tea-time Mixture

As a sort of variation of the "First Time Here" series, Eric Maschwitz is nearly ready with his "Tea Mixture" for Saturday afternoons.

You can tune into the new series on the first Saturday in March. In addition to "mike" debutantes, we shall hear one or more well-known stars of the air.

Charles Brewer will produce the shows, for which he has written a catchy signature tune. Wait for it!

Cooling Droitwich

What a lot of water they have to use at modern broadcasting stations!

We muse thus as we record the exciting news that no less than 300,000 gallons of water have been poured into the concrete pond at the new Droitwich station.

The next thing is the installation of the actual transmitters, and before we quite realise it first tests will be on the air.

H. D. Price, well-known amateur transmitter G6HP, who is entering the annual transmitting and receiving contest again. For latest short-wave news see Kenneth Jowers' short-wave notes on page 177 of this issue

New Bristol Studios

Our good friend Mr. Proctor is busy with his designs for the Bristol studios in Whiteladies Road. Work goes ahead on the large orchestral studio being built in the back garden of the house.

Meanwhile the dramatic studio is already being acoustically treated, and the talks studio is actually in use, though with only temporary drapings.

These studios mean better programmes for West Regional.

Exchanging Radio Producers

Peter Creswell, London station producer, goes off the West Regional for a spell in the spring, while Cyril Wood comes across in exchange. At the same time Howard Rose will be back again in London from Scotland.

Mr. Wood has some hard work ahead. He is down to do a play from Shakespeare, an E. M. Delafield adaptation, and a specially written microphone play.

Tempting Away B.B.C. Men

Peter Fleming, who went round the world before he joined "Talks," has left the B.B.C. to take up a very nice post in Fleet Street.

Which reminds us that the B.B.C. cannot compete with outside interests when it does find bright young men. They are quickly snapped up by organisations that can well afford top-line salaries.

The Right Detector

Sure yours is right? According to Kenneth Jowers, on pages 166 and 167, far too many amateurs are using the wrong detector valve.

Read his article and reassure yourself—or profit thereby and put in a new one.

For the Home Builder

We have made a real hit with our "Experimenters" articles on coils, chokes, and transformers.

Thousands are building the coils for Lucerne conditions, and many will certainly go in for the well-designed transformer described on page 163 this week.

Micro Rays Now Span the Channel

Back in the October 28 issue of "Amateur Wireless" we gave details of the Lympne-St. Inglevert tests on 17 centimetres, and now, in this topical article, ALAN HUNTER records his impressions of the commercial micro-ray service just introduced

Control equipment at Lympne for the micro-ray link with St. Inglevert across the 35 miles of the Channel

MY voice has just been flashed across the English Channel on a wireless beam of only 17 centimetres. For at Lympne, in Kent, I have just been talking to a colleague at St. Inglevert in France via the new micro-ray.

Sir Philip Sassoon exchanged the usual felicitations with M. Delesalle—his opposite number, the French Under-Secretary for Air. Then, the new service officially open, we all had a chance to hear what a 17-centimetre telephone signal sounded like.

Just like any other telephone conversation, as a matter of fact. Very clear, no fading, no atmospherics—and no crossed lines, of course.

Early Experiments

We were making use of an idea that first saw light about two years ago, when Standard Telephones and Cables, Ltd., tried out this very short wavelength of 17 or 18 centimetres across the Channel between Dover and Calais.

It worked, this ultra ultra-shortwave wireless—so well that the company went right ahead with its commercial development. The Lympne-St. Inglevert micro-ray service is the result. It is the shortest wavelength commercial service in the world.

As I approached the Lympne airport I saw the two reflectors mounted on steel towers, one for reception and one for transmission. Very like searchlights, they looked. Not a bad simile, because these centimetre waves are actually focused like light, into a thin beam that "shines" across the Channel on to the receiving reflector at St. Inglevert.

These reflectors are 10 feet in diameter, and made of aluminium. They concentrate the transmitted energy into the fine pencil of energy that spans the Channel. The actual transmitting aerial is *less than one inch long*!

From Lympne the tiny waves go out on exactly 17 centimetres, but from St. Inglevert to this side the wavelength is 17.5 centimetres. This slight staggering of the two signals enables duplex working to be carried on.

I had a look at the micro-audion valve they use for this remarkable transmission. It is indeed a simple little tube. Just a grid, anode and filament, with two brass rods coming out of the top of the bulb from the ends of the grid spiral. These rods have two little adjustable nuts on them, so that by moving them up and down the coupling between the valve and the rest of the apparatus can be varied.

Very Small Powers

Diminutive powers suffice to run this service. The whole outfit, including the Creed teleprinters, takes only 700 watts. The aerial input is about 15 watts—much less than we use for an electric-light bulb. As for the radiated power, it is less than you need to light a pocket flash lamp.

Yet, as I say, with this micro ray they can talk directly across the Channel—night and day, whatever the weather.

Until now messages from Lympne to the other side have been land-lined up to Croydon, where they have then been sent by wireless telegraphy on the usual 1,300 metres aircraft channel. Sometimes this procedure has taken as long as twenty minutes, whereas over the micro-ray service of direct communication the longest time taken will be about 2 minutes, and usually only a few seconds.

Now this speeding up is highly significant to aircraft crossing the Channel. It is the usual practice for aeroplanes not equipped with wireless to circle the airport just before leaving the coast and to circle immediately they get across to the other side. Any untimely delay in reporting in this way sets in motion all the available machinery for searching for missing aircraft.

Aerials less than one inch long are used for the 17-centimetre signals, which are concentrated in 10-foot reflectors

With a following wind a 'plane can easily cross from Lympne to St. Inglevert in less than 20 minutes, so that under the old system it often happened that the 'plane got to the other side before the notification by wireless of its departure.

With the micro-ray system every 'plane that observes the procedure will be sure of immediate notification. This should certainly lessen the risk of air channel crossings, both for civil and commercial aircraft.

There is no doubt that micro-ray links will develop. They provide a cheap and as far as I can see infallible means of spanning short distances. Across channels or open country they can be directed with ease, giving interference-free communication coupled with almost complete secrecy.

Micro rays are *not* broadcast, remember. They are directed into a straight line—and act very much as a land line. In fact these rays will no doubt be widely adopted for short-distance links now making use of costly land lines. There is talk of a London-to-Paris service, with the Lympne-St. Inglevert micro-ray link replacing the submarine cable through which all 'phone talks now have to go.

Typewriting as well as telephoning can be handled by the micro-ray. Here is a Creed operator typing a message across the Channel

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Shakespeare is to be represented as the "Father of Wireless" in a pageant of British industries, which is to take place at the British Industries Fair dinner ball. Miss Gwenn Lally is pageant master. She regards Shakespeare's Ariel in *The Tempest* as the forerunner of wireless.

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Where is your address book? Another change of address. The Technical and Commercial Radio College has moved to Cromwell House, High Holborn, London, W.C.1.

A replacement battery for the Ekco receiver is being made by Britannia Batteries, Ltd. The type number is 330, and the price 18s. 6d. It is of higher capacity than the battery supplied with the set.

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Ohmic Accessories, of 8 Myron Place, Lewisham, S.E.13, ask us to correct the price details of their kits for making "The Experimenters'" components. The price of the coils is 2s. 6d. each as stated, but 6d. for postage on either a single coil or a pair must be included with your order. Postage for the transformer kit described this week on page 163 is also 6d., while for the high-frequency choke the postage is 3d.

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Replacement batteries are being manufactured by Ever Ready for the new G.E.C. Super-heterodyne 6 receiver, type BC3446. The voltage of the battery is 140, suitably tapped, with a 9-volt grid-bias battery included. The list number of this replacement battery is W1250 and the price 14s.

What Is This Kilocycle Business?

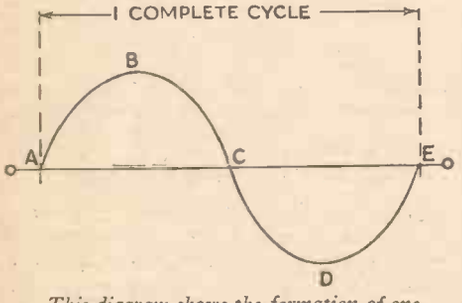
By the "A.W." Technical Staff

HOW often have you been puzzled by the mystic phrase, "nine kc. separation?" What do you think it means? Something to do with selectivity, obviously. Something to do with stations in the ether—but *you* know that stations have wavelengths, so why this reference to a separation by such a mysterious unit as a "kc.?"

What, to go on asking questions, *is* a kc.? Well, for a start it is a *kilocycle*. Which is 1,000 cycles. So that brings you up against the word cycle. What is a cycle? Let's say a series of events in time.

Matter of fact, that is just what a cycle means in wireless. Just a series of electrical events in a given time—actually a second. Now these events are very interesting. They refer to what happens to the high-frequency current at the transmitting station.

Look at our simple diagram. There is a zero line above and below which the current is represented as varying in strength. The series of events we are talking about—the cycle, in other words, is this: Current starting at A, rising in value to its maximum at B, waning to zero again at C, reversing direction and



This diagram shows the formation of one complete cycle

rising to a maximum at D, which is the same value as B, and finally waning again to zero at E. All this represents *one cycle* of a wireless wave.

Now we come to something very important. The number of times that this cycle takes place in one second of time is called the frequency of the signal.

A.C.-mains Frequency

Take a very simple example. Your A.C. electric mains are probably 50 cycles, which means that the current completes one full cycle in one-fiftieth of a second, that is, 50 cycles per second.

In much the same way a wireless wave can be classified by its frequency, only the frequencies are *very much higher*. Take Daventry, for example. This has a frequency of 200,000 cycles, or, since 1,000 cycles equals 1 kilocycle, 200 kilocycles—that is, 200 kc.

Do you realise that you have approached wireless waves, perhaps for the first time, without thinking about *wavelength*? Yet Daventry, just mentioned, has a wavelength, of course. It is 1,500 metres.

There is a connection between Daventry's frequency of 200 kc. and its wavelength of 1,500 metres. We had better find out what this connection is. *The connection is the speed of the waves through space.*

All wireless waves travel at the same speed—whatever their wavelength or frequency. You can imagine yourself perched at some fixed point in the ether watching the waves go by. As you sit in your ethereal position, 200,000 waves from Daventry will pass you in a second at the enormous speed of 300,000,000 metres per second.

Now you know the *speed* of these waves, and you know *how many* are passing you *every second*. From these two facts you can easily find out what is the length of each wave. You simply divide the speed by the number of waves and that gives you the length of each. Taking Daventry's figures, we have the speed of 300,000,000 metres per second, divided by Daventry's frequency of 200,000 cycles per second. The answer is 1,500 metres, which is, of course, correct for Daventry.

In the same way every station's frequency is co-related to some wavelength. For another example, take a medium-wave station with a frequency of 1,000,000 cycles. Divide this into the speed, which is 300,000,000 metres per second, and you get the wavelength as 300 metres.

In passing, you might note that this little sum can be reversed, so that knowing the station's wavelength you can find its frequency. Take Daventry again. Imagine the wavelength this time is known but the frequency unknown. The speed, as before, is known—a figure *always* known *because it is the same for any station at any time.*

The wavelength is 1,500 metres. The speed is 300,000,000 metres per second. Divide the speed by the wavelength. This gives you 200,000 cycles or 200 kc.—as before.

By now you ought to see that wavelength and frequency are very closely connected—in fact, to an engineer they are interchangeable, because the common factor is always the speed, which is the same for all wavelengths.

You might ask why we always refer to the *frequency* separation of stations—as in the Lucerne Plan—and not to the wavelength separation. We have said that these two things — wavelengths and frequencies — are interchangeable—so why not? Well, there is a very good reason.

The wavelength—that is the length of each wave, remember—is different for every station. The medium-wave stations have much shorter wavelengths than the long-wave stations. This means that the frequency with which a medium-wave station's wave will pass a given point is much higher than the frequency of a long-wave station's wave.

But that is not all. On the medium waves, especially near the bottom end of the band, a difference of 9 kilocycles in frequency means very little difference in wavelength. Many stations can be crowded into an apparently small waveband. Actually the frequency

Relationship between frequency and medium wavelengths

Kilocycling with the latest Marconiphone set—the model 262

difference between the two wavelength limits of this band and the medium band is very wide. Taking it from 200 to 550 metres, we have a frequency difference of 1,500 to 545 kc., which is 1,005 kc. This for a wavelength difference of 200 to 550, which is 350 metres.

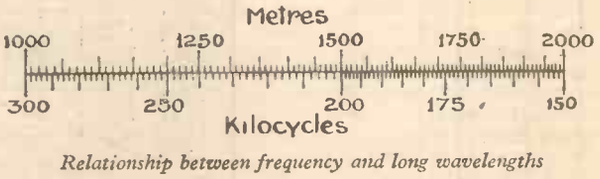
Going on the long waves, the rapid decline in the frequency difference for a given wavelength difference is very easy to see. Taking the wave-band as 1,000 to 2,000 metres, we have a frequency difference of 300 to 150 kc., which is only 150 kc. frequency difference for the whole of the long-wave band.

Frequency Separation

Here is a simple example to show what we mean. If you look at last week's wavelength list on page 142 you will see that Heilsberg has a wavelength of 291 metres and a frequency of 1,31 kilocycles. Rennes P.T.T. has a wavelength of 288.6 metres and a frequency of 1,040 kilocycles. These stations are separated by a frequency of 9 kilocycles. But the wavelength difference is only 2.4 metres.

Now go on the long waves. Kalundborg has a wavelength of 1,261 metres and a frequency of 238 kilocycles. Luxembourg has a wavelength of 1,304 metres and a frequency of 230 kilocycles. The frequency difference is only 8 kilocycles, but this means a difference in wavelength of 43 metres.

It so happens that for transmission without mutual interference wireless stations must not use frequencies closer together than about 9,000 kilocycles, that is 9 kilocycles. If the



Relationship between frequency and long wavelengths

stations are to be separated by this amount you can easily see that many more stations can be fitted in the medium band, with its very wide frequency difference, than in the long waveband, with its much smaller frequency band.

In other words, you can get at the number of permissible stations in each band by dividing the frequency band in this figure by 9. For the medium waves this gives us 1,000 divided by 9, which is no less than 110 stations. Compare this figure with the long band, with its frequency difference of 150. We can get only 150 divided by 9, or less than 17 stations.

Under the Lucerne Plan an attempt has been made to crowd many more stations into these two bands by making low-power stations share common frequencies.

Getting the Best Out of the High-

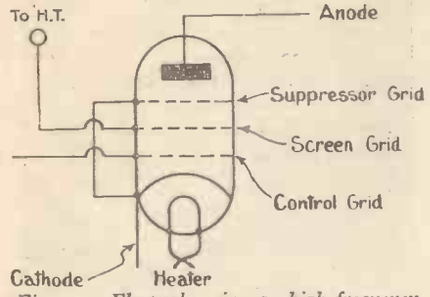


Fig. 1.—Electrodes in a high-frequency pentode

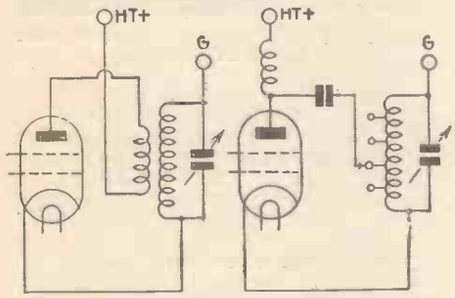


Fig. 2.—Coupling transformer and tapped coil used with an ordinary screen-grid valve

IF you take the screen-grid valve from the high-frequency stage of your receiver and fit in its place one of the new high-frequency pentodes, the chances are that you will not notice much difference in the results.

Yet it is true to say that the high-frequency pentode is a better valve for high-frequency amplification than the screen-grid type. It must be used properly, of course, and the circuit values be adjusted in order to obtain the best results.

To change from one valve to the other without considering the circuit values is not fair, because the conclusions drawn from so elementary a test are not reliable.

Extra Grid in the Pentode

The high-frequency pentode has one more grid than the screen-grid valve, as shown in the diagram (Fig. 1). This extra grid lies between the anode of the valve and the normal screen grid. It is joined to the cathode and is sometimes called the suppressor grid.

The chief effect of this suppressor grid is to avoid the negative-resistance kink which is present in the characteristic of ordinary screen-grid valves. This kink restricts the working voltages which may be used, and the pentode may be employed with safety to provide much bigger outputs.

This is an advantage worth having, as it has always been necessary to design a circuit having a screen-grid stage with great care. The same care is, of course, essential in the case of a high-frequency pentode, but as bigger outputs can be obtained for feeding the detector, this particular difficulty is avoided.

Higher Amplification Factor

Now, a high-frequency pentode normally has a much higher amplification factor than a screen-grid valve, and its anode impedance is greater. From this three things follow.

The first is that, as the pentode has a greater impedance, tuning should be more selective. This is because the loading effect of the valve upon the tuning circuit connected to its anode is reduced. The actual improvement in the tuning may well be slight, depending as it does upon the characteristics of the tuning circuit and the following valve.

But every little helps, and attention to the circuit with this feature in mind will probably result in a worth-while improvement.

The second point to note is that greater magnification can be obtained, or, put in another way, the sensitivity can be improved provided the tuning circuit is suitable.

In many sets having a screen-grid valve, a coupling transformer is used, or a tapped coil, as in Fig. 2. Now, as the high-frequency pentode has a greater impedance than the screen-grid valve, it will normally be correct to use a larger primary coil, or to take the anode to a tap nearer the grid end of the coil in Fig. 2.

The effect in both instances is to increase the impedance connected to the anode circuit and this will increase the magnification or sensitivity. There is, naturally, a limit beyond which you cannot go, the limit being the point where instability is produced.

The factors are therefore (*a*) the completeness of the shielding of the parts in the grid circuit from those in the anode circuit, Fig. 3; (*b*) the degree with which common couplings, such as may be present to a slight extent in grid bias, cathode, screen-grid and anode circuits, are eliminated; and (*c*) the efficiency of the coils, tuning condensers and how they are connected. With poor shielding the set will oscillate before much magnification is obtained, and the circuits must be properly decoupled.

With poor coils the tuning will tend to be broad and maximum amplification will not be obtained. If we use good coils, however, we shall be able to obtain considerable amplification and good selectivity provided shielding, decoupling and circuit connections are correct.

The third point is that considerable voltage outputs can be obtained when necessary to feed, for example, an anode-bend detector or one of the diode type valves or a Westector.

Put briefly, therefore, in order to get the best results from this class of pentode, it is necessary to give attention to the tuning circuits, how they are connected and also to the working voltages.

We want first of all a high-impedance tuning circuit. This is obtained from good coils and tuning condensers. Complete screening is

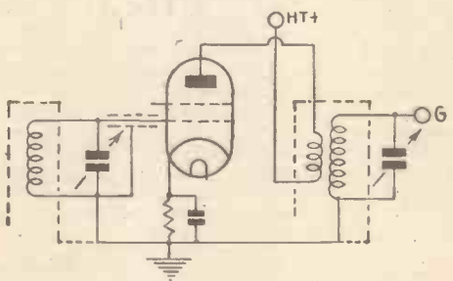


Fig. 3.—Shielding of the parts in the grid circuit from those in the anode circuit

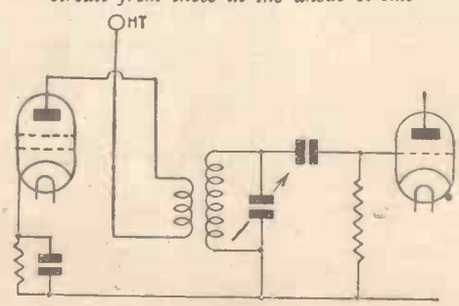


Fig. 4.—Leaky-grid detector circuit connected across the whole of the tuning coil

necessary. As the tap is raised up the coil (Fig. 2), or as the size of the primary is increased, so is the impedance increased.

We must avoid loading the circuit by the detector. If the leaky-grid type is used, and is connected across the whole coil (Fig. 4), the tuning circuit will be loaded. This will broaden the tuning and the amplification will be reduced.

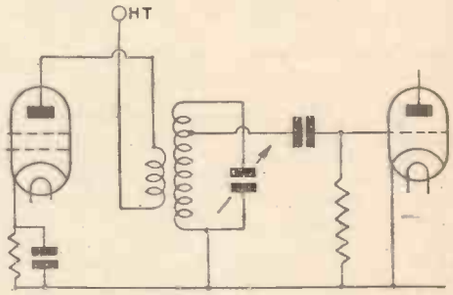


Fig. 5.—Connecting the detector to a tap on the grid coil

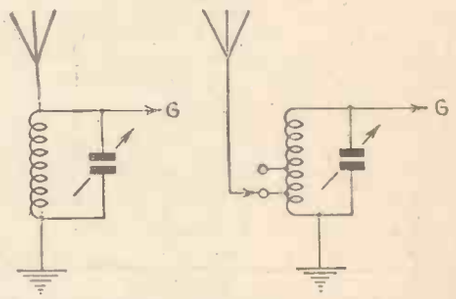


Fig. 6.—Aerial connected to the top of the tuning coil

To avoid this the detector may be connected to a tap on the grid coil, as in Fig. 5. The effect of doing this is to place the load of the detector across part of the coil, and so the effective load across the whole coil is less than when the detector is connected to the top of the coil. At the same time, the voltage applied to the detector is a fraction of the total voltage built up across the whole coil.

But, as the loading is reduced, the amplification is increased. It therefore follows that the voltage applied to the detector may be no less when it is connected to a tapping than when it is joined to the top of the coil.

Thus there is a gain by using the tap, being in this case improved selectivity. The use of good coils involves also the use of a good gang tuning condenser, and also the coils must have equal inductances.

Effects of Ganging Errors

It will be clear that a slight error in ganging is likely to be more serious in a sharp tuning circuit than in one tuning broadly. Coils and condenser must be good, therefore, or sharp tuning will not be obtained and the amplification will be below normal.

Further consideration of sharp tuning circuits brings out various interesting points which may well pass unnoticed when ordinary coils are used. There is the aerial circuit, for instance. An aerial has inductance and capacity. When an aerial and earth is joined to a coil, the tuning may be altered because of the addition of the inductances and capacity to the tuning circuit.

It would be useless to join the aerial to the top of the coil (Fig. 6), because gang tuning would be impossible, so great would be the added capacity. If the aerial is taken to a tap on the coil, however, the effect of the

frequency Pentode Valve

Very great interest is being taken by amateurs in the possibility of the high-frequency pentode, especially now that battery types are available. In this article W. JAMES explains all the special points that should be watched when these valves are used in a receiver. Much interesting experimental work can be done with this new type of screen-grid valve

capacity (and inductance) of the aerial is reduced.

By taking the aerial to a lower tap, that is, nearer the earth end, the effect is still further reduced, and a point may be found where the effect may be balancing the trimming condensers provided on the gang condenser. At the same time, the voltage actually set up across the grid coil will vary with the point to which the aerial is joined.

Need for Accurate Tuning

In practice it is often necessary to have a tap which allows of accurate tuning over the whole range, even though the signal strength is brought down to below the best which could be obtained by choosing a different tap.

With this circuit, signal strength and selectivity are involved, and the best arrangement is sometimes the one giving the best of both. But when a set having a large amount of magnification is being designed, selectivity is probably more important than the signal strength set up across the first coil.

A separate aerial coil is sometimes used instead of a tap, but if the greatest care is not taken it is possible for the results on the average to be less satisfactory than when the grid coil is tapped.

Now, valves have capacity, and one valve may have a capacity between grid and earth, different from another. It is possible to re-gang, of course, when a valve is changed, but it is possible to avoid this, at least to some extent, by connecting the grid to a tap on the coil. At the same time, this tends to stabilise the circuit, and is a little trick well worth adopting on occasions.

The voltage applied to the valve is a little less than the maximum when this method is used, it is true, but something cannot be had for nothing.

This point is also liable to crop up in the detector circuit as well. A detector has capacity. The capacity may not be of constant value at the various wavelengths. This is because the effective capacity is usually greater than the capacity between the electrodes of the valve measured under non-amplifying conditions.

A screen-grid valve or high-frequency pentode valve does not produce this effect to any extent, but the ordinary type of three-electrode detector valve does.

It is, therefore, better to use a pentode or screen-grid valve as detector when possible.

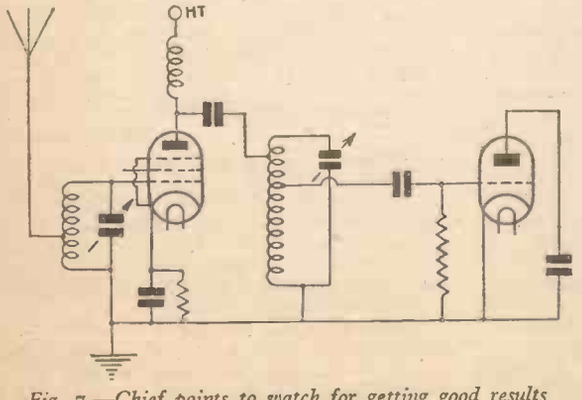


Fig. 7.—Chief points to watch for getting good results from a high-frequency pentode

A large condenser connected between the anode and the filament or cathode of a three-electrode valve reduces the effect and enables more accurate tuning to be obtained.

It will be seen that in order to obtain the best results from a high-frequency pentode, good tuning circuits are essential and they must be properly connected. To get that little extra amplification and selectivity over the whole tuning range calls for close attention to numerous points which can be overlooked when less effective results are required.

The diagram (Fig. 7) shows the chief points, which are a low tap for the aerial, efficient tuning coils and condensers, a tap for the detector and the highest tap or the largest possible primary coil for the anode coupling to the detector.

The grid of the high-frequency pentode can be taken to a tap on the input grid coil, and it is better to use anode-bend detection with a high-frequency pentode in this stage as well, as shown in Fig. 8.

This circuit can be made extremely sensitive and as selective as desired by using one or two bandpass circuits between the aerial and first valve and between the anode of the first valve and the detector.

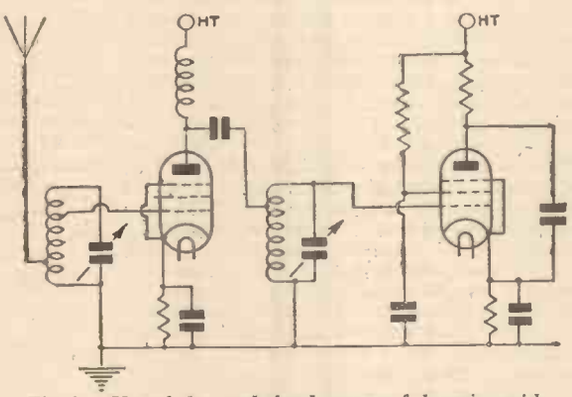


Fig. 8.—Use of the anode-bend system of detection with a high-frequency pentode

[There is now a very comprehensive range of this type of valve actually available to the general public, particularly in the A.C. ranges. In the Mullard range there is the SP4 with a fixed grid base and the VP4 with variable-mu characteristics. There are two in the Six Sixty range, the HP1AC with a slope of 3, and the HP2AC with a slope of 2.5. Mazdas make a very efficient valve with a slope of 6, designated the AC/S2Pen.

Other High-frequency Pentodes

The Marconi-Osram ranges include an MSP4 with a slope of 4 (fixed grid base) and the VMP4 with a variable grid base and a maximum slope of 3.5. The first high-frequency pentode was the Cossor MS/PenA, designed for use as a detector. Their range has now been augmented by the introduction of the MS/Pen with a slope of 3.5 and the MVS/Pen with a variable grid base and a maximum slope of 3.

The Standard Micromesh valves are already well known. They have two valves, the 8A1 with a slope of 4 and an amplification factor of 1,500, and the 9A1 with an amplification factor of 2,500. The Ferranti pentode, the VPT4, has a slope of 2.6.

There is also a battery high-frequency pentode, the Marconi Osram VP21.—ED.]

Tune-in These American Giants!

BY now most readers will have heard something of the wonderful new station at Cincinatti, which has been sending out test transmissions with the enormous power of 500 kilowatts.

This station, situated at Cincinatti, Ohio, U.S.A., is owned by the Crosley Radio Corporation, whose 50-kilowatt station WLW has long since achieved a world-wide fame.

To listeners with ordinary broadcast sets in this country, the test transmissions from the 500-kilowatter, called W8XO, should be of special interest, since they can easily be picked up in the early hours of the morning—around the usual breakfast time.

Many reports have been received of W8XO's reception in this country—one listener managing to tune-in the station with a portable at 8 a.m.

We have just received notification of a special test from W8XO on February 18, 1934. This will take place at 6 a.m., G.M.T. All long-distance enthusiasts should make a note of the date. They will then almost be sure to hear the new American giant, on a frequency of 700 kilocycles.

Reports will be welcomed by the Crosley Radio Corporation, of Cincinatti, Ohio, U.S.A., and by the International DX'ers Alliance, Bloomington, Illinois, U.S.A.

Another opportunity for long-distance fans will be presented earlier in the month, on February 10, by station WTIC, of Hartford, Connecticut, U.S.A., which will be broadcasting a special test programme from 5 to 6 a.m.

WTIC, known in America as the Travellers' Station, is well heard on this side. It has a power of 50 kilowatts and broadcasts on a frequency of either 1,060 or 1,040 kilocycles.

Where to Send Reports

Reports will be gladly received by J. C. Randall, Manager of WTIC, Travellers Broadcasting Service Corporation, Hartford, Connecticut, U.S.A.

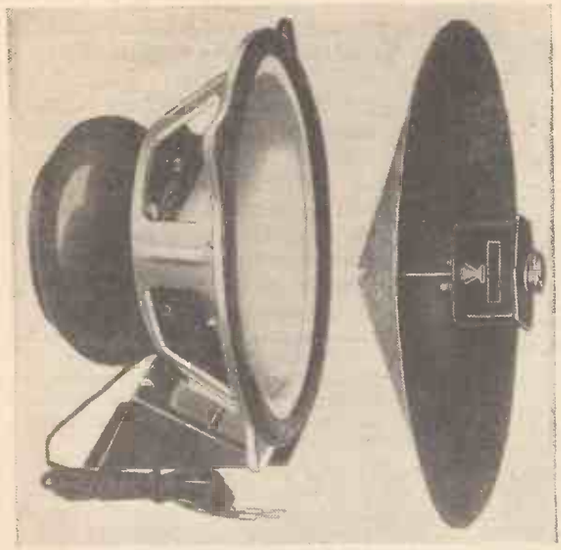
News of these two interesting transmissions are sent to us by Richard E. Rawles, Publicity Director, Blackwater Corner, Newport, Isle of Wight, from whom all details of the unique organisation known as the International DX'ers Alliance can be obtained. Anyone interested in *medium-wave* long-distance reception is eligible for membership.

This organisation should appeal to a wide circle of keen listeners who like logging very distant stations just for the fun of the thing. Why not join?

The Third (and Last) Article of a Series

First Aid for Old Sets

By PERCY W. HARRIS, M.INST.RAD.E.



Moving-coil loud-speakers of the permanent-magnet type (left) are sometimes liable to deteriorate owing to loss of magnetism . . . cone loud-speakers often deteriorate after a year or two by losing the pliability of the cone suspension material (right)

IF your old set still fails to come up to scratch after the hints given in the previous two articles of this series, there is still another possible source of trouble which, now you have made up (as I hope you have) the little testing device, you can easily track out. I refer to breaks in insulated leads.

Concealed breaks in flexible leads are some of the most irritating of wireless receiver faults and often go undetected for a long time, particularly when they are in parts of the set where the small capacity between the broken ends is just sufficient to pass on at least some signals. They may easily occur in aerial or earth leads, particularly when these are of a temporary variety frequently knocked, pulled, or bent about during ordinary domestic operations.

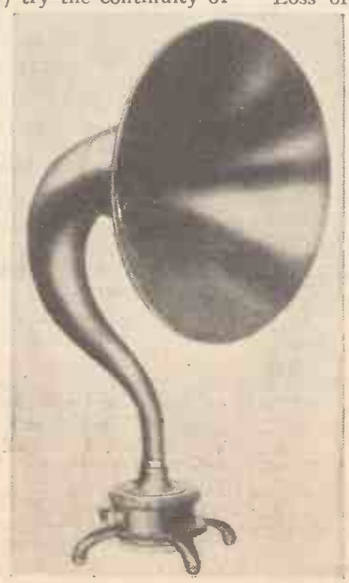
Testing Loud-speaker Leads

With the continuity tester described last week, test out the aerial and earth leads first of all and then each of the battery leads, being careful to disconnect the batteries before so doing. If these are all in satisfactory order (sometimes one of the high-tension leads is disconnected internally) try the continuity of the loud-speaker lead.

To do this disconnect both loud-speaker leads to the set and see if there is an unbroken path through them.

At this juncture the reader may say: "There is no need for me to test these leads as I can hear something in the loud-speaker all the time!" Don't you believe it! When a loud signal is coming in it is quite possible to get weak loud-speaker results with one lead completely disconnected due to certain stray capacities completing the circuit for voice and music frequency currents.

Flexible loud-speaker leads are particularly prone to give trouble, and I should not be surprised if many readers discover what is wrong with their set when making this test for continuity.



The horn type (of loud-speaker) is practically obsolete nowadays

The testing of loud-speaker leads suggests that we consider what other faults are likely to happen with old loud-speakers. Loud-speakers can be divided into the horn type, the cone type (either single or double) actuated by an electromagnet and a reed, and the moving-coil type, this last with either permanent magnets or electromagnets operated from a separate current source. There are a few other types, but the above classification covers practically all we are likely to want to deal with.

The horn type is practically obsolete nowadays, although some users still cling fondly to these old instruments. In most forms there is a means of adjusting the distance between the diaphragm and the magnet, but sometimes through an accident, such as knocking it over, this adjustment is upset. Make sure that the adjusting screw is properly set: This may restore your receiver to its original strength.

Quite likely, if your horn loud-speaker is old, the permanent magnets have lost most of their magnetism. You can find this out by unscrewing the top portion so that the diaphragm is revealed. Lift off this diaphragm and see whether it is strongly attracted to the magnet poles. If there is practically no attraction the only thing to do is to have the magnets re-magnetised, which your dealer can probably arrange for you; but if the loud-speaker is in this state, it would be much better to buy a new and more modern type.

Rust and dirt on the diaphragm may also be hindering the functioning, and when you take it to pieces if there is any need for cleaning you will see this at once.

Loss of magnetism also accounts for the falling off in performance of the cone type of loud-speaker, as also does a mal-adjustment of the reed. This type of loud-speaker is so cheap nowadays it is scarcely worth while having the magnets re-magnetised. It is probably better to buy a new movement and have it fitted to your existing cone. In the case of balanced-armature loud-speakers, however, the trouble will quite likely be due to faulty adjustment.

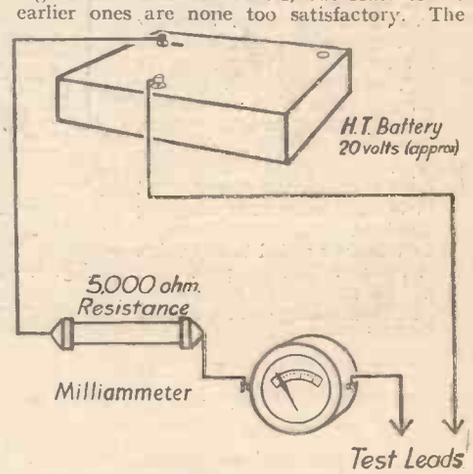
To get the best results, balanced-armature loud-speakers need careful setting. With no signal coming in the armature should be equally spaced between the two magnet faces and should not be more inclined to one side than the other.

Cone loud-speakers which have their cones suspended from the edge often deteriorate after a year or two by losing the pliability of the cone suspension material. Sometimes this is in leather, sometimes cloth, and if the cone has lost the flexibility of the edge suspension you cannot expect to get good results. New cones complete with flexible edging are easily obtainable at reasonable prices, and if you cannot fit them yourself it costs very little to have it done by the dealer.

Deterioration in Moving Coils

Moving-coil loud-speakers of the permanent-magnet type are sometimes liable to deteriorate owing to loss of magnetism, for which reason many manufacturers of commercial sets have abandoned them, preferring the separately excited type. This deterioration is so gradual that it is difficult to test and the only thing to do is to try your loud-speaker out against a similar model which you know is working satisfactorily.

Do not forget to examine the cones of both permanent-magnet and excited-field loud-speakers. There is not much trouble in this regard with modern models, but some of the earlier ones are none too satisfactory. The chief trouble likely to arise with a moving-coil loud-speaker is the loosening of one or more turns on the moving coil itself.



Circuit of the tester described by Percy Harris last week. A milliammeter is placed in series with a 20-volt battery and a 5,000-ohm resistance

The clearance between the moving coil and the magnet cores is so small that any loosening of a turn may cause the coil windings to rub, thus completely spoiling reproduction or else giving an unpleasant rattling effect. Rattling noises, however, are not always due to faults in the loud-speaker, distortion in the output stage due to overloading may give a very similar effect.

Work for an Expert

If the cone itself is badly centred, the coil may touch, while a deterioration of suspension material may cause this coil to get slightly out of centre. Adjustment of a moving-coil loud-speaker which has gone "off colour" is, however, scarcely the work for any but an expert and experiments of this kind should not be made by the beginner.

There are several firms which undertake such work at reasonable prices—better get them to help you

On Your Wavelength

By Thermion

Plan Settles Down

THE Lucerne Plan, as I said before, is getting well into its stride. During the first week of its existence one was tempted to doubt at times whether it could ever be a success, but in the second week a big improvement occurred and reception is tending to become steadily better as night follows night.

I don't think it will be very long before Europe enjoys a more peaceful time in the ether than we've had for many years. The chief trouble now is that many of the smaller stations using group channels cannot keep exactly to their proper frequencies.

They wander somewhat and so cause heterodynes. This is a matter that will right itself as plants are brought up to date by the installation of proper frequency-control apparatus.

On the Long Waves

ON the long waveband conditions are still far from perfect, though they are much better than they were but a short time since. Roughly, half of the long-wave stations are working on the Lucerne Plan and the other half aren't.

Huizen, Königswusterhausen, Daventry, Warsaw, Luxembourg, Kalundborg and Oslo are usually clear of interference, and that's not a bad selection when you come to think of it.

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What of Eiffel Tower?

THE French authorities say that they won't close down the Eiffel Tower until Radio-Paris is free from interference. But so long as they keep the Eiffel Tower working they help to overcrowd the waveband and so prevent Radio-Paris from securing a free channel!

I don't quite know why, but it reminds me of the old story of the angler who had just caught a pike, which was lying on the bank beside him. Along came a yokel accompanied by a dog, which proceeded to sniff at the fish. Next instant the pike made a snap and grabbed the dog by the nose. With the pike firmly attached, the dog promptly made for home at something approaching the speed of light.

"Hi!" cried the fisherman, seeing his capture vanishing into the distance. "Call your dog off." "Nay," grinned the yokel. "Thee call off they pike."

Medium Waves Pretty Good

THE medium waveband is now pretty good, taking it all round. My own log shows that on no recent evening have less than about twenty stations been receivable strongly and clear of interference.

Amongst the most reliable at the moment are Budapest, Beromuenster, Athlone, Vienna, Stuttgart, Lyons PTT, Langenberg, Rome, Munich, the Poste Parisien, Breslau, Hilversum and Trieste.

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Another Radio Conference?

THERE'S some talk of calling another radio conference in the very near future to see whether some agreement cannot be reached that will enable the Lucerne Plan to work as it should.

It's not a bad idea, for there are several very important points to be cleared up. First of all there is the Eiffel Tower business and then France has another little trouble—Fécamp, which does not appear to be obeying orders.

The Luxembourg business must be settled somehow, though I hope that the suggestion for jamming its transmissions will not materialise.

Holland and Poland will have to be appeased in some way and we ought to be able to come to some arrangement with the Swedes about Motala. They have shown their goodwill otherwise by keeping very closely to their allotted frequencies on the medium waveband.

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Blood-curdling Broadcasts

THE B.B.C.'s decision to produce melodramas of the real, old-fashioned thriller type will probably receive a warm welcome.

Next Friday, Tod Slaughter, of *Sweeney Todd* and *Maria Marten* fame, will give us *Gentlemen, the King*. Like the Fat Boy, Tod Slaughter "wants to make yer flesh creep"—and does it. As a nation we enjoy being harrowed!

You remember the gallery girl who was in such floods of tears when the heroine was spurned by the villain that her next-door neighbour proffered consolation. "Shut up," she sobbed, mopping her swollen eyes. "Can't you see that I'm enjoying myself?"

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More Battery Wonders

THE letter on five-bob batteries from a Stratford-on-Avon reader in a recent issue of AMATEUR WIRELESS was most interesting.

After relating his experiences with a five-bobber, he expresses the opinion that the one whose performances under test I recorded in these notes must have been a "dud."

It wasn't, really, for I obtained it direct from the firm whose name appears on the label and was assured by them that it had only just come into stock.

Further, the preliminary voltmeter and ammeter tests showed that it was in good condition.

Volts and Watts and Things

THE reader in question claims that a five-bob battery, used since the middle of August, was in the middle of January showing a voltage of 88 out of an original 100 after three and a half hours' service a day (Sundays included) under a load of 6 milliamperes.

In round figures, this is 150 days, so that the service hours are 525. If the voltage is now 88 the average voltage must have been at least 90. The total watt-hours are thus 283.5 and the watt-hours per cell 4.3.

I can only say that in the course of laboratory tests on over a thousand batteries—British, American, French, German, Swiss, Danish and Dutch—I have never come across one of standard capacity that could show anything like such a figure even if it was run down to the point of destruction!

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Reaction Ferocity

WHEN trying out some of this season's straight sets I have been rather surprised that their designers and makers should be content with such fierce reaction.

Provided that the design is not faulty, it is not as a rule very difficult to make the reaction control quite smooth.

There should be a steady build-up of signal strength as the knob is turned clockwise and, except when a very powerful signal is being received (when naturally you won't want reaction), the set should glide smoothly in and out of oscillation without a trace of "ploppiness" or overlap.

Smooth reaction means that you can get the very last ounce out of your set for long-distance reception. With fierce reaction you can't, because the set "boils over" just when

Explaining the mysteries of cathode-ray television at the Borough Polytechnic, London, where radio salesmen can now receive instruction in this rapidly growing branch of radio. Here is yet another proof of the steady advance of television science

it appeared to be going to give you good volume from the station that you are trying to get.

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Making S.A.V.C. Futile

ANOTHER criticism that I have to level against some of this year's products is that though they have self-adjusting volume control—in deference no doubt to popular demands—it is so arranged that it is all but useless for one of its main purposes, *the prevention of fading.*

S.A.V.C. can't tackle this particular job unless there is sufficient magnification in reserve to bring a signal up to loud-speaker strength during a period of waning.

Harry Mizler, new light-weight "champ," broadcasting from London recently in his talk on "Fighting Through"

No kind of S.A.V.C., of course, can do anything with a signal that is going out altogether at intervals, but if there is sufficient amplification in hand, well-designed S.A.V.C. can completely smooth out fading of the milder type.

As a rule it is not much good fitting S.A.V.C. to less than two high-frequency or intermediate-frequency stages. With less than two the only thing that it can do is to prevent the local station from coming in with an ear-shattering bellow.

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Detector Refinements

IN a recent leaflet the Mullard valve people answer a question which may have been a puzzle to a good many wireless enthusiasts.

Why does the same firm manufacture two battery detector valves? Wouldn't a single type suffice for all purposes?

It wouldn't, and here's the reason. People don't always realise that in a set with no high-frequency stage or only one of them the impulses reaching the detector valve are usually quite small. But with two high-frequency stages impulses are usually of considerable amplitude and those applied to the second detector of a superhet may be bigger still.

Thus in a simple set you can use a rather high-impedance detector valve, which gives slightly more magnification; but in a big set a detector of somewhat lower impedance is required in order to be able to handle the bigger impulses without distortion.

The point is an important one and many people suffer from the unpleasant kind of distortion caused by detector-valve overload without knowing what the cause is. The substitution of a detector of moderate impedance for one of high impedance in a big set has often an almost miraculous effect on the quality. [Kenneth Jowers enlarges upon this theme in a special article on page 166.—Ed.]

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America's Wireless Giants

SOME time ago I told you that WLW, the Crosley station at Cincinnati, Ohio, was conducting experimental transmissions every day with an output power of 500 kilowatts.

I now hear that 400-kilowatt transmissions are being made also by KDKA, the Westinghouse station at Pittsburgh. Both of these transmissions are made after midnight in America, which means from 5 a.m. onwards in this country.

They have been well received on quite small sets as late as half-past eight in the morning. WLW works on 428.3 metres and KDKA on 305.9 metres. Have a shot for them at breakfast time.

World-wide Wireless

IT seems probable that these two big American stations will eventually be allowed by the Federal Radio Board to use their full power for regular programmes. When they do I am open to wager that they will heterodyne European stations from about 9 p.m. onwards in winter time.

Just two of them perhaps won't matter very much, but you know what Americans are: every town will want to have a broadcasting station as big as them, if not bigger.

Imagine a hundred such giants at work, and remember that the United States use a 10-kilocycle separation instead of the 9-kilocycles of the Lucerne Plan.

Probably there will have to be in time a World Conference to limit output power and to draw up a wavelength plan not only for Europe but for the whole globe. That will indeed be some job.

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This Year's Exhibition

IT is a bit early perhaps to talk about this year's big Wireless Exhibition at Olympia, but I thought that you might like to know roughly when it will be held.

The exact date for its opening has not yet been fixed, but it has been decided that it will be held some time between August 13 and September 2.

Last year's exhibition started on Tuesday, August 15, so the probabilities are that this year the opening day will be either Tuesday the 14th or Tuesday the 21st of August.

I think that the 14th is the more probable date, since the Scottish Wireless Exhibition will probably begin on August 31.

Radio en voyage! The captain and some of his engineers listening to an H.M.V. portable while crossing the English Channel

Aircraft and Wireless

BY a remarkable coincidence Marconi was sending his first feeble messages across the Atlantic just about the same time as the Wright brothers were making their first heavier-than-air flights. The aeroplane and wireless may therefore be said to have grown up together, and I am inclined to think that the next big development will be in the direction of a still closer connection between the two.

I am not referring to the ordinary wireless equipment which enables a pilot to pick up weather reports and send messages back to the aerodrome, or, even in case of necessity, to get his bearings from a D.F. land station. What I have in mind is the ingenious system—now firmly established in America—of "charting" the air by means of radiated wireless beams, and of fitting each aerodrome with short-wave transmitters designed to allow the pilot to land "blindly" even in the densest fog.

New Radio Careers

SOMETHING of this sort will have to be done sooner or later if the airway is to compete on an equal footing—both in regularity and safety—with other forms of transport. And when it does come it should open up a new and interesting field of employment for those who are keen on radio as a career. In the first place there will be a tremendous amount of constructive and engineering work to be done in fitting up all the aerodromes with the necessary "beam" transmission gear, and in the second place a highly skilled staff of radio operatives will be required to run and maintain the airway services of the future.

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More Patents

ACCORDING to an official report, no less than 36,744 applications for patents were filed last year—which works out at over a hundred a day, including Sundays. Of course, there *are* other kinds of inventors, but I would say that quite a fair percentage of the total is accounted for by wireless, and what one might call "allied industries."

Every year produces a new crop of patented radio circuits, components and "gadgets" in general, including valves, batteries, eliminators, loud-speakers, aerials, and what not. Last year, in particular, I believe an enormous amount of inventive work was done in connection with television, including photo-electric cells, and cathode-ray tubes—to say nothing of special improvements in sound and picture reproduction intended for the gramophone and talkie film industries.

It is amazing to think of so many new brainwaves being hatched out per annum. In fact it is calculated to give the ordinary man a bad headache—or a pain in the neck!

Potter's Wheel

AND yet some of the most modern work is still being carried out by methods which—in principle—date back to ancient times. For instance, the other day I had an opportunity of seeing the way in which the conical diaphragms for loud-speakers are manufactured.

A handful of wet pulp is thrown on to a rapidly-rotating disk of wire-gauze, which first of all throws off the surplus water and then, by centrifugal force, spreads the remaining material evenly over the "dished" surface of the gauze until it takes up the required shape and sets there. The whole process is most effective and ingenious, though it reminded me very forcibly of the old-fashioned Potter's wheel.

Home-made Components for the Set-builder

Build Your Own Low-frequency Transformer!

By The Experimenters

WHEN you start thinking about wireless, one of the very first puzzles is how a transformer works. How, that is to say, a current flowing in one winding can set up another current in an adjacent winding—even though you know perfectly well that there is no direct connection between the two windings.

The next thing you wonder is why the transformer is so called. What does it *transform*, in other words? If you are thinking of the word transform in the sense of radical change the transformer is mis-named. For the current in the second winding is just the same in nature as the current in the first.

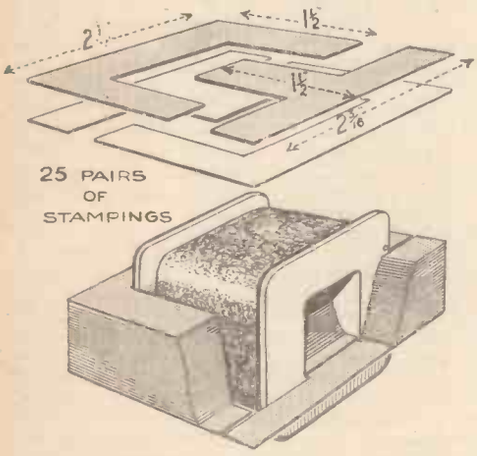


Fig. 1.—How the T- *and* U- *shaped pieces form the iron core for the bobbin*

Right now you might as well clear up your ideas about the transformer. It consists of two windings, one called the *primary* and the other the *secondary*, with a centre core of soft iron.

The iron is in the form of laminations, as you can see from Fig. 1. These laminations are shaped as U's and T's. As you can see, the U's surround the bobbin carrying the windings, while the T's go through the centre, so making a complete iron circuit.

Two Windings

The bobbin inside the iron circuit consists of two quite separate windings. Each winding has a large number of turns of very fine wire. The inner bobbin is what we call the primary, and the outer bobbin the secondary.

In case you want to know, the primary consists of 2,800 turns of No. 44 gauge enamel-covered wire. After this has been wound on it is covered with a layer of insulating tape—as you can understand from a look at Fig. 2.

On top of this tape is wound the secondary, consisting of 11,200 turns of the same wire as for the primary.

You don't need to be much of a mathematician to see that the ratio of secondary turns to primary is 4 to 1. In theory this means that there will be four times as much voltage across the secondary as there is across the primary. In other words, such a transformer gives you a step-up in voltage.

In practice you don't get quite all this step-up, because there are various losses in the iron and in the insulation between the windings—but you do get something very close to the theoretical step-up. The transformer is, in fact, one of the most efficient components in a radio set.

Just one thing here before we go any further. Why the *iron* at the centre? It is simply to increase the inductance of the windings. The low-frequency currents we want to pass through such a transformer need this high inductance—which cannot be obtained in a practicable way by increasing the number of turns.

Well, that's enough about the theory of the thing. If you want to know more, any good school book on magnetism and electricity will tell you. Our job here is to show you how very simple it is to make up a really sound little transformer for yourself. It has plenty of iron, plenty of turns on the primary and secondary, so it has a nice high inductance for good-quality amplification.

We assure you that it is not a practicable job to wind your own primary and secondary. Only a very experienced amateur blessed with infinite patience could tackle such a task.

So, in order to make the transformer appeal to as large a section of our amateur friends as possible, we have already arranged for Peto Scott and Ohmic Accessories to supply the kit of parts, the price being only 3s. 6d.

You can obtain these kits from Peto Scott, Ltd., of 77 City Road, London, E.C., and from Ohmic Accessories, of 8 Myron Place, Lewisham, S.E.13.

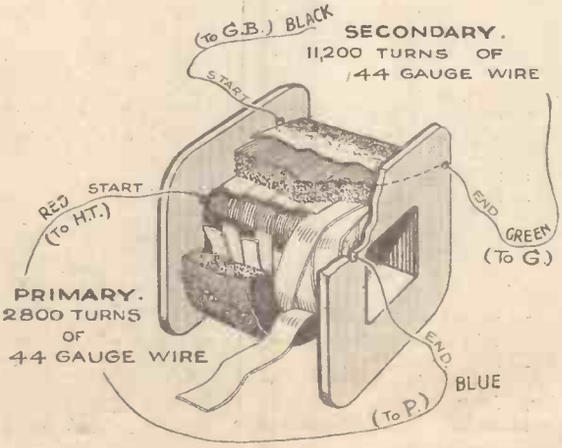


Fig. 2.—A peep inside the transformer, showing the relative positions of primary and secondary windings on the bobbin, with the insulating tape in between

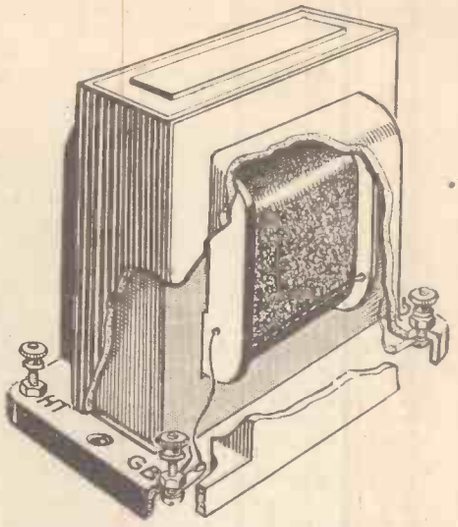
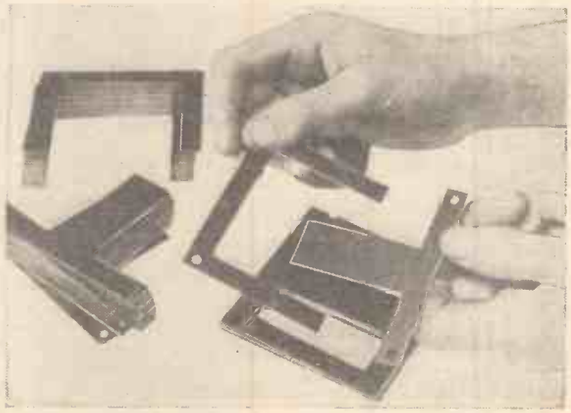


Fig. 3.—From this diagram of the finished transformer you can see how the wires from the bobbins are taken to their correct terminals

These kits consist of three main constituents. A large moulded case, a bobbin already wound with the primary and secondary, and an iron core consisting of twenty-five pairs of T and U pieces.

When your kit arrives, you will find all the iron laminations in one of the packets. Sort out the T's from the U's and then begin to insert them in the bobbin—as shown by our specially drawn diagram Fig. 1.



How the laminations of the transformer are built up into a complete core

Firstly, insert a T on one side, then a U on the other, then a U on top of the first T, and then a T on top of the first U, so alternating T's and U's up each side until all of them are in place.

Make quite sure that all these laminations fit tightly—and if you have a T over jam it in one end through the centre so as to make a really tight job.

Now you are ready to put the assembled bobbin into the case. You will find that from the bobbin there are four wires—all from the same end. Drop the bobbin into the case so that these four wires come at the bottom end of the case, which will, of course, be upside down for this purpose.

There are two possible ways of putting in this core, but make sure that your way is such that the coloured wires come near their right terminals. The red must come near the terminal

Continued on next page

Radio in the Great War

Snow — and Atmospherics!

Keystone photo

AMERICA'S HIGHEST AIRWAY STATION

At an altitude of 7,200 feet at Summitt, California, where the Lincoln Highway crosses the Sierra Nevada Mountains, is the highest man-operated radio station in America. Here six men are on twenty-four hour duty sending out signals and weather reports to the Trans-Continental air liners on what is one of the most treacherous stretches of the airway system on the whole of the American continent

ATMOSPHERICS! Well, of all the peculiar species. . . .

But what a day it was! Scraping, jamming, and then the mysterious rattle.

Our mast stood on the summit of a hill. The aerial itself ran parallel to the road which linked the village of Wagnonlieu with the city of Arras.

Had you been walking, perhaps marching, past this particular spot on Easter Monday, 1917, you would have seen that the lead-in ran into an aperture in the bank of the road.

Airman—with Phones!

And as a wireless enthusiast, you naturally would have been interested to see a young fellow in the uniform of the Royal Flying Corps, seated on a ration box, with a pair of the famous Browns' adjustable clasped to his ears, and twiddling the condenser dials of a Mark III trench receiver.

That would be Georgie, if the time had been 8 a.m., or thereabouts.

But the dawn had hardly broken when *I* started the day's "watch." Shortly after donning the phones, the first air-patrol signalled a target for the battery to which we were attached.

Then another, followed in quick succession by messages from machines of our own and other squadrons. And by the time Georgie arrived to relieve me for breakfast signals were bombarding us from all points of the compass.

Not only did they come in thick and heavy, but each transmitter apparently did its utmost to drown the other.

"Earthing" the Apparatus

As if that were not enough, the detonations and rumble of massed artillery fire shook the dugout, causing streams of earth to fall down necks and over the apparatus.

Returning from a breakfast of fried bully, a thick slice of bread, and an enamelled mug full of tea, I found Georgie overwhelmed by the complexity of things.

"Come—on—Lowe," he cried in jerks. "Take—other—phones."

You see, the circuit was so arranged as to accommodate two pairs. And there we were, filling page after page, until a few hours log gained hefty proportions.

Georgie knocked my arm.

"What's that?"

"I dunno."

"Sounds like the distant murmuring of a babbling brook."

◆ ◆ ◆

Signals had fallen off considerably.

The arrow-marked watch that was affixed to the lid of the receiver denoted that the hour for dinner was approaching; and, taking his billy-can, Georgie stepped out of the dugout.

"Snowing, Lowe," he shouted.

I looked outside. Large flakes were falling.

The din of artillery battle had become somewhat fainter.

But what was that rumbling in the phones? At first it had sounded like running water. Now, with the increasing force of the blizzard, the noise assumed that produced by small marbles being rapidly dropped in a china basin.

Signals from planes were now few and far between. A mantle of white covered the landscape. As the fall of snow thickened, so that peculiar noise increased in volume. None of your ear-splitting cackles or cracks—a persistent, continuous, rapid shelling of marbles into a basin.

Georgie returned from his dinner of Machonochie.

"Anything up?"

"No, can't hear signals. But listen to this!"

"Strewth, what's happening? I'm not wearing these." And with that, my comrade placed the phones on the ration-box "table."

With billy-can in hand, I climbed out of the hole. The blizzard was at its height. Those X's were now broadcasting to within a few yards around the dugout. No operator could have worn the telephones for more than a few moments without his aural faculties being affected. It was terrific, and at its zenith, nothing more or less than the racket of a cup-tie enthusiast's rattle (without the intervals of silence).

◆ ◆ ◆

I battled through the snow back to the dugout. The storm began to abate.

Georgie looked up from his seat. He had replaced the phones on his big fat head.

"It's going off," he said.

Sure enough, the cessation of the mysterous X's coincided with the end of the blizzard.

We looked at each other.

"Wonder what it was?" I murmured.

The silly fool grinned.

"Why, I discovered that whilst you were at dinner."

"Well, what was it?"

"You know this wireless telephony they're trying out?"

"Well?"

"A squadron sergeant-major spoke into the microphone. Being such a sensitive piece of apparatus, it naturally . . . it . . . well, we were getting his signals, that's all."

"You silly mut. . . . !"

But what a day! Phew! W. T. LOWE.

Build Your Own Low-frequency Transformer!

Continued from preceding page

marked "H.T.", the black near "P," the blue near "G.B.", and the green near terminal "G." See Fig. 3.

You can now connect up these wires to their correct terminals, either by soldering—which is preferable—or by screwing down underneath the washers. Make a clean contact by scraping off the silk covering from the ends of the wires before connection.

Well, that's the transformer. It is ready to do good work in a wireless set—in the low-frequency amplifying stage of almost any type of receiver.

It can replace any existing low-frequency transformer of the ordinary type. Then again, if you have a set with a resistance-coupled stage you can get more volume by taking out the present coupling and using our transformer.

In any straight set using a transformer that is not giving you good quality our new transformer can be put in without any alteration.

We have now told you, in our three special home-builder articles, how to make a tuning coil, a high-frequency choke, and now a low-frequency transformer. You have the most important components needed to build a first-class modern set.

Next week we are going to tell you how to make use of the Lucerne coils in all sorts of popular sets. Then the following week comes our own three-valver employing all the components we have designed and described.

"We will now play you 'How Deep is the Ocean?'"

How to Take Grid Bias from the Mains

A helpful article by the AMATEUR WIRELESS Technical Staff

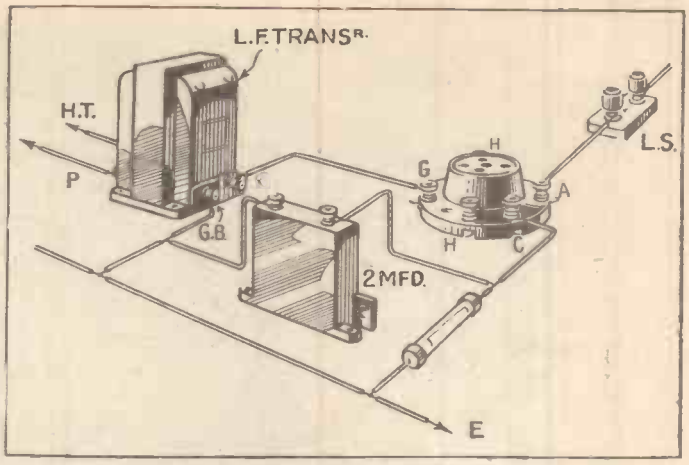


Fig. 1.—Typical circuit for applying grid bias to an indirectly-heated power valve

ARE you still using a grid-bias battery with your mains set? We ask this question because it seems that many amateurs who have long since gone over to mains working have retained the small 9- or 16-volt battery for grid bias "for simplicity."

Now in practice the retention of this little battery is not simple at all, because you never quite know when it is going to give up the ghost. If it does that you are in danger of ruining your power valve, which will take an excessive anode current when the grid bias fails.

Practice—Not Theory!

Perhaps you do not realise how extremely simple it is to fix up grid bias from the mains? If not, this article should help you. We are not going into the theory of mains grid bias at all. Instead, we are keeping right down to brass tacks, covering all the usual mains-set bias needs.

Let's talk first about automatic grid bias. This is the usual system, in which a resistance is connected in between the cathode of the valve and earth, in such a way that the anode current completes its circuit through that resistance.

As you know, when a current flows through a resistance there is a voltage drop across the resistance. Look at Fig. 1, for example. We have an ordinary transformer in front of a five-pin valve holder. You already have these two components, probably, but if you are using a grid-bias battery they are wired up slightly differently.

Assuming you are, there will be a flexible connection from the grid-bias terminal of the transformer secondary, going to a negative socket in the grid-bias battery, while the C, or cathode, terminal of the valve holder will be joined to earth.

Grid-bias Terminal

You remove these two connections—and forget them. Then join the grid-bias terminal of the transformer to earth. Connect the cathode or fifth pin of the valve holder to one side of a fixed resistance and the other side to earth.

Now this is the resistance we were just talking about. Through it flows the anode current of the power valve. Across this resistance develops a voltage, and it is this voltage we make use of for grid bias.

One thing is important to note right here. *The voltage thus gained for grid bias is lost for the anode or high tension.* As this is seldom more than 15 or 20 volts, and as there is usually plenty of spare voltage from the mains, this is not much of a drawback—especially when you think how simple are the alterations.

What you want to know is how to work out the resistance for any given grid-bias requirement. As you will find, every power is supplied by the makers with a little slip of paper, giving working details of the valve—*including the grid bias and anode current.*

For example, you might find the valve needs 150 volts high tension with 10 volts grid bias, at which the anode current would be quoted as 10 milliamperes. For this problem you need not worry about the high-tension voltage figure. Divide the grid-bias figure quoted by the makers, say 10 volts, by the anode current *passed under this condition*, here 10 milliamperes.

As one figure is in volts and the other in milliamperes—thousandths of an ampere—it is necessary to multiply the answer to this division sum by 1,000.

Here, then, the sum works out at 10 divided by 10 multiplied by 1,000, which is quite obviously 1,000. The answer is in ohms, so a 1,000-ohm resistance will give you the required 10 volts grid bias.

Of course, if the anode current were only 5 milliamperes you would need a 2,000-ohm resistance, and if it were 20 milliamperes you would need only a 500-ohm resistance. In these days most makers give the resistance value on the valve slip, so you will not need to work it out.

The resistance, when its value has been found and it has been connected up as shown by Fig. 1, *must* be by-passed with a 2-microfarad fixed condenser. If this is omitted you will find that the bass notes will be cut down, and possibly there will be some instability.

The condenser is very easy to connect. One side of the condenser goes to C, or cathode, of the valve holder, and the other goes to earth or the grid-bias terminal on the low-frequency transformer which is itself earthed.

We have dealt with automatic grid bias for an indirectly heated output valve, where the cathode is quite a separate electrode. Many of you have *directly heated* power valves and to obtain grid bias from the mains for such valves needs a slightly different circuit.

Taking the Osram PX4 as typical of the sort of directly heated power valve used in some mains sets, we find that the system shown by Fig. 2 is the most suitable for obtaining the grid bias.

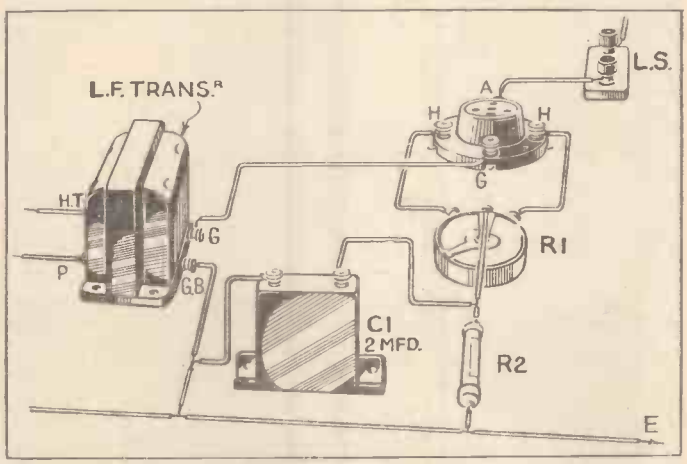


Fig. 2.—How grid bias is applied automatically to a directly heated power valve

Obtaining Voltage Drop

The principle of the system is the same as before. The grid-bias voltage is obtained by inserting a resistance in a suitable part of the circuit, so obtaining a voltage drop from the current flowing round the anode circuit from the high-tension supply.

In this system there is no separate cathode, so we have to provide an artificial centre point for the filament connection. This we do with a potentiometer resistance connected across the filament heater, marked H,H.

The winding is connected across the filament terminals of the valve holder, and the slider connection taken to one side of a fixed resistance, the remaining side of which is joined to earth.

Earth Connection

Looking at the Fig. 2 circuit, you will see that, as before, the connection that previously went to the negative side of the grid-bias battery, that is the terminal marked "G.B." on the secondary of the transformer, is now taken directly to earth.

A condenser is connected between this grid-bias terminal on the transformer and the slider on the potentiometer.

The value of the resistance connected between the slider and earth is calculated in just the same way as before by finding out what bias voltage you want and what is the anode current of the power valve at that voltage. Then divide the current into the voltage and multiply by 1,000. The answer will be the resistance required in ohms.

One last point. If there is any hum in the reproduction, carefully re-adjust the setting of the slider of the potentiometer, as there is usually one point at which all trace of hum can be eliminated.

If you are working on D.C. mains with the new indirectly heated mains valves the same principles apply for grid bias. You must make quite sure, though, that you take your earth returns really to *earth*—and not just to one side of the filament.

Three Ways

Yo

Gulliland photo

How they do it in Germany. This operator strikes every valve with a mallet before it leaves the factory—then the manufacturer knows it will stand up to rough handling!

LOOKING through a Cossor valve catalogue the other day, a young friend of mine was slightly mystified when he came across three consecutive pages describing three different valves for the detector stage.

Naturally, he was looking for a new valve. He knew perfectly well what he wanted before he looked in the catalogue until he saw these three valves. Then he was puzzled.

Three Detector Valves

"Why should there be a 210HL, a 210HF, and a 210Det for detection?" he asked me. Before I had time to reply, he went on. "Then much the same mystery surrounds the Mullard catalogue. They have a PM1HF, a PM1HL, and a PM2DX—all recommended for detection. What *am* I to use?"

As I was telling him, I realised that he was probably voicing the puzzlement of many an amateur listener. So here I am writing an article, telling you which type to use for your own needs.

For a start, we can reduce the three apparently distinct types of detector to two. One is the higher impedance type, such as the Cossor HL or the Mullard HF. These are only detectors by accident and not by design. Their original use was for high-frequency amplification in the old days before screen-grids came along. They are still used now in certain five-valve portables, but they have undoubtedly gone out of general use.

Impedances

I should say that there are only two detector types of any importance to-day—medium and low impedance. Typical examples are the Cossor 210HF with an impedance of 15,800 ohms in the medium-impedance class, or the Mullard PM1HL with an impedance of 20,000 ohms.

In the second class, we have valves such as the Cossor 210Det, with an impedance of 13,000 ohms, and the Mullard PM2DX—a very popular valve—with an impedance of 12,000 ohms.

Now the anxious amateur will want to know what is the function of the high- as compared with the low-impedance detector. To explain this, it will be simpler to give you some typical examples.

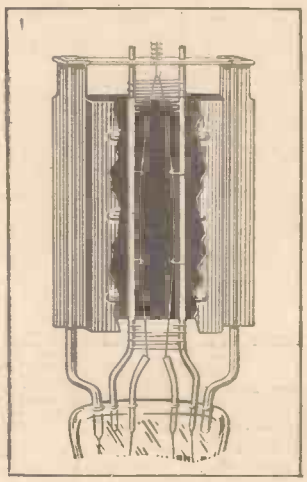
Let us take the case of a reader with a battery super-het set. No matter where he lives the volume from home and foreign stations will be very great—the signal input to the detector, I mean.

The PM2DX valve handles almost twice as much input as the PM1HL, although the amplification is only 18 as compared with 28.

In such a set the paramount need is for a valve that will handle the maximum signal input without distortion. With so many valves there is no need to worry about any loss of amplification at the detector stage.

Obviously, the valve type to use here is the Mullard PM2DX or the Cossor 210Det—or similar impedance valves in the ranges produced by other makers and listed on this page.

Suppose that, in ignorance, you were to put in the higher-impedance type, such as the Cossor 210HF. What would be the result? With the weaker stations the volume would be slightly up on the PM2DX type, but what would happen to the quality on the rest of the stations?



How the filament is supported in a typical Cossor detector valve

You would get nasty overloading—and the usual milliammeter in the anode circuit of the power valve would reveal evident signs of distortion, because the needle would waggle both ways.

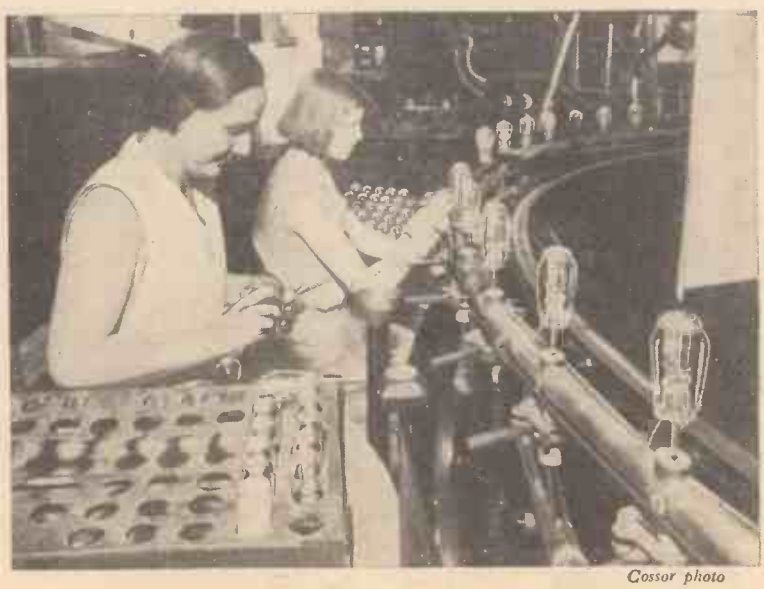
Quite a number of amateurs have told me that they are getting distortion even with increased high tension and a super-power valve. They have first blamed the output stage, and finally decided that the loud-speaker was to blame. *Actually, the second detector valve—assuming a super-het—was overloading.*

This would happen with a type of valve such as the Cossor 210HL, a detector with an impedance of 22,000 ohms. The excuse for using this valve might be that it had given good results in the past. You would not have realised that as the stations have all increased in power the valve has been more and more overloaded with the increased signal input. The distortion at the detector has been amplified by the following valves, so that the power valve has had to handle a signal already badly distorted. No improvement in the output stage has any effect on this distortion.

I stress this case because it is very common to-day. People want to get the utmost from weak stations, and blindly fit the highest "mag" detector valve. But they forget what they are doing—or never know.

I'll give you a real-life example. An amateur friend had a number of detectors in his box, and to find out which

The chances are two to —unknowingly, of course—u of detector valve in your here a member of the " Technical Staff te to do about it in forward way. Se taken into account detector for any notes will put you you want to try furt overlook the article by W. James on pa mostly in



Cossor photo

Operators at work on one of the big rotary pumps at a British factory. A nearly perfect vacuum is obtained by this machine

# of Putting our Detector Right

By KENNETH JOWERS

one that you are sing the wrong type battery set. Well, Amateur Wireless" lls you just what a very simple and straight- veral factors have to be in the choice of the best particular set and these on the right track. And if her valve experiments don't on high-frequency pentodes ges 156-157—that feature will rest mains users

was the best he tuned in a very weak foreigner, and then plugged in the valves one after another. When he had found the one that gave more volume than any of the others, he said: "That's the valve for me," and left things at that.

Then he happened to tune in the local station to listen to some announcements. They sounded very nice indeed. Came an orchestral programme; every other bass note and such sounds as cymbals sounded as though they were cracked. *Terrible!*

Signal-handling

He was just another amateur putting too much emphasis on the need for amplification at the detector, and not enough on the all-important attribute of signal-handling.

The set in question was one with two high-frequency stages and it was only afterwards that I found out the valve he was trying to use was an "R.C.," capable of handling only a fraction of a volt without distortion.

When I called in, I simply replaced the "R.C.," type when a Mullard PM2DX and the quality was then well up to standard.

Taking this problem from another angle, let us consider those with sets having detector and low-frequency stages, but no high-frequency amplification in front of the detector. The low-impedance type of valve I have been cracking up is not much use to them.

They need, above all, good amplification at the detector. This is where the higher-impedance valve comes into its own. For, with the higher impedance goes a much higher amplification. This in itself is an advantage in such simple sets, but there is still another point in its favour.

The anode current of the 210HF type of valve with 100 volts high tension is 3 milliamperes, whereas the anode current of a low-impedance valve with the same high tension would be between 5 and 6 milliamperes.

So you see that there is another factor to be considered. If your high-tension supply is on the meagre side and you want to economise as much as possible in the anode current you will have to effect a compromise—whatever type of set you are using.

I suggest you use the higher-impedance type of valve, but make some provision for controlling the input from the preceding stages. Then you can keep your quality up to standard and at the same time economise in high-tension current.

Now I come to a point that many amateurs entirely neglect. I refer to the connection for the grid leak. As a rule, this leak is taken from the grid condenser to the low-tension negative side of the accumulator. I am referring now, of course, to sets that have been in use for some little time.

That was all very well in sets using the old type of detector, which was designed to work with a slight negative bias. But if you start putting in a modern high-efficiency detector with such a connection you will find that the set will become unstable.

Positive Bias Needed Now

The reason is that the modern valves need a positive bias in order to work on its correct operating point. Under this condition, grid current flows, thus stabilising the valve.

You are then able to obtain the maximum output from that valve, whereas with the old connection you might have condemned it as no better than the original valve. In other words, the modern detector should have its grid leak taken from the grid condenser to low-tension positive.

Another point that often causes trouble is fierce reaction when a new detector is inserted. It is more than likely that the new valve will have a lower impedance than the old one, and this will cause the valve to oscillate more freely. If the set already oscillated quite well, it is very probable that uncontrollable oscillation may be caused with the new valve.

A simple way to stop this trouble is reduction of the high tension. But that will mean bad quality, probably. It is not likely that you have made your own coils, but if you have the remedy is very simple—remove one or two turns from the reaction windings. Or you could use a smaller capacity reaction condenser.

One remedy that rarely fails is the connection of a small capacity pre-set type of condenser between the anode of the detector valve and earth. This is adjusted until sufficient high frequency is by-passed to give complete stability with the reaction condenser at minimum.

High-impedance Types

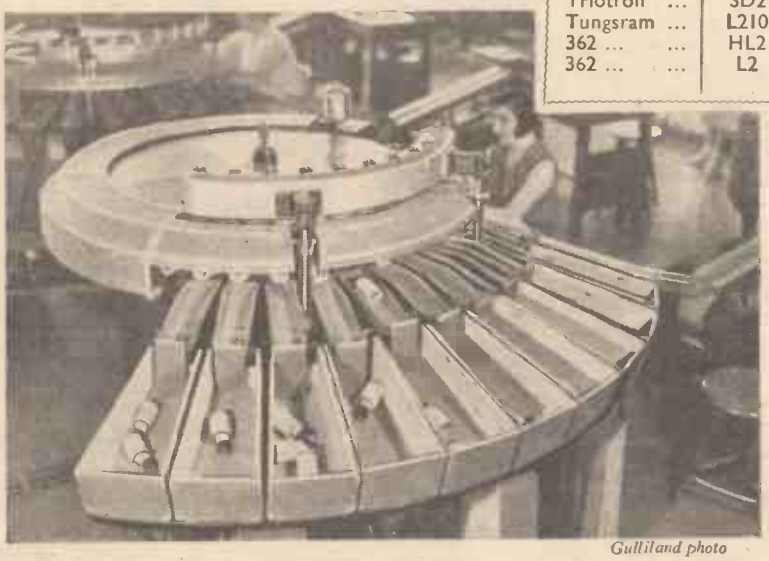
From what I have said, you might imagine that there is no occasion when a really high-impedance valve should be used for the detector. On the contrary, the high-impedance can be very useful. Take a set with resistance-capacity coupling after the detector. When the set was built you probably used the PM1A, a valve with an impedance of 41,600 ohms.

Although I said a high-impedance valve can be very useful, I was not thinking of that particular type; it is really *too* high.

I was thinking more of the PM1HF type, with an impedance of 22,500 ohms. This valve makes an ideal detector with a resistance capacity stage after it. But you cannot just take out the PM1A and put the PM1HF in its place. You must alter the anode resistance to something around 75,000 ohms.

VALVES DESIGNED SPECIALLY FOR DETECTOR USE

Make	Type	Impedance	Amplification Factor	Mutual Conductance	Anode Current at 120 volts
Cossor ...	210HF	15,800	24	1.5	2.2
Cossor ...	210Det	13,000	15	1.15	2.5
Hivac ...	D210	13,000	16	1.2	3.0
Marconi ...	HL210	20,000	24	1.2	2.0
Marconi ...	HL2	18,000	27	1.5	1.0
Marconi ...	L210	12,000	11	.92	2.0
Mazda ...	HL210	18,500	26	1.4	2.0
Micromesh...	HLB1	16,000	24	1.5	2.0
Mullard ...	PM1HL	20,000	28	1.4	1.2
Mullard ...	PM1LF	12,000	11	.9	2.6
Mullard ...	PM2DX	12,000	18	1.5	3.0
Osram ...	HL2	18,000	27	1.5	1.0
Osram ...	L210	12,000	11	.92	2.0
Six-Sixty ...	210HL	20,000	26	1.3	1.0
Six-Sixty ...	210LF	12,500	10.6	.85	2.5
Triotron ...	HD2	15,000	15	1.0	2.0
Triotron ...	SD2	12,000	18	1.5	3.0
Tungsram ...	L210	16,000	16	1.0	3.0
362	HL2	16,000	24	1.5	2.0
362	L2	12,000	15	1.2	2.5



Gulliland photo

Completed valves are passed through this German machine and automatically ejected into one of ten trays according to any one of ten faults that may be shown up

A giant of its kind—the Marconiphone searchlight loud-speaker for public-address announcements in halls and open air

Shall We Soon Have Smaller Loud-speakers?

J. H. Reyner, B.Sc., A.M.I.E.E., tells in this article of a new magnetic alloy that may well revolutionise the design of our loud-speakers. Models with magnet systems no larger than a matchbox are foreshadowed

MANY years ago locomotive engineers were very troubled at the wastage of certain portions of the firebox. Owing to the intense heat, the steel plates used to burn away and it was necessary to replace them at much too frequent intervals.

Accordingly they got in touch with steel manufacturers and asked them to produce a heat-resisting steel which could be used in this rather difficult position. Baldwins, the well-known Sheffield firm, in due time provided them with a special alloy of aluminium, nickel, and steel which satisfactorily stood up to the intense heat and is still used for the purpose.

BH VALUES FOR TYPICAL STEELS	
Tungsten, 6 per cent.	330,000
Cobalt, 9 per cent.	530,000
Cobalt, 25 per cent.	720,000
New alloy	Over 2,000,000

There the matter stood until a few years ago, when a Japanese experimenter found that if this particular steel was heat-treated in a certain way it showed magnetic properties considerably better than those of ordinary steel.

Similar work on the heat treatment of steel in Germany, notably by Siemens Schuckert, produced the same results, and indeed carried them rather farther, with the result that the new alloy, under proper treatment, was found to be several times better than the best magnetic alloy yet evolved.

The material appears to be principally applicable to the production of permanent magnets suitable for loud-speakers, meters, and suchlike. In the design of a permanent magnet for any purpose, say, for example, the magnet system of a moving-coil loud-speaker, we find that the field strength is proportional to the "BH" (magnetising force and total magnetic field) of the magnet and the volume of the steel.

Reducing Magnetic Leakeage

For a given BH the only way of increasing the field strength with a given design is to increase the volume of steel, which means increased cost, and commercial design to-day consists in so proportioning the magnet that there is the least possible leakage of magnetic field so that the volume of steel may be kept down, and hence the cost kept low.

The BH of the magnet is a measure of its magnetic properties. If we have a coil of wire carrying current a certain magnetic field is produced. If we insert inside the coil a piece of steel the magnetic field produced is many hundred times greater and the better the material the greater the increase.

If we increase the magnetising force by increasing the current down the coil the total magnetic field with the iron in circuit also increases up to a point and then begins to fall off again, giving a definite maximum, which is the best that can be obtained with that particular steel.

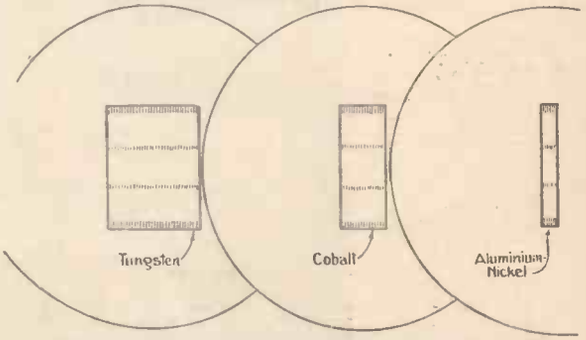
Magnetising force is usually represented by the symbol H and the total magnetic field produced by the symbol B, and the relative excellence of any sample of steel is determined by the product of B and H at the particular maximum just mentioned. This is what is meant by the BH of a magnet and, since the total field produced in the gap is proportional, both to the BH and to the volume, it follows that if we can increase the BH of the steel we can reduce the volume, with a proportionate saving in cost.

Against this saving must be reckoned the fact that the material is possibly more expensive, but even so the improvement is usually worth while. The early permanent-magnet loud-speakers were made up with tungsten steel—a steel with a small proportion of tungsten alloyed with it.

This was formerly considered to be the best steel for permanent magnets, but when designers attempted to use it for loud-speakers they found that they wanted such a large volume of steel to obtain the necessary magnetic field that the whole thing became much too cumbersome. Tungsten steel has a maximum BH of about 330,000.

Then came the introduction of cobalt steel, a material which exhibited distinctly better properties than tungsten steel, the improvement depending upon the amount of cobalt. Up to 25 per cent. of cobalt is commonly used, and such steel has a BH of round about 700,000. This is twice as good as tungsten steel and, consequently, the volume of steel in the magnet system can be reduced to one half.

This new aluminium-nickel steel has a BH of about 2,000,000—over three times as great as the cobalt steel and six times better than tungsten steel. Cobalt steel is much more expensive than tungsten steel, but even so the saving in volume more than offsets the increased cost of the material, giving a compact assembly at an economical price.



How the size of the loud-speaker unit depends on the magnet material used. Each of these three loud-speakers gives the same volume, but, from left to right, they are made of tungsten, cobalt and aluminium-nickel steel

It is understood that the cost of this new alloy is not much greater than the cost of cobalt steel, so that the improvement due to the saving in volume should be very largely reflected in a reduced price.

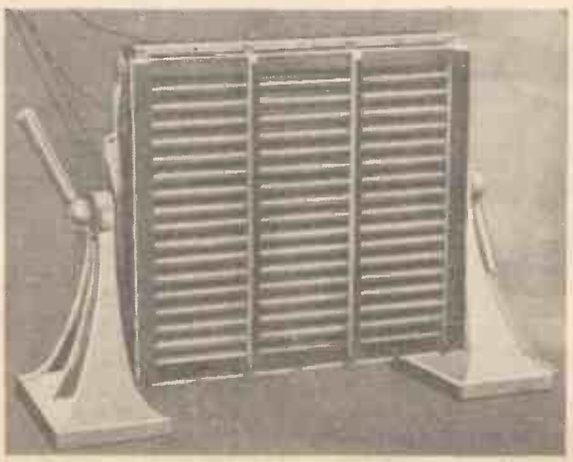
Hence if the material has all that is hoped for it we shall have loud-speakers with magnet systems not much larger than a match-box producing the same sort of results as we are getting to-day and probably at a cheaper price, although that remains to be seen.

Just when this material will be available is a little difficult to say. The constitution of the steel itself is covered by a British patent, while the treatment necessary to bring out the magnetic properties to the full is covered by Japanese and German patents and there are, accordingly, somewhat delicate negotiations proceeding at the moment in order to tidy up the position.

Midget Loud-Speakers

The indications are that this will not be long delayed, and the material will then begin to make its appearance in the laboratories of loud-speaker designers and ultimately in the form of midget loud-speakers which actually give a performance as good as a standard present-day model.

Thus we may well see a revolution in the design of our loud-speakers—all because the fireboxes in railway engines years ago needed a special kind of steel. We must thank a Japanese experimenter for linking locos to loud-speakers.



Another giant loud-speaker—an early model used in the Siemens system of public-address work

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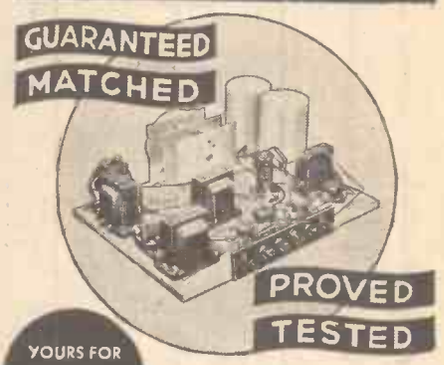

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Programme Criticisms by WHITAKER-WILSON

Without Fear or Favour

Monday

THE week began well with a concert by the Berlin Philharmonic Orchestra under Dr. Furtwängler. This orchestra has not the lineage of either the Gewandhaus or the Vienna Phil., but its traditions are good.

The visit of this orchestra has, naturally, caused considerable interest amongst listeners, the more musical of whom may have responded to the somewhat novel rendering of Beethoven's Seventh.

At all events, it was a great change from the B.B.C. Orchestra. We need these changes occasionally.

Tuesday

A really sensible programme of Grieg came on at 7.20 to-night. The E Orchestra was conducted by Stanton Jefferies, whose name I have missed since he went on to the more technical side of broadcasting.

I, personally, thoroughly enjoyed hearing Arthur de Greef play the A minor piano concerto, which he seems almost to have made his own. These kinds of programmes, though they have a classical flavour, ought to be considered part and parcel of Light Entertainment.

Wednesday

Of course you heard the Kentucky Minstrels? I am bound to confess I have a distinct weakness for them. It thrills me to hear "Ladies and Gentlemen!" and then a roll on a tambourine.

So long as the patter and the songs are constantly changed, I think we might have these excellent darkies more often. A thoroughly good, old-fashioned show.

Thursday

Soft Lights and Sweet Music are all very well for those who like either or both. Because there may be many who have leanings that way, nothing ought to be said against these shows.

All the same, to-night's edition might better have been named *Glucose and Saccharin*.

There is something to be said for forty-minute variety. Also, it is a good idea to have it divided into four more or less equal parts.

Whether it was wise to have two lady singers and two comedians is another matter. I liked Dodo Watts as a singer; I also like Rose Hignell as a singer.

It is in a kindly way, however, that I point out to both of them that they must take care to deliver their songs in tune.

Both sang flat. Another time they must expend a little more energy and thought. Easily remedied.

Ernest Shannon, imitating Stainless Stephen and Gillie Potter in a supposed dialogue, was very good, but much too long.

Strange, but whereas I welcome originals at that length, the very fact that I was listening to an imitation (clever though it was) made me impatient after a short space of time.

The Western Brothers were well up to form. They saved the show. Their songs "After All That" and "Great Stuff Chaps" were first-rate. I always enjoy those two.

Friday

"Songs from the Shows," Drury Lane edition, was well up to standard. These reminiscent shows are now thoroughly formalised.

Good singers, a well-trained chorus, the Theatre Orchestra, and someone like Stanford Robinson to conduct—all these make for something very much smarter, perhaps, than the original series.

There is something very respectable—something very "Beebeeseeish"—about the way these things are presented. From what I hear, they have been accepted in that form. Therefore, the only reasonable comment is to suggest they shall continue just as they are.

Saturday

Judging by various comments that have come my way, I think it can be now supposed that these "In Town To-night" shows are well established and are becoming more and more popular.

They are difficult to arrange and keep genuine. We have had one or two "flops" in them, but, on the whole, there is very little to complain of.

There is one point about them that might be explained. These shows are only *arranged for*. They are in no sense *produced*. Because of that we ought to be lenient in our view of what really sounds bad from the production standpoint.

People entirely unaccustomed to broadcasting are "collared" by the B.B.C. and asked to write down this or that experience and read it before the microphone.

The result in nine cases out of ten is stilted and awkward, but sometimes it carries a little unrehearsed humour.

At all events, the B.B.C. does as it says: it "tries to bring you something interesting each week."

◆ ◆ ◆

Sutherland Felce made a good compère for to-night's Music Hall. Actually he provided an extra turn, which is not "compèring" in the accepted sense of that somewhat extraordinary term. On the other hand, he provided genuine amusement.

The Moussorgsky Quartet is not often heard in this country. I do not know that I think it the best-balanced male quartet I have heard, but it has an air of distinction about it. That, of course, is everything—or nearly everything—in broadcasting.

The bass went so low as to make most baritones seem like light sopranos!

The only other good singing was by the Houston Sisters, who can always be relied upon.

A song like "On the Steamer Coming Over," which has been done to death recently, seemed to come very much to life again when they sang it. Those two have a high technique—so high that they ought to broadcast more often.

The humour of Leslie Weston made interesting comparison with that of Ernie Mayne.

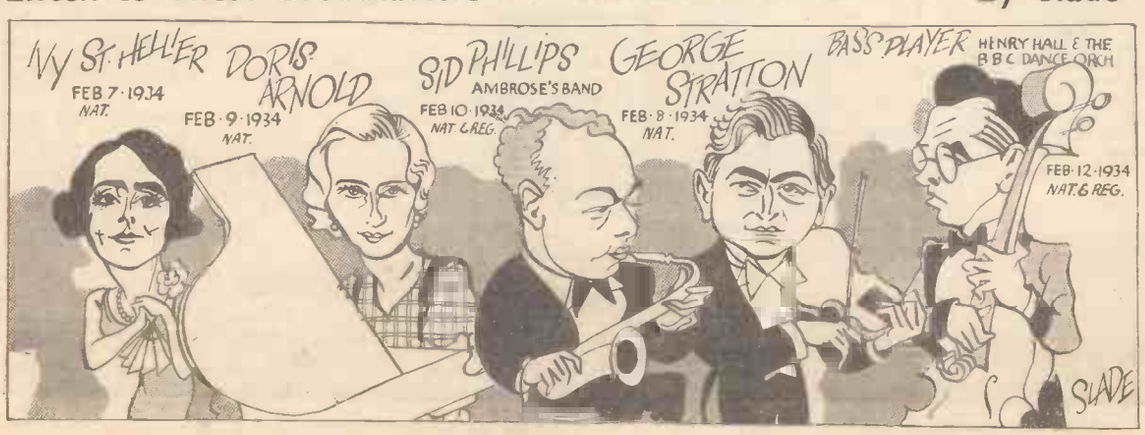
Leslie is always very funny and he has a happy knack of taking his hearers along with him. He is, definitely, a good broadcaster.

Ernie Mayne, in making his debut, went at it in his characteristic fashion. Very good he was. Just the same old Ernie, like a huge bull bashing at a gatepost. He yelled and bellowed away to his heart's content and to the delight of the audience in St. George's Hall.

Perhaps he would not make a good broadcaster but for the fact that we all know how to take him.

He seemed to broadcast his enormous proportions while he managed to ram his comedy points home at the same time. Now he has become one of us we cannot let him go.

Listen to These Broadcasters - - - - - - - - - By Slade



Straightening Out the Lucerne Plan

By JAY COOTE

AS at the time of writing the new Plan has been in operation for over fifteen days, it is now possible to judge of its efficiency. We have had the opportunity on several evenings of tuning in the stations, and can now sit down to a study of the log. Generally speaking, it is working well and, barring certain flaws in some portions of the band, stations working on the medium waves seem to have benefited—at least, the majority of them—by their change of channel. It is true that in some instances a few transmissions are lost to us—I refer to those on shared waves—but in most cases it is possible to pick up their programmes through another channel.

Prominent Stations

During the past few days, broadcasts of such stations as Copenhagen, Monte Ceneri, Hörby, Sundsvall, Goeteborg, Hamburg, Bergen, and Katowice, for instance, have been more prominent in my log than under the old plan. Admittedly, some of them have increased their power; Copenhagen, since January 15, has been working with the new 10-kilowatt transmitter, and Hamburg is one of the German "hundreds."

Taking all in all, I think that the few we have lost have been amply compensated by the better reception of a number of other broadcasts and on the average we register gains.

In the long-wave band, although matters are not yet as they should be, they are showing improvement. Dealing first with the dissenters, we find that, barring one station, they have not had it all their own way. Warsaw, which chose to work on its original frequency, saw its Lucerne channel snapped up by Radio Luxembourg, which in this position would appear to rule the roost. Poland has been awkwardly placed, inasmuch as the unexpected advent of Eiffel Tower has badly spoilt her pitch and it is no longer a place in the sun. Warsaw cannot take up the real allocation unless Luxembourg gives it up, and the odds are all in favour of the latter hanging on to a good thing.

Eiffel Tower has been gradually pushed away from Daventry National, and now, after violent collisions with the Pole, has placed itself on 1,389 metres (216 kilocycles), bringing its transmissions within five kilocycles of Motala on 1,357 metres (221 kilocycles). This is undoubtedly the worst part of the band and most certainly needs cleaning up.

Kootwijk, taking the Hilversum programmes on 1,875 metres, is another station which I do not expect will budge, and interference by Moscow (RCZ) on that wavelength has been considerably lessened; in fact, during two nights the Dutchman was perfectly clear. The Russian station seems to have moved to 1,107 metres, where you can hear his indistinct mumblings in the usual manner.

Ankara (Turkey), which was seldom picked up before, has less chance of being heard to-day, as the broadcasts are sandwiched between those of Daventry National and the *Deutschlandsender*. Reykjavik and Istanbul are sharing the 183-kilocycle channel (1,639 metres), but from about 11 p.m. G.M.T. I can hear the Icelandic transmissions fairly well.

Lahti has made an unfortunate choice in working on almost the same frequency as Radio Paris, as the former closes early and cannot be picked up whilst the *Poste National* is on the air. All things considered, there are many good clear broadcasts to be logged on the long waves.

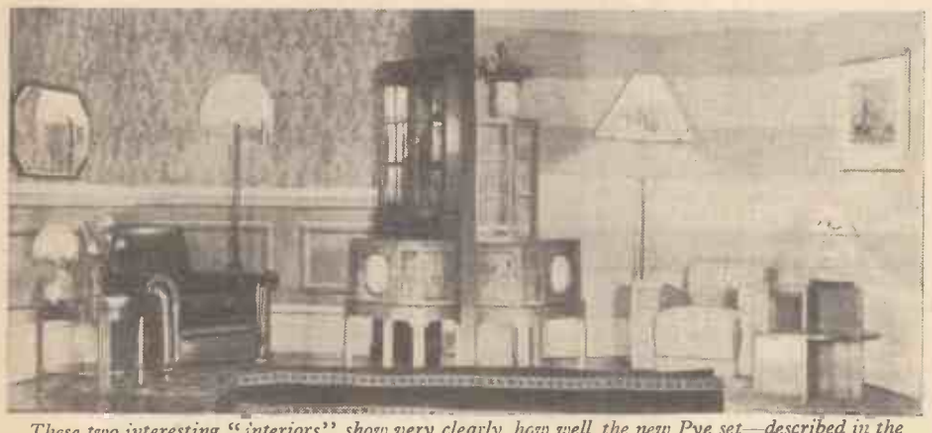
Radio Normandie, Fécamp, subsequent to a short stay on 225.6 metres, with which it interfered with the German common wave, has now gone down to 206 metres, coinciding with the French common wave. This, however, may not be permanent.

Now as to special observations: Both Munich and Muhlacker have proved somewhat of a disappointment in view of their advertised power (100 kilowatts), but the explanation is a simple one. They are still using their old aerials, which are not suited to the change of wavelength. New aerial systems are now under construction, and you should note a great improvement of signals within the next week or so.

German Jollity!

By the way, tune in to the German stations on February 11, as it is their special Radio Day. According to published notices, they are all out to broadcast the liveliest programmes they can compile. It will be interesting to find out a German's conception of a jolly entertainment.

If on Saturday, January 27, you failed to hear the usual programme from Hilversum via Kootwijk, you will want an explanation. The *Vara* programme was cancelled, as a punishment. Following the verdict of the Leipzig Reichstag fire trial, this socialist organisation expressed its feelings by a five minutes' silence. The Dutch State authorities intervened later, with the result that the *Vara* was forbidden to broadcast on the date mentioned. The other associations also refrained from giving their programmes.



These two interesting "interiors" show very clearly how well the new Pye set—described in the right-hand column—fits in with every furnishing scheme—period on the left and ultra-modern on the right

Too Many Dud Valves?

To Thermion, "Amateur Wireless"

Sir,—A recent experience of my own caused me to read with special interest, and in full agreement, your remarks in "A.W." for January 13, under the heading, "Too Many Duds."

A month ago I assembled a battery kit set for a friend, and found that the pentode supplied was taking about 50 milliamperes. As the makers of the valve disclaimed all responsibility, I purchased a similar valve locally, which was found to be in the same unsatisfactory condition. Fortunately the dealer exchanged this for a good valve.

While waiting for the decision of the makers in regard to the first "dud," I borrowed a new pentode of another make, which only gave about four hours' service before shorting internally, and, to my consternation, burned out the other valves in the set, no fuse being fitted.

Defective weld on grid support of pentode valve

Curiosity led me to open up the valve to see if the cause could be traced, and it was easily visible. A spot weld on one of the grid supports had given way, and allowed the electrodes to touch each other.

You can understand that this little episode led me to echo your remark, "Not good enough, I think."

I do not know if it is of sufficient interest to use, but I have enclosed a magnified photograph which I took of the faulty weld on the grid support. J. REID.

Dumfries.

A New Super-het

VERY ambitious claims are made by Pye Radio, Ltd., for the first of their New Era wireless receivers. The first Pye Cambridge set is certainly going to be talked about. It is *really* handsome, the cabinet having been designed by an architect.

It is a break-away from tradition, though all that is best in the modern cabinet-maker's art has been embodied. Picture a long, low cabinet of striking lines, with beautifully grained and inlaid natural walnut.

Inside this cabinet, which is designed with a lid that hides all the controls from view when no one is actually operating the set, is a chassis that Pye may well be proud of. A super-het with five valves and Westector, giving automatic volume control, tone control, volume control and every refinement yet discovered.

One of the special features is the tuning "compass"—a visual tuning device that will appeal especially to non-technical users.

Yet, with all these attractions, the set is only 20 guineas, or 22 guineas with a beautiful stand to match the cabinet.

Sets of the Season Tested

Telsen 474 A.C. Four

Two views of the latest addition to the Telsen range of sets—a four-valve A.C. model

TELSEN'S latest all-mains receiver is a development in more ways than one. The first outstanding point is the exceptionally neat and compact cabinet, which gives the effect of being of heavy, solid walnut. The fret and escutcheon plate are recessed from the remainder of the front panel by a little over a quarter of an inch. As the silk behind the loud-speaker fret is a rich nut-brown, the whole effect is particularly pleasing.

Of course, all of the control knobs, as well as the escutcheon plate, harmonise with the remainder of the cabinet work.

In view of the compactness of the set, the cabinet size will be of interest. The total width is a little over 14½ in., the height is 18 in., with a depth of 8½ in.

Good Tuning-dial Arrangement

Unlike the majority of compact receivers, the tuning dial is wide enough to make calibrations of adjacent stations an easy matter.

As may be expected, with a set designed by manufacturers experienced in the production of kit receivers, everything about the set is simple, while any points which might cause difficulty have been fully explained.

There are three major controls on the front panel; in the centre a 1½-in. tuning knob. Although this tuner has a ratio of only about 5 to 1, it is ample for fine tuning and weak stations can be accurately tuned in without having to fiddle too much. On the left-hand side is the volume control, which operates on the high-frequency pentode amplifier.

It enables you to increase to the maximum or decrease to the minimum the high-frequency stage gain and, at the same time, if the receiver is used close to the local station, it prevents possible overloading of the detector valve.

On the right-hand side is a simple reaction control which, during our tests, was hardly used, at any rate for sixty to seventy per cent. of the stations we heard. On the right of the cabinet (and recessed in) is the wave-change switch. This has a lever action and it is pushed up for high waves and down for long waves. The on-and-off switch is at the back of the cabinet on the chassis next to the mains plug.

Provision has been made for external loud-speaker, gramophone pick-up and mains aerial, while there are three alternative mains input tappings. The output from this set is the order of 2½ to 3 watts, which is handled by the energised moving-coil loud-speaker without any difficulty. Actually the quality is comparable with sets costing much more. This is particularly noticeable when a gramophone pick-up is used, full volume at good quality being obtained without any trouble.

Selectivity is well above the standard of the average three-valve set, which is probably due to the fact that the aerial is coupled to the first high-frequency pentode through an iron-cored bandpass filter.

Where the mains are unusually rough and likely to cause hum, provision has been made to neutralise this by means of a semi-variable hum-adjuster on the chassis. This can be regulated to cut out the hum, after which it can be left set.

The tuning range on medium waves is between 200 and a little over 535 metres, while on the long waves all stations between 835 metres and 2,040 metres can be tuned in. The tuning dial is not calibrated in station names, so that it is quite suitable for use with the Lucerne Plan. As well as being calibrated in wavelengths, it is also marked in degrees from 0 to 100.

The high-frequency pentode detector is resistance-capacity coupled to the pentode output valve which, as well as improving the quality and reducing the hum, makes quite sure that there will never be any trouble through the primary winding burning out.

As the loud-speaker field is used as a smoothing choke, this will also help to make the set reliable.

A little point which interests a lot of people is the illuminated dial. This is lit by twin bulbs which can be replaced without having to take half the set to pieces. These bulbs provide equal illumination over the entire tuning scale.

On test, 30 miles from London, with a 50-ft. aerial, the local National and Regional could be cut out within two or three degrees. Stations such as Fécamp, Cork and Athlone could be heard at full loud-speaker strength, while in the daylight quite a number of stations could be heard on the long waveband at sufficient volume to be of entertainment value. Another good daylight station was Langenberg, but only slightly better than Brussels.

For the average home where a moderate number of stations is required, but these at good quality and volume, this Telsen 474 will be a very satisfactory set. It will give enough stations, quality good enough for the most fastidious listener, and will be suitable for playing records for a small number of dancers.

IN A NUTSHELL

Makers : Telsen Electric Co., Ltd.
Model : 474.
Price : £11 11s.
Valve Specification : Bandpass coupled high-frequency pentode (Mullard SP4), high-frequency pentode detector (SP4), power pentode output (Mazda AC2Pen). Full-wave rectifier (Micromesh R2).
Power Supply : 200-250 volts A.C., 40-100 cycles.
Type : Self-contained upright table model.
Remarks : An outstandingly cheap family set of good design.

Fun Among the Foreigners

DO you realise that there are many foreign stations broadcasting music that is so characteristic of its country of origin that no call sign is needed to identify them? Perhaps the best example is Budapest, with its gypsy music from various hotels and cafés along the Danube.

Very few listeners with anything like a good set can have failed to log Budapest. Almost every evening at some time or another—and always after 9.30 p.m.—this tzigane music comes to us with its fascinatingly wailing lilt. And now that the high-power Budapest station is in operation the programmes as received in this country really are worth hearing.

Volatile Tzigane Leader

Don't you remember the volatile Alfredo Rhode, who came over here not long ago? He is typical of the type of band that can be picked up so easily now from Budapest.

Then, what of the broadcasts from Stockholm? Their dance music seems strangely old-fashioned, with lancers, polkas and valetas. These dances seem very popular in Scandinavian countries—and, of course, they strike a reminiscent chord among the older listeners in this country.

These old-fashioned dances can easily be picked up through Motala on the long waves—when that station is not jammed—and through Stockholm, Hörby and numerous relay stations on the medium waves.

◆ ◆ ◆

Nearly everyone at some time or another has a grouse about the English railways; well, last week I picked up a talk on them that really made me swell with pride—and the talk came from Kalundborg, the long-wave relay of Copenhagen. Every Sunday morning at 12 midday this station gives a talk in English, and in these talks the English listener will hear things to the credit of his own country that will certainly be cheering.

◆ ◆ ◆

Toulouse is another station nearly all listeners can pick up. Although I am not frightfully keen about the programmes from this station, there is no doubt that the concertina and mouth-organ bands are gleefully received in the northern part of this country. These can usually be picked up between 8 and 9 p.m. in the evening.

◆ ◆ ◆

We owe a great debt of gratitude to Hilversum, the Dutch station that so regularly sends us our breakfast-time programmes of gramophone record selections. From this station, at 7.40 a.m., you can always hear the time signal corresponding to 8 a.m. Dutch time.

Every morning they arrange very enjoyable light programmes made up of such popular items as waltzes of the Viennese type, English dance hits, and, without fail, a Richard Tauber record.

Then on Sunday evenings the Dutchman very often broadcasts for at least an hour a programme of English artists. Many will remember Jack Payne and Jack Hylton broadcasting—and now the popular Lew Stone and his band are booked for an early date.

◆ ◆ ◆

There is little need to mention the tango music picked up from San Sebastian. The only snag is that the programmes are rather late. If you are up after the B.B.C. has closed down, though, you might just tune around for the Spaniard—the music is very characteristic of the country.

MALCOLM HARVEY.

Readers' Views on This and That

Listeners' Letters

SCRAPPING LONDON NATIONAL

To the Editor, "Amateur Wireless"

SIR,—Mr. E. A. Hornett's letter (January 27) expresses the thoughts of many other listeners. Why should the B.B.C. have no less than fourteen powerful stations between 200 and 450 metres, many of which send out identical programmes?

The B.B.C. policy is simply an obstruction to world radio.

A. DUNOLLY.

Jesmond, Newcastle-on-Tyne. [1023

DANCE-BAND BROADCASTS

SIR,—I read with some surprise Mr. Hogan's letter in "A.W." of January 27. What does he mean by "sloppy stuff"? Does he think Ambrose plays "sloppy stuff," and does he seriously think Bertini plays better *dance music* (Mr. Hogan's italics) than Ambrose, who is not only famous in Britain, but the world over, for the quality of his dance music?

London's hotels pay high fees for the services of dance-band musicians, therefore they get the best. A West End dance-band musician receives anything from £14 to £80 per week, according to his skill.

Ambrose's band is the finest broadcasting. He is so versatile that he can play ordinary (commercial) dance numbers, Cuban rumbas, tangoes, comedy items, and the most advanced "hot" compositions, with equal skill and precision.

Mr. Hogan may prefer Bertini, so may many local Bertini fans, but countless other Northerners would regard the substitution of Ambrose by any other band on Saturdays as a calamity.

PHILIP A. BEALES.

Clapton, E.5. [1024

TOO MANY "DUDS"

SIR,—I can match Thermion's experience with "dud" mains valves.

Some months ago I fitted a friend's set with indirectly-heated variable-mu screen-grid and detector and directly-heated pentode, all by one of our biggest valve makers. In a very short time the variable-mu went "off" and was replaced by the makers.

Shortly after this the set started imitating a circular saw. My friend took the valves to be tested again and was told, in effect, that the detector was weak but the pentode was a crock, and these were replaced without question.

Recently an indirectly-heated pentode, by the same firm, went "phut" in less than a minute. I replaced this with a similar valve of foreign make, and, so far, it is going fine.

Why buy British?

I. ATKINSON.

Leeds. [1025

AMERICAN VALVES

SIR,—The letter from our Canadian friend should be taken as a hint to us to get a "move on," because we are certainly behind the times. I would ask you to turn to page 122 of the January 27 issue—heading, "More News from the Valve Makers."

These tubes have been in use in America for the past twelve months:—

AC2/Pen type, refer to *R.C.A. tubes 2B7 and 6B7*.

Triode high-frequency pentode, refer to *R.C.A. tube 6F7*.

Battery pentagrid, refer to *R.C.A. 1A6*.

Also I guarantee that we will have to pay about 100 per cent. more than our Canadian friend for these valves.

So let's have an "up-to-the-minute" set using American valves, if our English valve makers will not give us the goods.

J. M. CURDY.

Liverpool. [1026

UNBUSINESSLIKE METHODS

SIR,—Is there anything wrong with the radio industry, or have I been unlucky? I have been a keen home constructor for a long time now, and it is simply extraordinary how often I have had to wait anything up to a fortnight for components ordered.

I have other hobbies, but the firms catering for such—for example, photography—have practically never failed to fulfil an order by return of post. It is only among radio firms that I find this extraordinary lack of elementary courtesy.

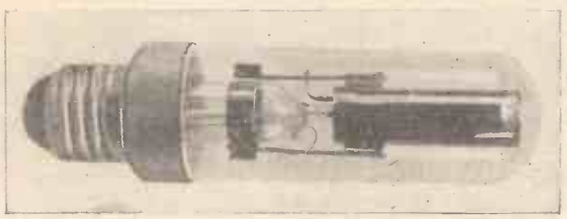
I am still waiting for an answer to a letter of mine to a very well-known firm, written in January, 1933, asking some perfectly legitimate questions about their apparatus, and I have now waited almost a fortnight for a set of parts ordered and paid for on the spot from another firm. Surely these are very poor methods and most discouraging to the home constructor?

J. W.

Godalming. [1027

Light Sources in Mechanical Television Systems

ONE of the problems in any mechanical system of television is the provision of adequate illumination which is capable of modulation according to the received signal impulses. Considerable progress has been made in the development of different light sources and methods of modulation but it is appreciated that an ideal has not been attained, chiefly because the amount of light that can conveniently be modulated is limited and this imposes restrictions upon the size of the projected image.



A typical crater-point neon lamp

Two Systems

The systems at present used can be divided into two classes: first, those in which the light is modulated directly; and, second, where light is modulated by being passed through a special light valve. In the first category come the ordinary neon, mercury-vapour and crater-point neon lamps and several variations with different fillings. The three first mentioned are, however, more or less standard and find the greatest general use.

Gas-filled Lamps

The disadvantage of any gas-filled lamp is the difficulty of securing adequate illumination for screen purposes, though the mercury-vapour lamp has now been developed so that it is capable of giving proper illumination for a screen of approximately 9 in. by 4 in. The simplicity of the gas-filled lamp, however, makes it particularly suitable for the smaller type of television receiver, obviating as it does a considerable amount of complication.

The ordinary beehive and flat plate neons have come into general use for the disc type of receiver and they will operate with a total voltage of about 185 and anything from upwards of 10 milliamperes of current. This means that in the majority of cases it can be placed directly in the output circuit of the average wireless receiver, which thus makes it possible to operate a machine of the disc type from the average wireless set and bring the reception of the television within the reach of all.

The crater-point neon lamp is a development of the ordinary neon, so designed that the light source is of very small area and of great intensity. As with the ordinary neon, this also is capable of direct modulation, which is a valuable feature, for it obviates a considerable amount of complication. The value of light, however, which is obtainable from this type of lamp is not so high as can be obtained by other methods. It is quite suitable for screen projection purposes for small-area screens and when a high degree of illumination is not essential. An operating voltage of approximately 250 volts is necessary for this type of lamp and current of about 30 milliamperes is required to work it at full efficiency. A typical lamp of this type is shown by the photograph, and the drawing shows the arrangement of the electrodes. The crater-point lamp is suitable for use in conjunction with the mirror-drum visor and it provides an easy solution to the problem of securing a point light with the minimum of trouble.

The mercury-vapour lamp is ideal where a line of light is required, as for instance with visors of the mirror-screw and rotating-echelon types. It consists simply of a glass tube an inch or so long with bulbs at each end and containing a small quantity of mercury, as shown by the photograph. The light which it yields is more intense than that given by a neon-lamp and is of a bluish colour. A current of 25 milliamperes is sufficient to give a very bright light and it operates at 300 to 450 volts. It has one slight disadvantage, in that a high initial voltage must be used to cause it to "strike" in the first instance.

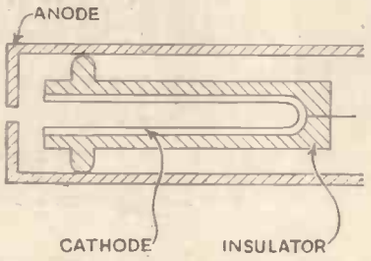


Diagram showing the electrode arrangements of the crater-point neon

This voltage need only be applied momentarily, after which the lamp will continue to run with its normal operating voltage. Various methods can be used to provide the striking voltage, the simplest probably being the momentary discharge from a spark coil.

There are several other types of gas-discharge lamps which differ chiefly as regards their filling, other gases and mixtures of gases being used. The neon and mercury-vapour lamps, however, find most favour at the present time in this class.

Light Modulation

We now come to the indirectly modulated light, that is in which the light is modulated at some point on its way to the screen. With this system an ordinary lamp is used and the beam from this is concentrated by means of a lens so that it passes first through an Iceland spar prism, then between a number of small metal plates arranged condenser fashion and immersed in nitro-benzine, and finally through a second Iceland spar prism. A potential is applied to the two sets of plates and this has the effect of controlling the amount of light that can pass through the cell. The construction and operation of this type of light valve has been dealt with in previous issues.

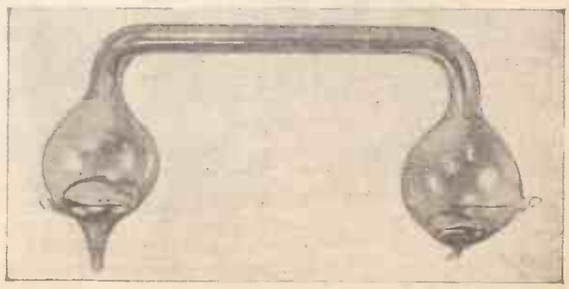
The Kerr Cell

The Kerr cell, as the combination is called, requires a pressure of about 400 volts for its operation and its power demands are 4 to 5 watts if full modulation is to be obtained. It will be evident, therefore, that this class of light valve can only be operated in conjunction with a powerful amplifier as the power demands are considerable. It is the best type of apparatus to use with a mirror-drum visor and the modulated light that can be passed will fully illuminate a screen with an area of about a square foot.

To sum up, then, the neon lamp is suitable for either the disc or mirror-screw types of visors and its operation and maintenance are very simple, the power demands being small. The crater lamp is suitable for the mirror-drum type of receiver where only a moderate amount of light is required. The mercury-vapour lamp provides a fair degree of illumination and is eminently suitable for visors of the mirror-screw class, the power requirements being moderate. Finally, the use of a Kerr cell as a light valve for modulating the light from a projection lamp is the best system of all from the point of view of getting the maximum amount of modulated light, but the system is somewhat complicated and costly compared with the others.

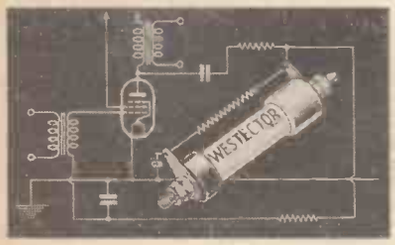
CATHODE-RAY OPERATION

More about the operation of a cathode-ray tube—dealt with in this section last week—will appear next week. This series of articles is of great value to all television experiments. Do not miss it!



A mercury-vapour lamp giving a line light. This type of lamp is suitable for use with the mirror-screw receiver

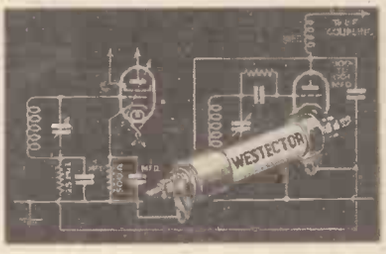
THREE TYPICAL USES FOR WESTECTORS



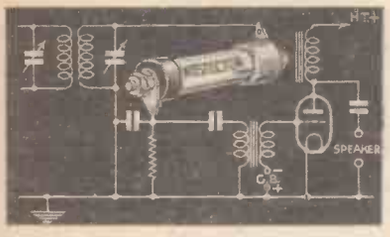
BATTERY ECONOMY

Used as a battery economiser, the Westector enables a large output to be obtained from a battery set without using special equipment, and is applicable to any type of receiver.

AUTOMATIC VOLUME CONTROL



Usually the introduction of Automatic Volume Control necessitates complicated alterations. But even delayed A.V.C. may be obtained in a simple manner with the Westector.



HIGH-QUALITY DETECTION

When used as the second detector in a Super-heterodyne, the Westector gives straight line rectification with distortionless detection, and it is almost impossible to overload it.

You will want to know more about this useful component. It is incorporated in many commercial receivers, A.V.C. Units, etc. The coupon below and a 3½ stamp to Dept. A.W. will bring you full details —a copy of our booklet "The All Metal Way, 1934."

COUPON

The Westinghouse Brake & Saxby Signal Co., Ltd.,
82 York Road, King's Cross, London, N.1

Please send me "The All Metal Way, 1934," for which I enclose 3d. in stamps.

Name .....

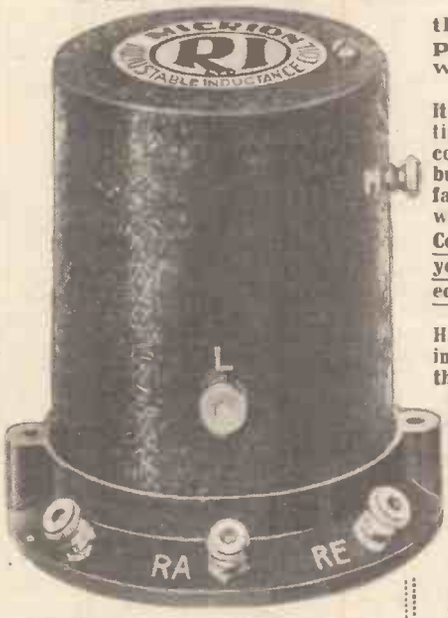
Address .....

A.W.10.2.34.

MICRIONISED TUNING —A MICRION TRIUMPH OF SELECTIVITY

Micrionised tuning is the secret of the great success of the new R.I.

WREN-EASTON 'CLASS B' RECEIVER



the circuit that has placed selectivity within reach of all.

It is easy to get selectivity by duplication of coils and condensers, but why such unsatisfactory complication when with one "Micrion" Coil and one Condenser, you can obtain knife-edged station separation.

Had "Micrion" been invented five years ago, the super-het would have been unnecessary, but now here is a remarkable circuit — the easiest set in the world to build, giving utmost selectivity, remarkable purity of tone, plenty of power and lowest H.T. consumption.

40% Greater Selectivity

Conclusive evidence of "Micrion" efficiency is given by the most authoritative technical sources of criticism. Recent test reports say:—

AMATEUR WIRELESS:—
"The high-frequency resistance was particularly good . . . quite the best coil we have tested. . . . A check in an actual circuit showed that the improvement was definitely noticeable . . . a distinct advance in coil design."

WIRELESS WORLD:—
"Our tests showed the 'Micrion' Coil to be a particularly efficient one and definitely better than a first-grade air coil . . . 'MICRION' COIL IS ABOUT 40% BETTER on the medium wave-band and 30% on the long waves."

POPULAR WIRELESS:—
'Micrion' has wider applications as well as a higher order of efficiency . . . altogether I consider the R.I. 'Micrion' to be a fine component."

All components necessary are specified in the R.I. "Wren-Easton" Photo-print Instruction Broadsheet, and constructors who have some of the necessary components can use them in the assembly.

Post the Coupon below for a complimentary copy.

List No. BY36 Price 12/6

Please send me the R.I. WREN-EASTON BROADSHEET free. I enclose 2d. in stamps for postage.

Name .....

Address ..... A.W.

Advt. of Radio Instruments Ltd., Croydon, Surrey

Conducted by J. H. Reyner, B.Sc., A.M.I.E.E.

We Test for You

Magnum dual-range coil

MAGNUM DUAL-RANGE COIL

THIS coil fully represents modern tendencies—making an efficient dual-range coil and at the same time keeping the price within reasonable limits.

The coil is wound on a cylindrical former, the long-wave winding being of the honeycomb type wound with double cotton-covered wire. The medium-wave and reaction windings are wound with enamelled wire on the solenoid principle.

Two fixing lugs are provided for fitting the coil to the base of the set, and provision for connecting is in the form of soldering tags.

Test Results.—The inductance of the coil on the medium waveband was found to be 162.2 microhenries and that of the long-wave winding to be 2,060 microhenries.

The high-frequency resistance of the coil was measured at 400 and 1,500 metres, and the L/R figures were found to be 26.3 and 51.7 respectively.

These figures indicate that the coil should prove quite efficient in use and, taking into consideration the very low price, we are of the opinion that this coil will find a ready market.

Makers: Burne-Jones, & Co. Ltd. Price: 2s. 6d.

FILTERMATIC OCTAVE TONE CONTROL

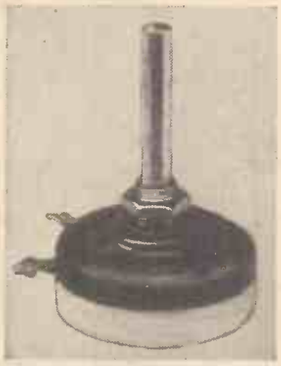
THE octave tone control takes the form of a very compact tapped condenser, having a capacity range of 40 micro-microfarads to .006 microfarad.

This range is covered in seven steps (all contacts being made internally by means of a bronze plate rubbing on bronze contact strips) and there is no noticeable interruption between the capacities when used.

The unit is very sturdily built and is constructed of the best parts obtainable for the purpose, such as bronze plates, mica dielectric and bakelite case. A plated dust cover seals the switching arrangement. Soldering lugs are provided for connecting purposes.

Test Results.—The control was connected, in accordance with the maker's instructions, in the grid circuit of a two-valve amplifier, having an uncorrected pentode in the output.

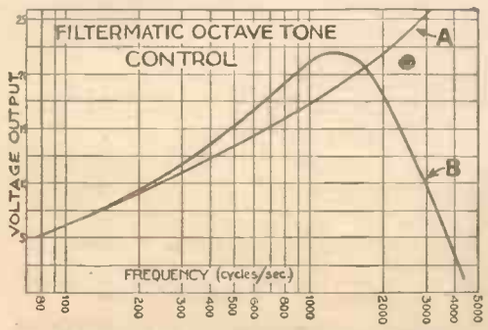
This, as will be seen from the curve reproduced, gave a large high-note response, yet the unit provided a definite cut-off of the higher frequencies. Curve A represents the audio output without the control and curve B the output with the control in No. 3 position.



Filtermatic octave tone control

It should prove especially useful in cases where interference is experienced in the higher audio frequencies.

Distributors: Rothermel Corporation, Ltd. Price: 5s.



(A) *Shows uncorrected output;* (B) *output with Filtermatic in circuit*

VARLEY NICORE AUTOMATIC VOLUME CONTROL UNIT

THIS is a unit intended to allow automatic volume control to be fitted to an existing receiver with the minimum of trouble. It is inserted immediately following the detector valve and uses some of the high-frequency current which is normally by-passed to earth (and thereby wasted) to generate the necessary A.V.C. voltage. The unit consists of a screened high-frequency choke, a Westector and the necessary resistance and decoupling components.

The unit has the advantage that it can be used on either anode-bend or leaky-grid detectors in both battery- or mains-operated receivers. The extent of the A.V.C. obtained is dependent on the sensitivity of the receiver.

The unit is supplied in a moulded bakelite case with a metal can screening the high-frequency choke. Seven terminals are provided, four of which are used for a simple circuit, the others being employed for delayed action or manual control.

Test Results.—The unit was connected up in accordance with the instructions supplied and was found to give a controlling voltage of some 4 volts between the A.V.C. point of the unit and earth, for an input of 1 volt R.M.S. when the customary grid detector was employed.

This gives a very convenient amplification of the control which will be satisfactory for most purposes. The by-passing action did not produce any appreciable effect on the normal reaction control in the receiver and the unit should prove very satisfactory in operation.

Varley automatic volume control unit

Makers: Varley, Ltd. (Oliver Pell Control). Price: 15s. 6d.

Exide DTG-C accumulator

EXIDE INDICATING ACCUMULATOR

THE Exide DTG-C accumulator is one of the two types recently introduced, fitted with an indicating device resembling the pointer of a clock. This method of indicating the state of charge is termed "Battery Time" by the makers. The indicator has three marked positions—"Full," "Half" and "Empty," and as the pointer is operated by the gravity of the acid, this at once gives a clear indication of the state of charge.

We understand from the makers that the indicator should be ignored when the battery is under charge.

Test Results.—With a resistance of 6 ohms across the terminals the accumulator lasted for 30 hours at an average discharge current of .3 ampere, giving an actual capacity of 9 ampere hours at 30-hour rate.

The pointer gave a satisfactory indication of the state of the battery throughout the discharge.

Makers: Chloride Electrical Storage Co., Ltd. Price: 5s.

Measuring Tuning Coils

The efficiency of a tuning coil is determined by the high-frequency resistance relative to the inductance. The lower the resistance the more sharply does the coil tune and the greater is the signal strength. The resistance, however, must always be considered in relation to the inductance, for it is really the ratio of these two factors that matters.

In fact the selectivity of the coil is proportional to the ratio L/R.

In testing coils submitted for test, therefore, the inductance is first measured and then the high-frequency resistance is determined at suitable frequencies, usually 750 kilocycles and 200 kilocycles (400 and 1,500 metres). The ratio of the inductance in microhenrys to the high-frequency resistance in ohms is then quoted.

On the medium waves a figure of 25 to 30 represents average conditions for the small air-cored coils of to-day. Iron-cored coils are usually somewhat better. The figure of merit on the long waves is always higher than this, being between 50 and 100 for a good, modern coil. This is because the high-frequency resistance on the long waves is relatively much less than on the medium waveband.

Amateurs on the Short Waves

By KENNETH JOWERS

HEARING W8XK on 13.92 metres is somewhat like listening to the cuckoos; everyone wants to be the first. As you probably know, W8XK is almost unobtainable during the winter months, so there are many listeners on the look-out for this station in the early spring.

This week I have had my two first reports from listeners who have picked up this low-wave Pittsburg station, and both of them are very enthusiastic about it. They tell me that reception is good, the volume being fair phone strength, rising to average loud-speaker strength a little after lunch.

When to Listen

The best times to listen are between 1 p.m. and 3 p.m., so you must bear in mind that this is a station to be looked for only during the afternoon.

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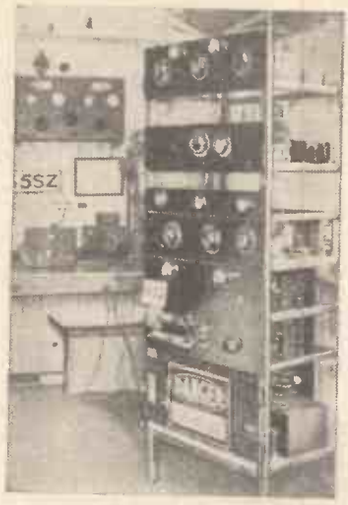
It seems that half the short-wave listeners in this country spend their time writing to the more prominent amateur transmitting stations, giving them reports and asking for QSL cards. While these reports are appreciated if they contain any information at all, you can hardly expect a reply if the transmitting station is only a few miles away and the report is simply a reception report without any interesting information.

Of course, it is different if you are writing to Australian or American stations and can give information over a long period. At the same time there are very few of these listeners who ever bother to send a stamped addressed envelope, so you can realise that the more important stations, who often receive fifty or sixty letters a week, get rather annoyed at having to find all these 1½d. stamps. So remember, if you do want a reply, please send a stamped, addressed envelope.

These transmitters do receive helpful reports which are really worth having. I have in front of me a report from a Mr. Pond, of Eltham, who has written to G6KV, commenting on his transmissions. He gives the very fullest information — such things as height above sea level and locality, dimensions of the aerial, barometric pressure, wind, exact time, atmospherics, interference, the amount of fading, as well as details of modulation, signal strength and intelligibility.



G5SZ's 36,000-kilocycle transmitter is seen in the foreground. Behind it is 161-metre gear

◆ ◆ ◆

G6CT reports reception of a 40-metre American amateur station at quite good strength. This confirms other reports I have received that the 40-metre band is looking up for long-distance reception. There is no doubt at the moment that conditions generally are much better than they have been for a long time.

As I mentioned before, the 13.92-metre Pittsburg station is now coming over, while W3XAL, on 16.87 metres, is one of the most reliable American stations at the moment.

As well as these, if you are listening late at night, the 50-metre band will provide plenty of entertaining stations. During the last week there has not been an evening when at least three stations could not be tuned on this band.

The Pick of the Records

Reviewed by WHITAKER-WILSON

Here our contributor reviews only the pick of the month's record releases. If you own a radio gramophone you will find this feature of great use to you when you want to buy new discs

THERE are a good many dance records in this month. It is some little time since I reviewed any. As a matter of fact, they are not the easiest things in the world to review because there is rather a sameness in dance tunes. However, here goes. Some of the productions are distinctly good.

Taking them in the order I happened to hear them, I was more than a little attracted to "You Ought to See Sally on Sunday," which I found on a Brunswick record (01660). I like Brunswick records because their surface is so good. This particular record I consider well up to standard in this respect. Also I must say I liked the tune.

Selling Like Hot Cakes?

Another Brunswick disc ought to sell like hot cakes, though I am not at all sure hot cakes sell any better than cold ones. At all events, the number is 01662, and it gives you "On a Steamer Coming Over," with "My Hat's on the Side of My Head" on the other side—of the record, I mean. Excellent. "Dancing in the Moonlight" is one of your favourites by now, I imagine.

If you like "Summer is Over" as a winter investment, you can have both—and well done, too—on Brunswick 0165. Another Brunswick issue that rather intrigued me was an Ambrose record. "I'm Hitching My Wagon" was the title of the effusion. I liked it quite well, but I particularly liked Ambrose's playing of it. It is a slow fox-trot and I am rather partial to them.

If your nervous system is in good order, and you can stand up to a little "hot" music, you can fairly scorch yourself either with "White Jazz" or "Blue Jazz"—it all depending on your taste in (tone) colour. "Blue Jazz" nearly finished me off! The Casa Loma Orchestra is responsible for both sides. Very good, but very "hot." So don't say I didn't warn you.

If you are sedate and prefer the old-time style of dancing, you can get the "Veleta" and even "See Me Dance the Polka" splendidly done on a Broadcast record—No. 528.

I should be sorry for anyone to see *me* dance the polka, but I felt inclined to try.

An operator in the H.M.V. factory preparing a copy of the record of the King's Christmas speech for the personal use of His Majesty. All profits will be handed to the Papworth Village Settlement, nominated by His Majesty

Well, that's that! Now for some orchestral music of the lighter type. H.M.V. (C2617) do an admirable little selection, using the Gaumont British Studio Orchestra for the purpose. Surprisingly good. I don't mean that rudely to the G.B.S.O., for a moment—in any case, it has nothing to do with George Bernard Shaw—but I did not think it could produce anything quite so good as this. Perhaps that's my fault, but I have not heard much light music of this kind recently. Anyhow, I recommend the disc.

Broadcast Twelve (3351) do quite an attractive selection from "This Week of Grace" and "College Humour," with Peggy Cochrane as the soloist. Her diction is remarkable.

Not too many songs this month, but what there are are not too bad. Lawrence Tibbett singing the "Song of the Flea" (Moussorgsky) and Tchaikovsky's "Pilgrim Song" is one of the best records I have heard for some time. DB1945 of the House of H.M.V. supplies these.

On DB2087 two arias from *Der Rosenkavalier* are well sung. Wonderful music it is, too. I sincerely suggest you ask to hear this record. There is a waltz theme on one of the sides—can't remember which at the moment—that you won't forget in a hurry.

In lighter style try Decca 25603 for a "Cowboy Yodel" (if you are so inclined) with a guitar accompaniment. Gene Autry as soloist. It is the real thing.

A little humour for you. Not much, but very good. Bobbie Comber lightly humorous in "Any Dirty Work To-day" on Broadcast Twelve 3348 is one.

John Tilley on the "Anti-arson Squad" (Columbia DB1294) is simply splendid. He is one of our best comedians. You will laugh.

Elsie and Doris Waters at their best in *London Pride*, on Columbia DB1299. They are a scream, those two. Get this at once, or it will be O.P. or something, and then you will be disappointed.

Columbia (C2634) gives a remarkable piano duet played by Mark and Michal Hambourg. It is an *Andante and Variations*, by Schumann. Rather unusual.

Two Superb Records

And now, before I finish, I see I have missed two in my list which must be included. The first is a Panachord 25604. "When the White Azaleas Bloom," and "Tie Me to Your Apron Strings Again" are worth having, if only for the superb recording.

The other was "And so Good-bye," and "Reflections in the Water" (Decca 3735)' sung by Frank Coleman, the male soprano. His voice is amazing.

What's New in Radio

Tonastat selectivity unit; this gives six different combinations of capacity

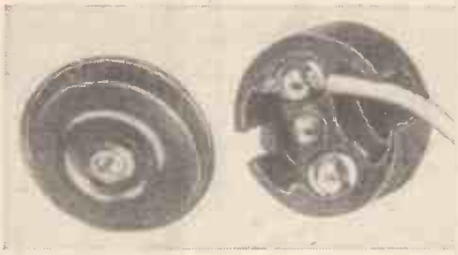
THOSE who want to make their sets more selective will be interested in the Tonastat, marketed by the "TX" Products Co. at 3s. 6d. In addition to the usual pre-set condenser, this unit contains two fixed condensers; by linking together the six terminals provided, it is possible to get six different combinations. The makers provide an instruction sheet, showing the best combinations for different types of sets with different lengths of aerial at various distances from a transmitter. On test the unit was found to work satisfactorily.

◆ ◆ ◆

From Lectro Linx, Ltd., we have received a sample of a new Clix quick-connecting 5-ampere plug for use with mains receivers. At its price of 6d., this is surprisingly good value. The connecting wires are held in position by spring friction and are clamped very firmly when the top of the plug is screwed on.

◆ ◆ ◆

Pickett's have recently introduced a new radio-gramophone cabinet known as the Popular; this sells at £3 15s. This is of ample size to take even large mains sets, and will attract the interest of many constructors who want a soundly constructed job at a reasonable price.



Excellent value for money is this Clix 5-ampere plug for mains sets

The new Popular radio-gramophone cabinet made by Pickett's

◆ ◆ ◆

In the G.E.C. advertisement of Osram valves in the issue dated January 27, the price of the VP21 was given as 16s. 6d.; this should have been 15s. 6d.

◆ ◆ ◆

Readers owning N. and K. Farrand inductor loud-speakers will be interested to know that F. W. Lechner & Co. have taken over the servicing of these loud-speakers.

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	Kilo-cycles	Station and Call Sign	Country
16.86	1717.790	Daventry (GSG)	Great Britain
16.88	177,775	Huizen (PHI)	Holland
19.54	15,350	Lisbon (CTIAA)	Portugal
19.56	15,330	Schenectady (W2XAD)	United States
19.68	15,234	Paris (Coloniale)	France
19.72	15,210	East Pittsburgh (KDKA)	United States
19.73	15,200	Zeesen (DJB)	Germany
19.82	15,140	Daventry (GSF)	Great Britain
19.84	15,120	Vatican (HVJ)	Italy
23.39	12,825	Rabat (CNR)	Morocco
25.00	12,000	Moscow (RNE)	U.S.S.R.
25.25	11,880	Paris (FYA)	France
25.27	11,870	E. Pittsburgh (W8XK)	United States
25.28	11,865	Daventry (GSE)	Great Britain
25.40	11,810	Rome (2RO)	Italy
25.53	11,750	Daventry (GSD)	Great Britain
25.57	11,730	Huizen (PHI)	Holland
25.63	11,705	Paris (Coloniale)	France
30.0	10,000	Madrid (EAQ)	Spain
31.25	9,600	Lisbon (CTIAA)	Portugal
31.28	9,590	Philadelphia (W3XAU)	United States
31.28	9,590	Sydney (VK2ME)	New South Wales
31.30	9,585	Daventry (GSC)	Great Britain
31.38	9,560	Zeesen (DJA)	Germany
31.48	9,530	Schenectady (W2XAF)	United States
31.55	9,510	Daventry (GSB)	Great Britain
37.33	8,035	Rabat (CNR)	Morocco
38.47	7,797	Radio Nations (HBP)	Switzerland
38.65	7,765	Kootwijk (PDM)	Holland
42.92	6,880	Oslo (LCL)	Norway
43.86	6,840	Budapest (HAT2)	Hungary
45.38	6,610	Moscow (RW72)	U.S.S.R.
45.40	6,593	Bucarest	Roumania
46.69	6,425	Boundbrook (W3XL)	United States
48.86	6,140	Pittsburgh (W8XK)	United States
49.94	6,130	Mexico (XETE)	Mexico
49.02	6,120	Wayne (W2XE)	United States
49.18	6,110	Chicago (W9XF)	United States
49.18	6,110	Boundbrook (W3XAL)	United States
49.22	6,095	Bowmanville (VE9GW)	Canada
49.4	6,073	Skamlebaek (OXY)	Denmark
49.47	6,065	Nairobi (VQ7LO)	Kenya Colony
49.59	6,050	Daventry (GSA)	Great Britain
49.83	6,020	Zeesen (DJC)	Germany
50.0	6,000	Moscow (RNE)	U.S.S.R.
50.26	5,969	Vatican (HVJ)	Italy

Long Waves

Metres	Kilo-cycles	Station and Call Sign	Country	Power (Kw.)
696	431	Oulu	Finland	1.2
726	413.5	Boden	Sweden	.6
748	401	Geneva	Switzerland	1.5
748	401	Moscow (3)	U.S.S.R.	20
765	392	Ostersund	Sweden	.6
845	355	Vardo	Norway	1
940	319	Kharkov	U.S.S.R.	35
1,107	271	Moscow (RCZ)	U.S.S.R.	100
1,186	253	Oslo	Norway	60
1,224	245	Leningrad	U.S.S.R.	100.0
1,261	238	Kalundborg	Denmark	30
1,304	230	Radio Luxembourg	Grand Duchy	200.0
1,357	221	Motala	Sweden	30
1,389	216	Eiffel Tower (Paris)	France	15.0
1,415	212	Warsaw	Poland	120
1,500	200	Daventry National	Great Britain	30
1,531	196	Ankara	Turkey	7
1,570.7	191	Konigswusterhausen	Germany	60
1,637.6	183.2	Istanbul	Turkey	50
1,639	183	Reykjavik	Iceland	21
1,714	175	Moscow (1)	U.S.S.R.	500
1,796	167	Radio Paris	France	80
1,797	166.9	Lahti	Finland	40
1,875	160	Kootwijk (Hilversum prog.)	Holland	50
1,935	155	Kaunas	Lithuania	7

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 the last 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 Query Department 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 Department, "Amateur Wireless," 58/61, Fetter Lane, London, E.C.4.

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.

Power Gear for Mains Users

THE catalogue of power transformers and chokes, by Rich and Bundy, Ltd., will be interesting to readers with A.C. mains supplies. It contains a wide range of mains transformers from about 300 watts to 25 watts and a wide range of chokes, for smoothing and output circuits. This firm also manufacture special types of output transformers. The cores of Rich and Bundy transformers are constructed of stalloy-alloyed high resistance steel. The maximum power losses due to hysteresis and eddy currents are reduced to the lowest limit by the large cross-section of core and the use of insulated core stampings. **138**

M-L Rotary Transformer

Readers who have no mains supplies available can obtain high tension from an M-L converter driven by a 6- or 12-volt accumulator. Included in the latest M-L list are D.C.-to-A.C. rotary transformers driven from 12-, 32-, 50-, 100- or 220-volt supplies and motor-generator sets for heavy duty work. Another interesting item is a hand-driven generator with an automatic signalling device. This is for use with transmitting gear. It has been used extensively by the R.A.F. and in outlying districts and lighthouses. **139**

FULL-SIZE BLUEPRINTS

When ordering, please send Postal Order. NOT STAMPS. Quote the Blueprint number shown below; not the number of this issue.

CRYSTAL SET (6d.)

1931 Crystal Set AW308

ONE-VALVE SETS (1s. each)

B.B.C. One-valver AW387
Portable Short-wave One AW354

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B.B.C. National Two (D, Trans) AW377
Melody Ranger Two (D, Trans) AW388
Full-volume 2 (SG Det, Pen) AW392
"A.W." Iron-core Two (D, Trans) AW395
"A.W." Iron-core Two with Q.P.P. AW396
Consolectric Two (D, Pen) AW403
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)

James Push-push Three (SG, D, Q.P.P.) (1/6) AW378
Everybody's Home Radiogram (SG, D, Trans) AW381
Home-lover's New All-electric 3 for A.C. mains (SG, D, Trans) AW383
Our Up-to-the-minute Three (SG, Westector, LF, Trans) AW384
Class-B Three (D, Trans, Class B) AW386
S.S.3 (A.C.) (SG, SGDet, Pen) AW390
"Up-to-the-minute Three" with Class B, 1/6 .. AW384B
New Britain's Favourite Three (D, LF, Class B) AW391
A.C. Triodyne (SG, D, Pen) AW399
Home-built Coil Three (SG, D, Trans) AW404
Fan and Family Three (D, 2LF) AW410
£5. 5s. S.G.3 (SG, D, Trans) AW412
1933 Economy S.G. Three (SG, D, Trans) .. WM306
Harris Ethergram (SG, D, Pen) WM308
A.C. Calibrator (SG, D, Pen) WM309
Narrow-pass Three (SG, SG Det, Pen) .. WM314
£6 6s. Radiogram (D, RC, Trans) WM318
Simple-tune Three (SG, SG Det, Pen) .. WM327
Tyers Iron-core Three (SG, SG Det, Pen) .. WM330
I.C.B. Three (D, LF, Class B) WM333
Economy Pentode Three (S.G, D, Pen) .. WM337
Three-range Three (SG, D, Pen) WM336
Simplicity A.C. Radiogram (SG, D, Pen) .. WM338
Duo-tune Three (SG, D, Pen) WM341
A.C. Transportable (SG, D, Pen) 1/6 .. WM347
All-wave Three (D, 2 LF) WM348

FOUR-VALVE SETS (1s. 6d. each)

Melody Ranger (SG, D, RC, Trans) with copy of "A.W." 4d. postage AW375
"A.C. Melody Ranger" (SG, D, RC, Trans) .. AW383
Signpost Four (SG, D, LF, Class B) AW398
"A.W." Ideal Four (2SG, D, Pen) AW402
Table Quad (SG, D, RC, Trans) WM303
"Words and Music" Radiogram (2SG, D, Trans) WM307
"Words and Music" Radiogram de Luxe (2SG, D, Q.P.P.) WM307A
Home Short-waver (SG, D, RC, Trans) .. WM311
Empire Short-waver (SG, D, RC Trans) .. WM313
Merrymaker Super (A.C. Super-het) WM345
1934 AC Quadradyne (2SG, D, Pen) WM349

FIVE-VALVE SETS (1s. 6d. each)

James Short-wave Super (Super-het) AW328
Simple Super (Super-het) AW340
The Etherdyne (Super-het) AW406
1934 Century Super (5v. Super-het) AW413
Class-B Quadradyne (2SG, D, Class-B) .. WM344

SIX-VALVE SETS (1s. 6d. each)

New Century Super (Super-het) with copy of "A.W." 4d., post free AW363
New A.C. Century Super (A.C. Super-het) .. AW365
James Super-straight Six (2SG, D, LF, Push-pull) WM339

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 Blueprints Dept., 58-61 Fetter Lane, London, E.C.4

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DON'T MISS RADIO PICTORIAL

FEB. 9 - ON SALE FRIDAY

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Radio Will Bring Down the Tower of Babel! By ELLEN WILKINSON. This fine article deals with the influence of radio on European affairs.

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Chaos in the Ether—Has Lucerne made it Worse? By DEREK ENGLAND.

Etc., etc.

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Rapid Strides are taking place in TELEVISION

SUCH rapid progress is being made that, as a radio enthusiast you should keep in touch with these developments.

The January issue of "Television," the first of the new series, was an instant success, and was sold out within three days of publication.

The demand for the February issue, which is on sale to-day, will be equally heavy, and you would be well advised to get a copy immediately.

"Television," in its new form, is considerably increased in size, and many new features have been added.

Price 1/- of all bookstalls and newsagents.

SOME OF THE CONTENTS OF THE FEBRUARY ISSUE

The Standard Television Receiver—Full constructional details.
All about Gas-discharge Lamps.
The Baird Kit for the Home-constructor.
An Experimental Television System.
Television at the Physical Society Exhibition.
Problems in Cathode-ray Television.
Studio and Screen.
The Theory of the Kerr Cell.
Foreign News, etc., etc.

TELEVISION

FEBRUARY

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The LUCERNE STRAIGHT 4 solves the problem of the ether chaos

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Radio and War.
List of World Short-wavers.
Designing Your Own D.C. Set.
Quality from the Modern Loud-speaker.
Wireless Jobs Made Easy for Mr. Everyman.
Building the "Emigrator."
Choosing Your Gramophone Records.
Etc., etc.

The complete operation of the Lucerne Plan, which has recently come into force, packs the broadcast stations all over Europe together in a wavelength spectrum.

The "Wireless Magazine" has therefore produced a set, described in the February issue, now on sale, to overcome the difficulties.

This four-valver—The Lucerne Straight Four—gives the best possible reception under the new plan.

Full constructional details together with a wiring plan appear in the February issue. Get your copy to-day and start building this new receiver—The Lucerne Straight Four.

WIRELESS MAGAZINE

FEBRUARY ISSUE Price 1/-

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A.C. and D.C. MAINS VALVES

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B.V.33 A.W. 10/2/34

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Type	Purpose	Impedance	Amp. Factor	Mut. Con. m.a.v.	Price
*†M.S.G.-H.A.	Super H.F. Amp'n	500,000	1,000	2.0	17/6
*41 M.S.G.	Super H.F. Amp'n	400,000	1,000	2.5	17/6
*†M.S.G.-L.A.	Super H.F. Amp'n	200,000	750	3.75	17/6
†*M.V.S.G.	Variable-Mu S.G.	200,000	—	2.5	17/6
**M.S./PEN.-A	H.F. Pentode	—	—	4.0	17/6
†*M.S./PEN.	H.F. Pentode	—	—	2.8	17/6
†*M.V.S./PEN.	Variable-Mu H.F. Pentode	—	—	2.2	17/6
*41 M.D.G.	Bigrid	40,000	10	.25	19/-
**D.D./PEN.	A.V.C. (Detector and L.F. Amp.)	—	—	2.7	20/-
**D.D.T.	A.V.C. (do)	17,000	41	2.4	15/6
41 M.R.C.	R.C.C. or Det.	19,500	50	2.6	14/-
*41 M.H.	Detector	18,000	72	4.0	13/6
41 M.H.F.	H.F. or Det.	14,500	41	2.8	14/-
* 41 M.H.L.	Det. or H.F.	11,500	52	4.5	13/6
41 M.L.F.	Low Frequency	7,900	15	1.9	14/-
41 M.P.	Normal Power	2,500	18.7	7.5	14/-
41 M.X.P.	Extra Power	1,500	11.2	7.5	16/6
M.P./PEN.	Pen. Power Output	—	—	3.5	18/6
‡P.T. 41B	Pen. Power Output	—	—	2.25	22/6
‡P.T. 41	Pen. Power Output	—	—	3.0	18.6

* Supplied with Plain or Metallised Bulbs. ** Stocked with Metallised Bulb only.
† Characteristics measured at-1.5 Grid Volts. ‡ Directly heated filaments.

COSSOR D.C. MAINS VALVES (16 Volt 0.25 amp. Indirectly Heated Cathodes)

Type	Purpose	Impedance	Amp. Factor	Mut. Con. m.a.v.	Price
†*D.V.S.G.	Variable-Mu S.G.	—	—	2.5	17/6
*D.H.L.	Detector	13,000	58	4.5	13/6
D.P.	Power Output	2,800	17	6.0	14/-
D.P./PEN.	Power Pentode	—	—	3.5	18.6
*D.S./PEN.	H.F. Pentode	—	—	3.0	17/6
*D.V.S./PEN.	Variable-Mu H.F. Pentode	—	—	3.0	17/6
**D.D.T.16	Double Diode Triode (A.V.C.)	16,000	40	2.5	15/6

* Supplied with Plain or Metallised Bulbs ** Stocked with Metallised Bulb only.
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Prices in this List do not apply in I.F.S. ♡ 4477