270

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BUILDING THE "TWO STAR 2"

Amateur Wireless and Radiovision

Every Thursday 3d

Vol. XIX. No. 491 Saturday, November 28, 1931

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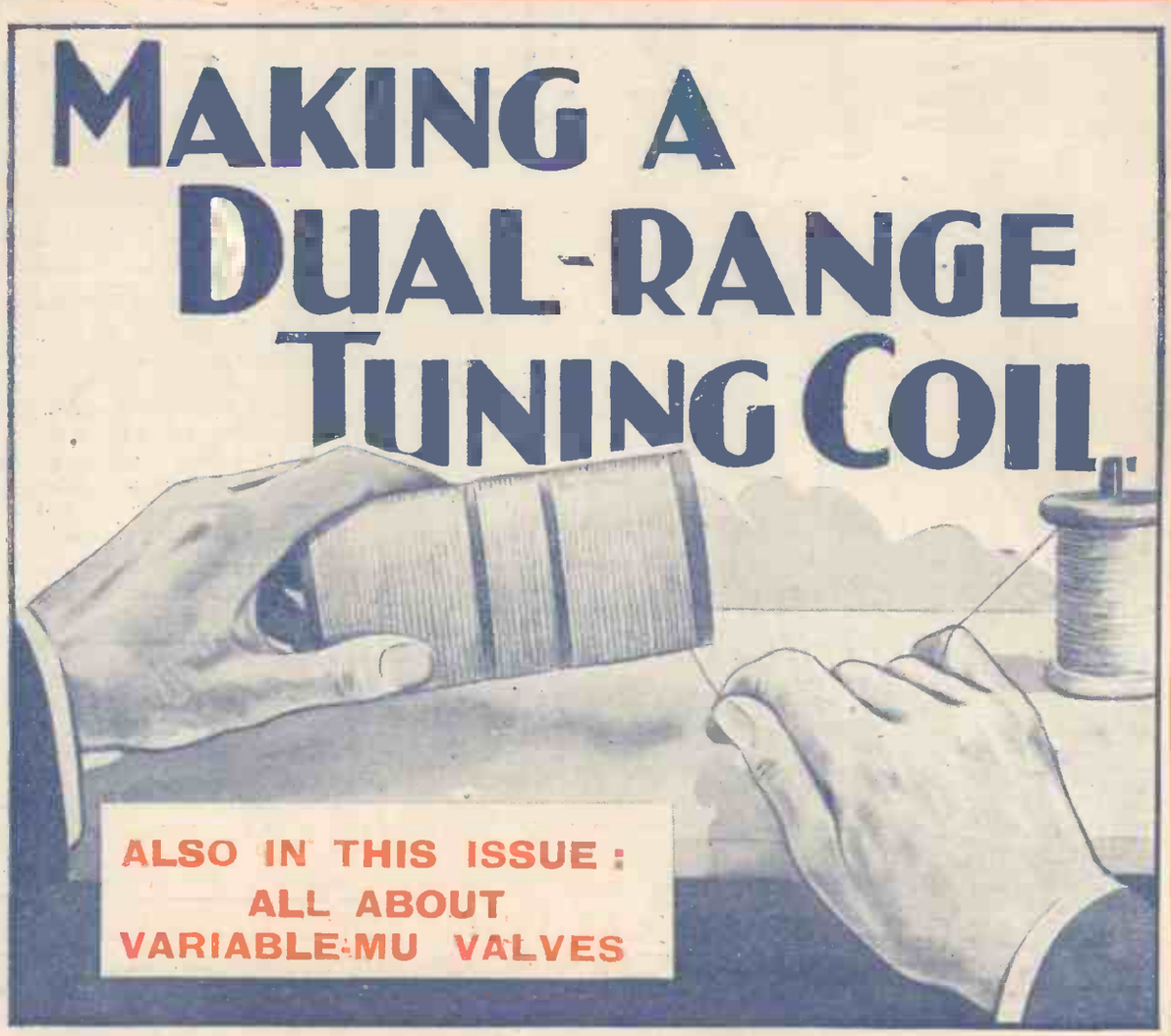

ALSO IN THIS ISSUE:
ALL ABOUT
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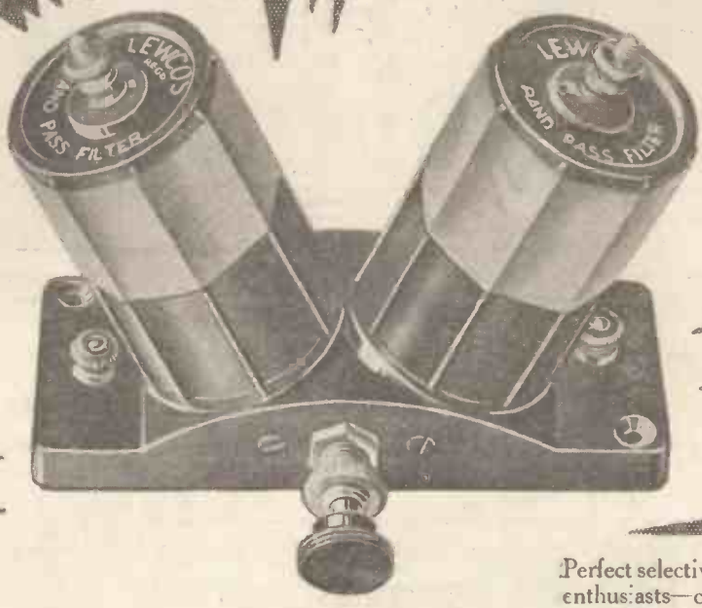

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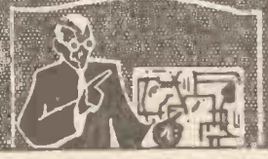
Send for fully descriptive leaflet Reference R.73.



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ADDRESS

A.W. 28/11/31

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Historical Signs—No 4

The Sign of the Weasel

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Rate of charge 2 Amperes
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Width..... 3⅝ inches
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No. 494. Vol. XIX. NOVEMBER 28, 1931

Amateur Wireless & Radiovision

BRITAIN'S LEADING RADIO WEEKLY
FOR CONSTRUCTOR, LISTENER & EXPERIMENTER

EDITOR: BERNARD E. JONES
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RESEARCH CONSULTANT: W. JAMES.
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NEWS & GOSSIP OF THE WEEK

OUR SPECIAL CHRISTMAS NUMBER

NEXT week AMATEUR WIRELESS makes its annual Christmas gift to you in the form of a bumper number, full of good things, at the normal price of threepence. This year our special Christmas Number is a really fine production, and between its attractive coloured covers you will find dozens of bright hints, tips, and suggestions for getting the most enjoyment out of your Christmas listening.

MAKE SURE NOW!

JUST one thing. Our Christmas issues have always been sold out within a few hours of publication. This year promises to break all records, so make sure of your copy now. Give your newsagent an order while you have the matter in mind. It will make it easier for him and will ensure that you are not disappointed by finding a "Sold Out" notice.

REX PALMER TO BROADCAST

MR. REX PALMER, a familiar personality in the early days of the B.B.C., is to be heard again via Radio Paris every Sunday afternoon, commencing November 29. He will announce the H.M.V. records in a special programme given by the Gramophone Company from 3 to 4 o'clock in the afternoon.

STATION CHANGES

ACCORDING to the latest wavemeter measurements taken by the B.B.C. at its Tatsfield listening post, the frequency changes to the London and Northern Regional stations have now come into effect. London listeners will be interested to know that London Regional's frequency is now 843 kilocycles, with Graz on 851 kilocycles and Stuttgart on 832 kilocycles.

LONDON NATIONAL IMPROVEMENTS

LONDON NATIONAL on 1,147 kilocycles is now 9½ kilocycles away from Leipzig on 1,156.5 kilocycles. Moravska-Ostrava is only 8 kilocycles away from London National, so what we have gained on the swings we seem to be losing on the roundabouts!

BETTER REGIONAL SEPARATION

NORTHERN listeners will be glad to hear that North National has been given more elbow room, for its neighbour Hilversum is now on 1,006 kilocycles, which is 11 kilocycles separation. North Regional is also better off with Prague, 11 kilocycles away, on 613.6 kilocycles. Anticipating the increase in the power of Langenberg, which is North Regional's other neighbour, this German station is now on 635 kilocycles, which is 10.5 kilocycles separation.

AT THE CONTROLS

Mr. Ashbridge, the B.B.C. chief engineer, at the panels of the new Control Room in Broadcasting House

RADIO PARIS INTERFERENCE

AS yet the B.B.C. has not received any complaints about interference with the reception of Daventry National programmes by the new high-power Radio Paris station. It is thought that possibly South Coast listeners may have some trouble, owing to the swamping effect of Radio Paris. As readers know, the B.B.C. is seeking permission to erect a new Daventry station working with a power of 100 kilowatts.

"GOOD NIGHT, VIENNA!"

SPECIAL interest is taken at Savoy Hill in the recent announcement that Jack Buchanan and Anna Neagle will shortly make a film of the musical show *Good Night, Vienna!*" because this was written by Holt Marvel, and, with music by George Posford. It will be broadcast during the first week in January, 1932.

LAST OF RIDGEWAY PARADES?

THE B.B.C. tells us that after the present Ridgeway Parade series is over it is not likely that there will be any more outside series of vaudeville shows. Several reasons may account for this decision. Probably the most important is that outside producers do not fully understand the fine art of microphone presentation. As a result, the B.B.C. staff are put to a great deal of unnecessary trouble.

CHRISTMAS DAY

THOSE with new sets for Christmas will be interested to hear that the B.B.C. has arranged a continuous programme from 12 o'clock noon on Christmas Day to 1 a.m. on Boxing Day. There will be no alternative programmes in the early afternoon, when light orchestral and cinema-organ music will be broadcast.

BROADCAST CRITICISM

THE tremendous power for good or evil of the B.B.C.'s critics in music, drama, and literature has long been recognised. But apparently the B.B.C. feels that the time has come to water down its critical faculties. After Christmas there will be less broadcast criticism of all types.

NEXT WEEK: OUR BUMPER CHRISTMAS NUMBER. MAKE SURE OF YOUR COPY NOW. Usual Price 3d.

NEWS & GOSSIP OF THE WEEK—*Continued*

TELEVISION RUMOURS

WHEN television really does arrive, as it must some day soon, there will be a lot of scepticism, due to the regularity with which listeners are now misled into believing all too optimistic enthusiasts. We are following up a strong rumour now going the rounds to the effect that a well-known radio organisation in this country is quietly but firmly overcoming the present snags of commercial television. What system this firm is working on we do not yet know. It may be cathode ray, which, according to Hanson, the chief engineer of N.B.C., is the only system America is worrying about at the moment. Seeing is believing!

PLACE-NAMES CONTROVERSY

THE B.B.C. is being criticised for mispronouncing place names, especially in Wales! It is pointed out at Savoy Hill that the B.B.C.'s main object is to use a pronunciation that will be generally understood in all parts of the country. Often the local pronunciation would be quite meaningless to outsiders. This problem is especially acute in the S O S broadcasts, and we rather agree with the B.B.C. in its attitude.

LEASING SAVOY HILL

SO far the B.B.C. has no offers for its Savoy Hill premises, which will be entirely vacated, including the studios, by January or February of the new year. It has been suggested that Savoy Hill would make an excellent headquarters for one of our opulent gramophone companies, or perhaps for a film company. It certainly seems a shame to waste all those studios. Anyway, there are no takers so far. The B.B.C. can surrender both its leases on Savoy Hill at twelve months notice. Probably this will shortly be done.

THE NEW P.M.G.

A recent snap of Sir Kingsley Wood, the new Postmaster General, who has just taken up his appointment at the G.P.O.

WHERE IT WILL BE?

This view from the top of one of the Daventry 5XX masts shows part of the Daventry private ground on which the new twin-wave Empire station will be built

HUGO JOHNSON'S VOICE

THIS is the voice heard every morning conducting the religious service. We hear that he is to be vicar of Cranleigh, near Guildford, but that he will go on conducting the morning service as he has done for the past four years. Some idea of the popularity of this regular broadcaster was recently gained by the tremendous post received when it was known that Hugo Johnson was to be vicar of Cranleigh.

P.O. VANS AGAIN

AT the moment the Post Office detection vans are playing the game of "spotting aerials" in and around Bristol and Bath. The idea is to note the aerials and then to check them up on the licence-lists. The Post Office is planning further visits to the north of England, presumably after it has added appreciably to the licence-paying listeners of the west of England.

TELL YOUR FRIENDS

NEXT WEEK—a specially enlarged Christmas Bumper Number. But no increase in price

OXFORD *VERSUS* HARVARD

THE debate between members of these two universities, provisionally fixed for December 2, on debt cancellation, will provide an interesting example of transatlantic conversation. The Oxford men will be in a B.B.C. studio and will talk to Harvard over the transatlantic phone, which will also carry back the replies of the men at Harvard. Although the American side will be reproduced on loud-speakers in the B.B.C. studio, listeners will not hear the debate; because the B.B.C. feels that its subject is rather too delicate!

TASTE IN DANCE MUSIC

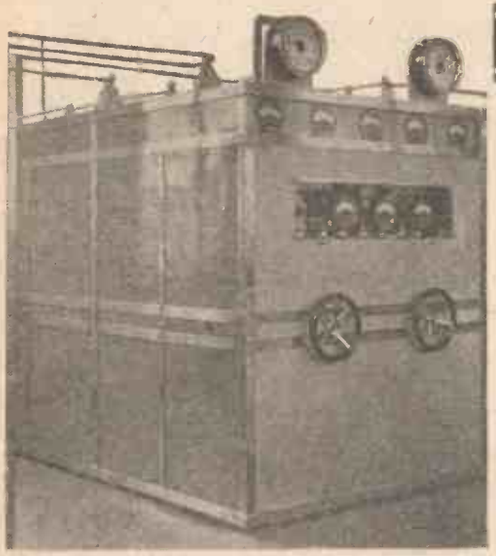
ACCORDING to Jack Payne, the most popular dance tunes in America at the present time are those written and composed by Britishers! He says that "Good-night, Sweetheart," written by Noble, who used to arrange Jack Payne's music, is now all the rage in America and that this and another British tune are the two most popular. This is certainly a complete reversal of the state of affairs existing a year or so ago, for then nearly all the tunes broadcast by British bands were American.

B.B.C.'s NINTH BIRTHDAY

ON November 14 the B.B.C. celebrated its ninth birthday—but without any microphone effort. Some listeners will recall the hilarious birthday nights conducted by the former chief engineer of the B.B.C.!

THAT STUDIO "BOOM"

ENGINEERS at Broadcasting House have now allowed the decorators to go ahead in the basement studios. In three out of twenty-two studios acoustical padding is being put on the walls and decorating is in full swing. Owing to the prevalence of "boom" in the other studios there is now no chance of a concert from Broadcasting House before Christmas.



AT THE B.B.C.

A PEEP AT A —— TRANSMITTER

The way in which a B.B.C. transmitter is operated is here made clear by a visit to Brookmans Park, described by KENNETH ULLYETT

IN AMATEUR WIRELESS No. 488 I described how, on a visit to Brookmans Park, I was initiated into the mysteries of the transmitter control desks. These are the final controls for the transmitters, and the same kind of gear is used at North Regional.

These desks do not tell the whole story though. There are over fifty knobs on the main battery switchboard and the five panels of each National and Regional transmitter!

I questioned my Brookmans Park friend more closely on this, and he told me just how the transmitters are tuned and explained how impossible it is, as some listeners maintain, for the wavelength to vary.

He took me into the main transmitter hall and we inspected the set of panels for one of the twin transmitters. At the end of the hall is a long black switchboard, carrying the subsidiary battery controls for L.T. and grid bias. All the H.F. gear is carried by the five main transmitter panels in their polished aluminium cabinets.

These panels are designated A, B, C, and D. There are two C panels, making up the total of five. The A panel is the first of the series. It carries four complete units. The first is a big modulating valve which is transformer-coupled to the last stage of the modulator amplifier in the control-room. This is, you see, an ordinary L.F. valve. It carries about 1,000 volts on its anode.

This big L.F. stage is in the top of the A panel. Below it is the master oscillator valve—the real reason why the transmitter does not vary on its wavelength. All the other valves in the transmitter are supplied by current from the generators in the machine room.

The Master Oscillator

The master oscillator, though, is fed from a separate set of accumulators, so that there is no possibility of the frequency varying if, say, one of the generators temporarily slows down a little.

The master oscillator and the big modulating valve are coupled together by a "mixing" valve which forms the third section of the A unit. This is the first H.F. valve and if a little aerial were connected to it, signals could be transmitted. Between the mixer and the master oscillator is a trap valve.

This trap takes the place of a tuning fork or piezo crystal. It prevents any backwash in the transmitter coming back through the circuit and affecting the master oscillator. It ensures that the steady H.F. impulses from the master oscillator are passed on to the rest of the transmitter.

At Brookmans Park the five panels are connected together by big copper leads running above the tops and supported by huge porcelain stand-off insulators. At North Regional these cables are carried in tubes between the metal cabinets.

The B panel is the first to carry water-cooled valves. There are four valves, two of them being in push-pull and two acting as spares. These push-pull valves are connected up in very much the same circuit as the push-pull valve of an L.F. amplifier, but the couplings are H.F., of course. The coupling coils, as I saw by peering through the wire mesh of the B panel, are of copper tube in place of wire.

This is the first panel of a B.B.C. transmitter. The master oscillator which keeps the wavelength constant is in one of the right-hand compartments

"There are two C panels," the engineer explained to me. "These are the final valves of the transmitter—big water-cooled valves which handle the full power. These valves are in push-pull, one side of the circuit being in one panel and the other side of the push-pull combination in the other. This is just as in an ordinary push-pull L.F. amplifier you have one of the push-pull valves on one side of the split transformers and the other valve on the other side.

(*Continued at foot of next page*)

Here are the five panels of the North Regional transmitter. There are two C panels, these carrying the final water-cooled valves. The tuning coils are in the D panel

Some Notes on Present-day Short-wave Conditions

Around the Short-wave Dial

By M. BARNETT

A FRIEND and I were discussing the relative merits of various types of short-wave receivers and adaptors, etc. There are two types of adaptor used to-day, both of which can be made to give very good results when used with a good broadcast receiver, or more important still, perhaps, a broadcast receiver which has a *powerful* L.F. amplifier incorporated.

The two types of adaptor consist of either a plain detector arrangement which is used to take the place of the detector in the broadcast receiver and which is capable of tuning in the short waves, and the second type (strictly speaking, this second type is called a "convertor," not an adaptor) consists of a detector valve and a short-wave oscillator valve—or sometimes the two operations are combined in one valve—which is connected to the first valve of the broadcast receiver. Thus all the valves in the receiver, including the H.F. valves, are used and made to do good work.

The plain detector type of adaptor is perhaps the easiest to make and the most successful type for the beginner to use, although the final results will not be so good as those provided by the super-heterodyne type of adaptor. The single valve detector-adaptor costs less and will take up less room than the other type. Many designs of short-wave adaptors have been published in this and other journals in the past and certainly hundreds have been built up by amateurs.

Adaptor Design

There are certain points to look out for in the design and construction of short-wave adaptors and often a simple design of adaptor can be very much improved by paying attention to some of these points. In the first place, a potentiometer control of the detector grid is extremely advisable in an adaptor, for the simple reason that the leads from the L.T. battery to the L.T. sockets on the detector valve socket are liable to be connected either way round—i.e., either of the sockets is liable to be positive or negative. Also, the wires to the pins on the plug which goes into this socket are liable to be connected either way round.

Now, in order to make the short-wave detector valve work efficiently, the return wire from the tuning coil has to be connected to the positive low-tension lead, in order to give the grid a slight positive bias in relation to the negative end of the filament. But, by connecting the end of the coil to one of the filament pins (either) permanently and instead of wiring our grid leak across the grid condenser but bringing one end of the leak to the moving arm of the potentiometer we can change our bias on the grid from either negative to positive at will.

Another advantage of the potentiometer control is seen when, for instance, the adaptor is used with a battery receiver using power-grid detection with a plate voltage of, say, 150 volts. Normally, this voltage is far too high for obtaining smooth reaction results on the short waves, but by adjusting our potentiometer until the grid is perhaps connected midway between positive and negative, we may achieve an absolutely smooth reaction control, whatever the plate voltage.

"A PEEP AT A TRANSMITTER"

(*Continued from preceding page*)

"The transformer is, in this case, the tuning circuit. The coils of this are carried in the D panel, which stands, as you see, between the two C panels."

I peered through the meter aperture of the D panel and saw that, as he had said, there were no valves, but only large tuning coils held on porcelain supports. Two large handles projected in front of the aluminium panel.

"Those are the main coupler handles," said the engineer. "Each separate circuit of the transmitter has to be tuned, but these are the final tuning controls and alteration of these would shift the wave-length. Unless the circuits in the C panels were also separately adjusted and the master oscillator retuned, the whole plant might be damaged, though, because it would go out of oscillation."

The Cooling Water

Two meters above the final aerial coil panel showed the temperature of the cooling water flowing round the valve anodes and also the rate of flow.

"You see," explained the engineer, "as the control man sits here facing the five panels, he can see at a glance the main meter readings for each.

"The meters along the top show the high-tension and peak voltages for each circuit and if anything goes wrong with the valve cooling system, which might mean the damage of several hundreds of pounds worth of valves if not checked, indication is given of it by the two large scale meters on the D panel."

"Those two wires going up from the top of the panel through the wall are the leads-in, or, rather, the leads-out, I suppose?" I inquired.

"Yes," I was told, "there are two out leads to a transmitter. These feeder lines, as they are called, both carry the high-frequency aerial currents. One is not the earth lead, as you might suppose. These feeder lines run out to the little hut below the aerial and there a transformer connects them up with the actual aerial lead-in."

THE PRINCE AT THE MICROPHONE

While in Birmingham inaugurating the "Buy British" campaign, the Prince of Wales broadcast from the talks studio of the Birmingham station

W. JAMES EXPLAINS The VARIABLE-MU VALVE

Here is a straightforward and simple explanation of the latest valve development

MANY good distant-station receivers that are both sensitive and selective cannot deal properly with the local stations.

The volume control is a defective one. When it is turned towards the minimum position in order to reduce the strength of one of the local stations to the point where the last stage is not overloading, distortion is introduced.

How many sets there are that give good quality of reproduction from stations that set up signals of fair strength in the aerial circuit and bad quality when the signals are strong. There are several ways of controlling the volume, but they usually vary the operating characteristics of a valve or circuit as well. The signals are, therefore, likely to be distorted.

In sets having a screen-grid stage you will generally find the trouble to be in the screen-grid circuit. Screen-grid valves of ordinary pattern cannot deal with signals of more than a fraction of a volt.

With stronger signals distortion is introduced and, further, the selectivity will probably be affected. The chances are that powerful stations working on a frequency near that of the station being received will be heard under certain conditions. For example, when the valve is not amplifying properly, but partially rectifies, the interference is likely to be noticed.

Volume Control

Most volume controls are arranged in the circuit in such a way that the amplification can be varied. These are the types of control that are specially liable to vary the characteristics of the stage.

It might seem that a control in the aerial circuit, as in Fig. 1, would be ideal. It is an effective control, obviously, because the input to the first valve can be adjusted. But if the rest of the receiver is left arranged to provide its maximum amplification at all times, the chances are that the quality of the stronger stations will not be too good owing to noises from the valves. These are not so important when receiving distant stations, although they should naturally be kept to the minimum. The point is that reception is not at its best with ordinary sets when the circuits are all giving their maximum magnification. The arrangement of Fig. 1 is, therefore, not ideal because the set is arranged to provide its full amplification all the time, and the input is adjusted.

All that we do when receiving the local station is so to weaken it that a signal of no greater strength than that obtained from a distant station is applied to the first valve. The actual magnification is under control in both the methods shown in Fig. 2 and Fig. 3.

In Fig. 2 there is a filament-resistance in the filament-circuit of the first valve. When the resistance is cut out, the valve gives its maximum amplification. As the resistance is brought into circuit, so the filament current is reduced and, further, the grid bias of the valve is increased. Therefore, the effectiveness of the valve is reduced and so the amplification obtained is reduced.

This form of volume control was popular in neutralised high-frequency sets. The circuits could usually be so designed that they just oscillated when the volume control was at maximum, that is, when the filament resistance was short-circuited. It was also noticeable that the selectivity usually increased when the volume was reduced. This form of control was, therefore, a valuable one, but, of course, strong signals were distorted as the control had to be set so near the minimum that the curved part of the characteristic was being used.

The arrangement of Fig. 3 is well known and is widely used. A potentiometer is in the screen circuit of the screen-grid valve. With the sliding contact at the positive end of the potentiometer the valve has its greatest effectiveness. The amplification of the stage is the maximum. Usually the circuits are just oscillating and weak signals are, therefore, greatly magnified.

As the voltage applied to the screen is reduced by moving the control towards the position of minimum volume, so the effectiveness of the valve is reduced and with it the actual amplification obtained. But the length of the working part of the characteristic is reduced as the voltage of the screen is reduced. And so, with this form of control we have the fact that the stronger the signal the smaller the working characteristic. Just when ability to handle a strong input signal is required, the valve is placed in a condition where it can deal with only a weak input.

This control is used in many amateur and commercial sets. The volume can certainly be varied over a wide range, but distortion is apt to be introduced and the quality of the stronger signals suffers as the result.

A further form of control is shown in Fig. 4. In this arrangement the value of the bias is varied. This in turn alters the effectiveness of the valve and the amplifi-

(*Continued at foot of next page*)

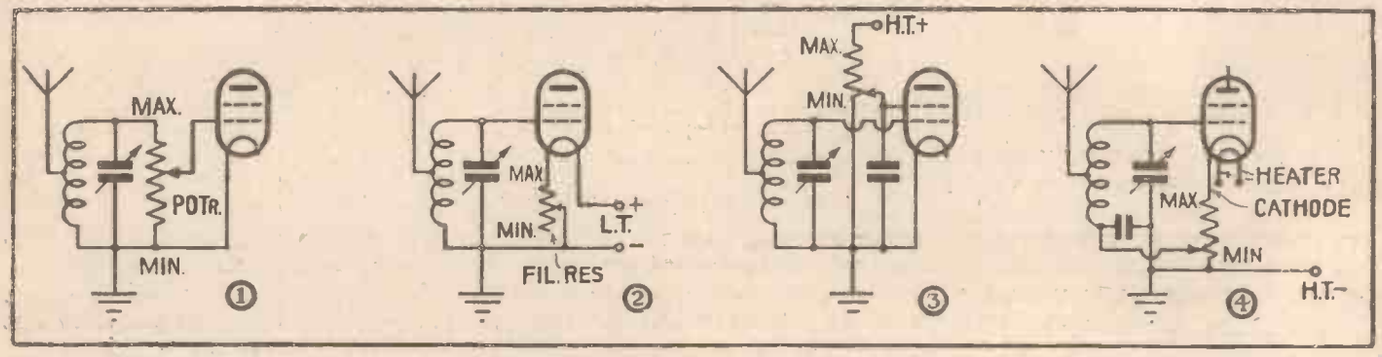


Fig. 1. Input volume control. Fig. 2. Filament resistance volume control. Fig. 3. Screen-grid type volume control. Fig. 4. Grid bias control of A.C. mains screen-grid valve

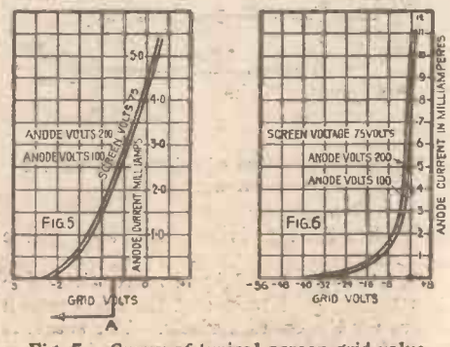


Fig. 5. Curve of typical screen-grid valve. Fig. 6. Curve of a typical variable-mu valve

For the Newcomer to Wireless: HIGH-TENSION ACCUMULATORS

I INSTALLED, as you may remember, an accumulator high-tension battery some months ago and up to the present it has been perfectly satisfactory, but I am having a little bother with it now.

What is the trouble?

It seems to be becoming rather noisy and I can't quite make out why.

I suppose that the plates are all in good order and that the electrolyte in the cells is as it should be?

Yes, I have had that seen to regularly.

You haven't got a bad unit in the middle of the battery?

No, I have tested out each one separately. They all show the proper voltage and if I pass, say, 20 milliamperes from any one of them through a resistance and a milliammeter the needle of the instrument shows that the current is perfectly steady.

You are quite sure that it is the battery and nothing else inside the set?

Quite certain, for I've checked over everything. Further, I tried the set on a friend's batteries and found it quiet.

Then I think I can spot the cause of the trouble.

I should be very grateful if you could.

They are 10-volt units, aren't they?

Yes.

How is each unit connected to the next?

By a short length of flex, with a wanderplug at each end. These fit into lead sockets in the units.

You must have had those wander plugs out lately when you tested each unit separately. How did you find them?

As a matter of fact they were rather corroded, though I scraped them before putting them back again.

And if you go and look at them now I am quite sure that you'll find that they are corroded again.

Would that cause noisiness?

FULL OF GOOD THINGS
Our Bumper Christmas Number Next Week!

It is more than likely to do so, since here and there there will probably be poor connections between units.

Then do you suggest fitting new wander plugs throughout the battery?

No, I think I can give you a better tip than that. All that you need is a yard or two of thick lead wire and a few feet of rubber tubing, which will just slip over the wire.

I think I see what you're driving at.

Lead resists the acid fumes from accumulators wonderfully well. What I suggest then is that you should get lead wire rather greater in diameter than the point of the average wander plug. Cut off a piece about 4 in. in length and with an old knife scrape the ends to a slight taper. Bend the wire into a U-shape and pass over it a 3-in. length of tubing. You will then be able to force the tapered ends of the wire into the sockets at the ends of the units and to make sound connections which should not corrode.

Supposing I can't get thick enough lead wire?

Well, here's another idea that I have found useful. You can get lead wire of about No. 18 gauge at any fishing tackle shop. Provide yourself with a small reel of this and buy some rubber tubing that will slip over it. In most H.T. accumulators the sockets for wander plugs are drilled right through and are not just pits. Pass the end of your thinnish wire through the socket and twist it up tight. Cut off as much tubing as you want, slip it on to the wire, and then fix the other end of the wire to the next socket in the same way. To make sure of a good connection you might pass each end of the wire twice through its socket before twisting it up.

"THE VARIABLE-MU VALVE"

(*Continued from preceding page*)

cation obtained. With strong signals, the bias is increased in order to reduce the amplification to a suitable value and rectification occurs owing to the working point being on the curved part of the foot of the characteristic. Fig. 5 is a curve of a typical screen-grid valve. The normal bias for this mains valve would be at A. To reduce the volume the bias would be increased and it is clearly seen that the working point is moved to a curved part of the characteristic.

Dual Control

In some sets two separate controls are provided and are worked by a common knob, both being on one spindle. One arrangement has the controls of Figs. 1 and 3 with the result that the input to the set is reduced at the same time as the amplification.

This is certainly a step in the right direction, but the difficulty is to arrange the separate controls in such a way that the result of operating the single knob is satisfactory. The combined control when carefully arranged is naturally to be preferred to a single-type control, but usually there are difficulties which prevent the arrangement from being an ideal one.

Fortunately the valve manufacturers have now come to our assistance with a new type of valve. It is called the Multi-mu and is at present available in the A.C. mains series only.

The valve is so designed that the effective amplification can be varied over a wide range by altering the grid bias in such a way that strong signals can be dealt with. In the case of the Mullard Multi-mu valve, type MM4V, with an anode voltage of 150, a screen voltage of 75, and zero grid bias, the mutual conductance is 3 milliamperes per volt. This falls to .01 milliamperes per volt when the bias is increased to negative 40 volts.

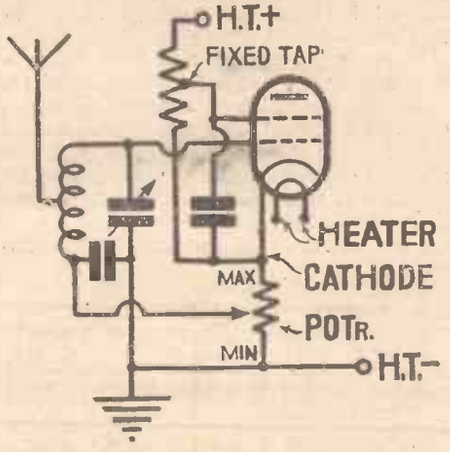


Fig. 7. Connections of volume control for variable-mu valve

In one type of multi-mu valve, the valve has a long grid base and an exponential curve for the characteristic. The result is that the maximum working slope (at about zero bias) is of the order of 1 milliampere per volt. In the other type the grid base is a short one and the valve has a larger maximum working slope. At the same time its usefulness is not so great.

Multi-mu Advantages

The Mullard MM4V combines the advantages of both types. It has a long grid base, as shown in Fig. 6, and yet has a high maximum working slope. The valve is therefore a very sensitive one at small values of grid bias. When dealing with strong signals the grid bias is increased and the amplification is reduced. Owing to the slope of the characteristic, the distortion introduced when working at big values of grid bias is very little in comparison with that produced when ordinary screen-grid valves are used. The volume control, too, is very smooth and the valve can deal with strong signals.

The advantages of the new valve are, therefore, very considerable and it is bound to be used in mains sets extensively.

There are several ways of arranging for the bias and one good method is shown in Fig. 7. You will notice that the current in the fixed screen-grid potentiometer circuit it passed through the bias resistance. Flowing through this bias resistance as well is the anode current which may be varied by adjusting the bias from very little to about 5 milliamperes. A better control is obtained when the total drop across the bias resistance does not vary too much and so it is useful to pass the screen-grid potentiometer current through it. I shall be using a valve of this type in my next mains receiver.

SELECTIVITY

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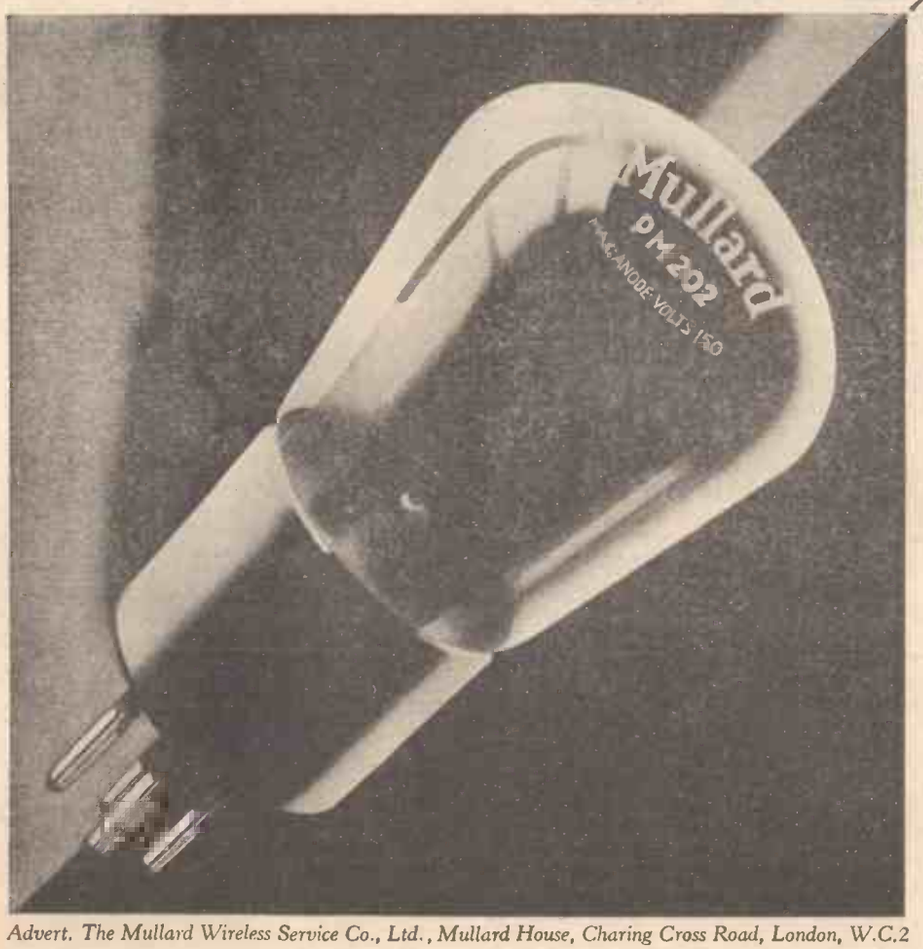

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On Your Wavelength!

"REG" OR "NAT"

WHICH do you find the stronger of the two, the London Regional or the London National? I am just fifteen miles from Brookmans Park, and at my place the National is very much the louder signal of the two, At a hundred miles or so the Regional is still good, as a rule, but in many places the National is either weak or shows bad fading. What is the distance on the average at which both stations are equally strong? I should guess at about fifty miles, and I should welcome information from readers on the point.

It would be interesting, too, to know how readers in northern England fare with regard to Moorside Edge Regional and National. The wavelength separation is very big between that pair, since the National is on 301.5 metres and the Regional on 479.2 metres. One would therefore expect pretty big differences in signal strength at short and longish ranges. The wavelength of 301.5 metres should be less subject to fading than the London National on 261.3 metres, and one imagines that it should provide a better level of signal strength over a large area. The North Regional's wavelength of 479.3 metres is one of the best in the whole of the medium waveband, for fading is rare up near the top and great distances are covered by stations using wavelengths not far below 500 metres.

AT A DISTANCE

THE distance from Daventry to my aerial is forty-five miles and that from Moorside Edge somewhere about two hundred. Thus, with Brookmans Park at fifteen miles, one can form a very fair idea of how the regionals behave at short, moderate, and long ranges. The only fly in the ointment, so far as tests are concerned, is that Daventry has one of its stations on the medium waves and the other on the long. I find that the Midland Regional is always a good signal with me at any time when he is working. In fact, the distance of forty-five miles seems to be just about the ideal for the reception of high-powered stations. If you are much nearer you are apt to be swamped and have to use rather elaborate apparatus in order to avoid distortion.

At forty-five miles the strength is just comfortably sufficient for operating a set without high-frequency amplification. I would say that with one good stage of high-frequency amplification I am just comfortably within the service area of the Northern Regional, which again is an "any time" station. The North National though, is very seldom a strong signal, and he is by no means easy to receive in daylight with a medium-sized set. I wonder how my experiences tally with yours?

A NUISANCE

THE London National is a great nuisance to heaps of people, owing to the enormous spread that he shows, particularly after dark. I have tried a good many sets that could be classed as reasonably selective, taken all round, which were simply paralysed by "Noisy Nat." The trouble is due, of course, to the fact that down towards the bottom of the band the tuning condensers are near their minimum setting, which means that there is very little capacity in circuit. Where the ratio of inductance to capacity is high, a tuned circuit shows a big response combined with poor selectivity. Hence we get large signal strength and big spread. If you have a set which uses plug-in coils you can get over the difficulty by putting in a smaller set for stations below about 300 metres. But this tip does not help much when you use, as most people do nowadays, fixed coils provided with a wave-change switch for the medium and long bands.

A SUGGESTION

I AM not sure that it would not be a good idea for some makers to design a set of coils with a three-position switch. The first position would give us the right number of turns for the long waves and the second that suitable for wavelengths down to 300 metres. Then the switch would be turned to the third position, thus leaving few turns in circuit and allowing a reasonable amount of capacity to be used to tune the circuit. We should then find that "Noisy Nat" had no more spread than "Raucous Reg." One of the pities about the interference caused by "Noisy Nat's" spread is that for many people he blots out or interferes with a number of excellent stations, such as Trieste, Leipzig, Hoerby, Turin, Moravska-Ostra, and Heilsberg.

FOR YOUR NOTEBOOK

I SHOULDN'T be surprised if you have not been able to find Turin recently, for he is no longer on the wavelength which he had been using for a year or more. The wavelength of 296.1 metres never really belonged to Turin, but he found one day that it was vacant and squatted there. At the recent Rome Conference, complaints were made of the interference that he was causing, and he has now gone to his proper wavelength of 274.2 metres, which is just below that of Heilsberg. He is coming through very well indeed there, and you won't have any trouble about finding him, provided, of course, that you have sufficient selectivity to get rid of the interference from the London National and to separate Turin from the big German station. The Italian stations, by the way, are quite the best all-rounders in Europe just now. Trieste, Turin, Rome, and Milan are nearly always to be relied upon for loud-speaker reception, whilst Genoa and Naples are often to be found. Considerable increases in the power of Italian stations are contemplated in the near future, and there are some new ones, I believe, to come into operation before long.

LONG-RANGE ARGUMENT

BY the time that this note meets your eye, wireless history will have been made by the first debate between "teams" separated from one another by three thousand odd miles of land and water. The debate in question is between the Oxford Union Society and the Debating Club of Harvard University, in the United States. The Oxford speakers are to use a studio at Savoy Hill and the Atlantic telephone service is to be employed. It was thought at one time that the debate might be broadcast from the B.B.C. stations, but, rather wisely in my view, the decision was in the negative. The Harvard speakers are to be in their own University buildings. Loud-speakers are, of course, to be installed in each team's room, so that speakers will hear, first of all, the applause or derision with which the audience on the other side of the Atlantic greets their remarks and then the reply by their opposite number in the other team. The subject of the debate is "The Necessity for the Cancellation of War Debts and Reparations."

THE MODERN PENTODE

WHAT a wonderful valve the modern pentode is, for in its most modern form it gets nearer than any other type to the ideal of making every electron, supplied by batteries or the mains, pull its weight. What really is amazing is the efficiency of these valves in terms of watts. The H.T. consumption works out at .6 watt and you can obtain from the valve .25 watt of undistorted output. The filament consumption is .4 watt, so that if you take H.T. and L.T. together the valve requires just one watt and gives you no less than a quarter of this amount for the loud-speaker.

A HINT

IF you compare these figures with those required for any other type of power valve you will find that, on the average, they are about twice as good. Don't imagine, though, that you can stick these pentodes straight into the last holder of a set with one L.F. stage and designed for an ordinary power triode. If you do, you will probably be disappointed with the reproduction, because the valve impedance is too high for your loud-speaker. By means of a suitable filter circuit with a pentode choke, and of a resistance and a condenser in series you can obtain first-rate reproduction from these marvellously efficient little valves.

INDOOR v. OUTDOOR AERIAL

THE other day I went to a friend's house to have a look at a new big "six" that he had just installed. He was working this from a high and efficient outdoor aerial, and the results, in one way, were nothing short of amazing. All Europe seemed to be there on the loud-speaker. There was, though, one serious trouble; on the long waves, particularly, there was an appalling

On Your Wavelength! (continued)

amount of interference from morse signals and from mush. I suggested to him that he was spoiling the performance of a wonderful set by using it with too big an aerial. In about five minutes we rigged up a simple indoor aerial made of No. 20 double cotton-covered wire, four baby insulators, four bits of string, and four nails. Then we connected the set to this and found an astounding all-round improvement.

COMPARISONS

WITH the outdoor wire so much amplification was available that the volume control had to be used for the great majority of transmissions. That meant that the set had plenty in hand, and the reserve was ample to enable it to work from the indoor aerial. All of the stations previously heard were brought in on the simple "wave-catcher," and we found two marked improvements. Stations were easier to separate and there was now scarcely any interference at all.

OUTDOOR WIRE TROUBLES

ONE of the bothers about the outdoor aerial is that it suffers from its own efficiency! What I mean is this. Atmospherics, spark signals, and most of the interference due to electrical machinery consists of trains of heavily damped waves. The more efficient your aerial, the better does it respond to undamped wave trains and the more do you suffer from unwanted noises. So long as your set has plenty of zip about it, you can afford to make the aerial less efficient and you will gain enormously in freedom from interference troubles. The big aerial, too, ruins the selectivity of many an otherwise good set.

WILL THE FUR FLY?

DID you know that a wireless war was being waged at the moment? It is, and there may be some interesting developments. With, I believe, little exception the American sets on sale in this country do not pay any British patent royalties. Shortly after this year's American wireless invasion had begun, the British Patents Pool fired the first shot by issuing writs. Now the other side has flung a bomb by issuing another lot of writs against British makers. Americans claim that they hold the master patents for the simultaneous tuning of circuits by means of ganged condensers, which are now used in nearly all modern sets. If matters come to a head, there should be a tremendous tussle in the law courts. Will the judge ask: "What is a wireless set?"

PICK-UPS AND NEEDLES

IT is, perhaps, not generally appreciated that different types of gramophone needles can make very marked modifications in the overall performance of a gramophone pick-up. This fact was well emphasised during a series of tests carried out recently on several models of a well-known make of pick-up. No ordinary steel needles being available at the time of commencing the test, a special type of semi-permanent needle was employed. With this needle the first pick-up tested was found to be very sensitive up to 2,500 cycles, after which the output fell off rapidly and at 3,000 cycles barely any response could be obtained. In addition to all this, a very sharp resonance occurred just below 1,500 cycles, the peak level of which was nearly three times the average output level. In fact, the overall results were distinctly poor, but, as the make of pick-up under test was known to be fairly good, these results were regarded with a certain amount of suspicion. The effect of different types of needle had previously been in part appreciated, and it was thus decided to re-test the pick-up with steel needles, the soft tone variety being used.

WORN NEEDLES

THE results obtained were remarkable, the resonance at 1,500 cycles had completely disappeared, and instead of the output falling off rapidly after 2,500 cycles, as in the previous test, appreciable output was obtained up to 5,600 cycles.

It is more or less well known that each needle, if the steel type is being used, should only be used once, otherwise rapid record wear will set in. Quite apart from this, however, used needles may distort the shape of the voltage-frequency curve of a pick-up to a very marked extent, and this seems to be particularly marked at the higher frequencies. This distortion is apparent aurally as an increase in scratch. The moral of all this is that the needles recommended by the pick-up manufacturer should be used and, if these are of the steel variety, used once only. If, however, there is no recommendation, then trials with different makes of needle should be made, and the type giving the best overall results should be used.

THE NEW VALVES

A COUPLE of years ago, I suppose, most of the experts would have smiled at the idea of a valve with an amplification factor of over a thousand. Well, now we have got it—or, rather, them—because there is quite a variety, and the smile has worn off. All the same, it is curious how often one finds a little fly in the ointment. Not that I mean to decry the modern high-mu valve in any way; on the contrary, I think it is a marvellous piece of work But it is certainly bringing some special problems in its train. One is increased background "noise" and another is the question of volume control.

TOO MUCH NOISE

OF course, it stands to reason that if one uses intense amplification one has got to put up with a certain amount of backwash. In other words, it isn't possible—not for the present at all events—to differentiate between the feeble input from a far-distant transmitter and the vast multitude of atmospheric "parasites" which inhabit the ether. If you boost one you must boost the other; so what is gained on the swings is in a measure, lost on the roundabouts. The other problem is that of volume control. It is easy enough to control signal strength from distant stations on a modern set, but when it comes to the local programme they want a lot of taming. Generally speaking, it is necessary to use two separate volume controls—ganged together—or else to fit a "local station" switch which cuts out one of the valve stages altogether for close-range working.

A LOUD-SPEAKER "SHOCK"

I SHOULD have thought most people would have been wise by now to the danger of wiring a detached loud-speaker on to a mains-driven set, without inserting either a filter output or a transformer coupling between the set and the extension wires. However, I heard a tale of woe last week from one who did not take this precaution, and is now a sadder and wiser man. The loud-speaker, which was a fairly costly model of two or three years' standing, occupied a position on a high shelf over the mantelpiece, where in the ordinary way it was well out of reach.

One evening, thinking the tone could be improved, the owner rather foolishly mounted a chair and attempted to adjust the diaphragm knob, whilst the set was still working. Unfortunately, in fumbling for it he touched one of the terminals and, in the resulting involuntary "spasm," brought the whole thing crashing down, narrowly missing a prominent member of the family circle. Her subsequent comments were much more forcible than anything I can add to point the moral.

"SWITCH OFF" FIRST

OTHER things apart, it is always advisable to switch off the mains, or the high-tension eliminator, before fiddling about with any part of a set, especially one that you haven't built yourself. The internal wiring of a modern set is not easily analysed, and one is quite likely to discover a high-voltage terminal for the first time by painful contact.

THERMION.

MOUNTING CONDENSERS

Although the positions of most of the baseboard parts can be gauged from the full-size blueprint, with certain parts, such as baseboard-mounting variable

condensers, it is advisable to fit these in place after the other parts have been mounted. It is easier in this way to get proper alignment with the panel.

MAKING A GRAMOPHONE RECORD

Valves, amplifiers, and other radio gear play a large part in the making of a gramophone record. Here the story of the manufacture of a record is described.

"THAT will do for timing. Now tell the engineers we're ready to make a wax."

A green light flicks on in the recording studio, and the birth of a new record commences.

"Making a wax" is the first step in the story of a record. Most people know that nowadays acoustic recording is hardly ever used, electric recording having superseded the older method which involved trumpets and introduced abnormal studio difficulties.

With the electrical system, gramophone recordings are made with a microphone and amplifiers, and the first stages of the process are very similar to a broadcast.

The Acoustics of Recording

Before the wax stage is reached, there is a lot to be done. In the case of a band record, for example, the members of the orchestra have to be placed round the microphone to suit the acoustics of the studio, just as has to be done in broadcasting. There is a whole art in this.

Then the item has to be timed, for 10-in. and 12-in. records have certain time limits. With some records there is no fixed diameter for the end of the sound grooves and if it is desired to squeeze more than the usual amount on to a record then the inner diameter may be made very small. The snag of this is that the reproduction at the end of the record will be noticeably inferior to that at the beginning, where the diameter is larger, and most gramophone companies do not tolerate this, and now have a definite limit for the inner diameter.

Timing

This involves very accurate timing to have the item finishing within a few seconds of the time taken to reach the standard inner diameter. It may take four or five repeats, alterations being made each time, before the proper length is obtained.

When the time limit has been arranged, then a test record is made on the wax.

The amplifier, having five valves as a rule, resistance-capacity coupled, is switched on and the item is played through. The studio director listens with a pair of 'phones and makes notes on volume, quality, and tempo and the respective brilliance of each solo instrument.

A test cutting is made on the wax with a cutter, this latter being similar in principle to a gramophone pick-up working in reverse (that is, with a cutting diamond in place of the gramophone needle), but the construction is very different.

The wax is a thick disc which has been previously very carefully prepared. It is made from a mixture of insoluble metallic stearates and waxes which are mixed at a very high temperature—approximately 550 degrees F.

The whole quality of the final record depends on the preparation and cutting of the wax, and the leading gramophone companies each have their own process for the manufacture of a wax. The general process, though, is to mix these stearates and waxes in a cauldron, super-heated steam being used. Thermometers are placed all round the cauldron, to check up the temperature which must be kept at an accurate level.

The molten wax is then either pressed through a filter or placed in a centrifugal churn and, while still hot, is moulded in brass trays, forming cakes about 1 in. thick and slightly larger than the required

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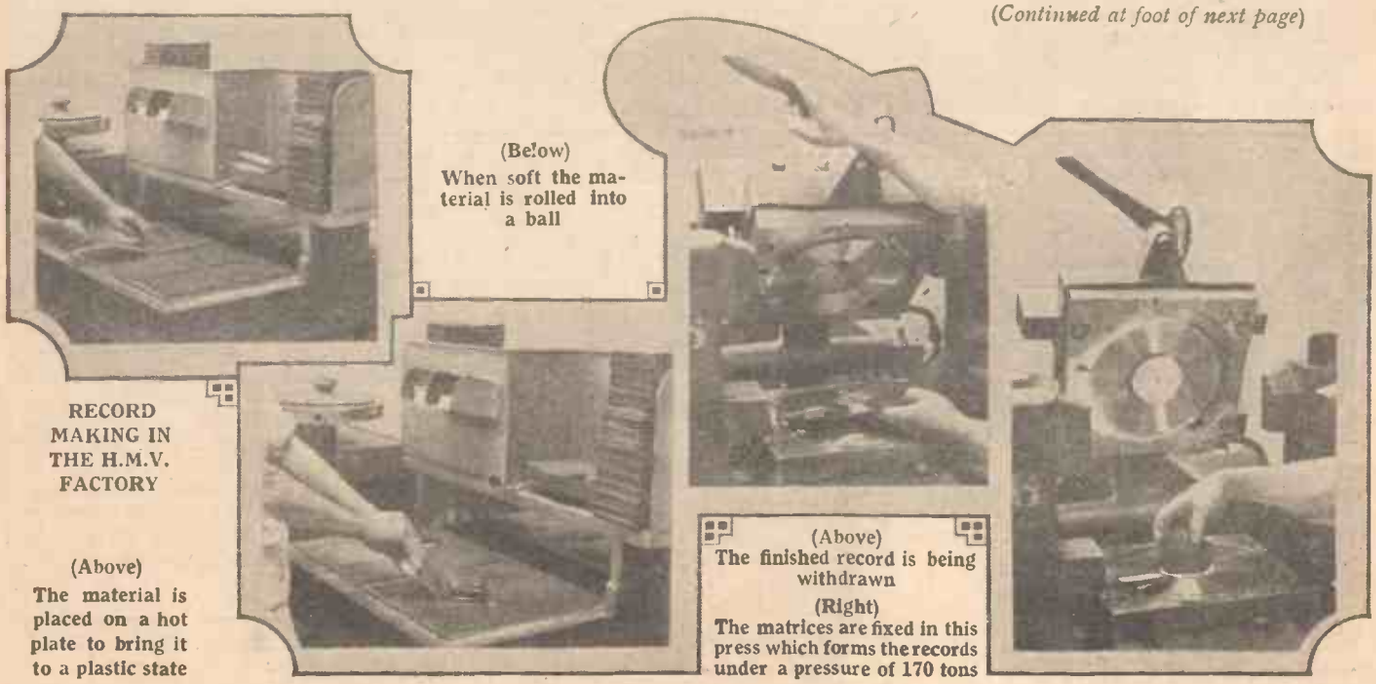

RECORD MAKING IN THE H.M.V. FACTORY

(Above) The material is placed on a hot plate to bring it to a plastic state

(Below) When soft the material is rolled into a ball

(Above) The finished record is being withdrawn

(Right) The matrices are fixed in this press which forms the records under a pressure of 170 tons

OUR LISTENING POST

By JAY COOTE

"*SLOUSCHAIT JE! Radio Stanzia Imeni Moskva Stalina!*" Have you already heard this call? It is that of the new 100-kilowatter recently opened at Moscow to commemorate the fêtes given in celebration of the fourteenth anniversary of the Soviet régime. Set your condensers at that spot on the scale at which it was your wont to pick up Madrid, and you should heard the Russian station on almost any evening. Its true wavelength is 424.3 metres. At intervals the call is abbreviated to "*Govoreet Moskva Stalina.*" I am afraid that its presence will wipe out our chances of hearing the Spaniard until the later hours of the night, as the signals given out by this new station in the middle of the broadcasting band are fairly hefty.

The French Stations

Stand-by also for tests by the new 7-kilowatt transmitter which the Ecole Supérieure (Paris) will make at the end of the daily programmes. They will be carried out on the regular wavelength, namely, 447 metres. The station, much to the annoyance of Paris listeners, may only be a temporary structure, as according to the Ferrié plan, the French State is to be the proud possessor, later, of something in the neighbourhood of 100 kilowatts. Curiously enough, although Radio Toulouse has not yet launched its new St. Aignan station, if we are to believe statements made in the French radio press, that city may be endowed with two big stations at some future date. In France the authorities are always coming up against that vexed question of private versus state interests. It would appear that the PTT has expressed the intention of transferring the present Toulouse-Pyrenees station to Muret and to raise its power to 60 kilowatts!

A Nightly Call

May I draw your attention to Warsaw? Personally, I make a point of calling there nightly, as its entertainments are always good. Poland provides a large number of international concerts broadcast for the benefit of Europe at large; we might as well take them direct, as they are now well within our reach. You could do worse than make a note of the following dates: December 4, 11 and 18, when specially select programmes will be offered to you. Arrangements have been made by Polskie Radio to transmit eleven such concerts between January 1 and March 18, 1932, and to these broadcasts famous artistes have been engaged to contribute.

International Relays

If you listened to the B.B.C. relay of the Lehar concert, recently provided by Vienna, you will have found, without doubt, that it is well worth while to tune in these special transmissions offered by Continental cities to their neighbours. For your guidance, November 26 is the date allotted to Prague for a special broadcast and December 17 to Brussels. Belgrade will be heard on January 14 and Stockholm on March 17. Little by little the continent of Europe is being properly linked up by special land-lines suitable for music transmissions, and by next year we shall see the net completed. We may look forward to relays of operatic performances from the Scala at Milan or from the Teatro Reale at Rome in a not too distant future.

Incidentally, there are likely to be some drastic changes in our log in respect to the Italian transmitters, as the 30-kilowatt Florence station will take over Milan's wavelength and the latter, when completed—a 75-kilowatter—will work on 331.4 metres. Naples, as a comparatively weak unit, will seek another position in the waveband.

At times, possibly, you may have picked up the test broadcasts put out by Kootwijk (Holland) on 1,053 metres; to these I have already referred in previous notes. According to a Dutch correspondent, I learn that the V.A.R.A., one of the associations using the Hilversum transmitter, has been granted permission to experiment with the Kootwijk station on 298.8 metres. It is not quite clear when these tests are to take place, but we may expect them shortly. I should not be surprised to hear of some startling developments in Holland in the beginning of the New Year, as the A.V.R.O. has purchased the site for a new studio at Hilversum, and is making every effort to secure authority to build a station worthy of its programmes.

Previous to the recent Rome Conference, where an unsuccessful attempt was made to improve the broadcasting band, certain alterations had been suggested to help matters along. Amongst others the stations affected by these changes were Heilsberg, Turin, Hilversum, and Tallinn. It is possible that for a few days these were carried out, but I may tell you that you will now find Heilsberg back again on 276.5 metres and that Turin is still, at the time of writing, in the immediate neighbourhood of the Dutchman, much to the latter's annoyance. Where Tallinn has gone for the moment I know not; it had been allotted 368.1 metres, a channel which has been jumped by Bolzano (Italy).

The Spanish Broadcasts

Of the Spanish broadcasts lately, I hear little. From time to time I pick up Barcelona (EAJ1), but seldom Madrid, which appears to have vanished beyond my horizon. On the other hand, Radio Valencia and San Sebastian, on most nights after 11 p.m., are fairly well heard. Radio España, the second station in the Spanish capital, was found in close proximity to Söttens, but recently it has popped up near 381 metres. It is usually swamped by Lvov or Radio Toulouse.

Between 11 p.m. and midnight you can listen to Reykjavik; as the main evening programme starts at 10.35 p.m., it is by then in full swing. On Sundays dance music is broadcast until midnight. Bear in mind that Icelandic local time is one hour behind G.M.T.

"HOW GRAMOPHONE RECORDS ARE MADE"

(*Continued from preceding page*)

diameter of the record. The greatest care is taken to keep dust out of the manufacture of the waxes, for this would produce scratching surface noises. In the department where the waxes are made, it is usual to brush with a calcium chloride solution to keep the dust out of the wax moulds. The wax discs are cut and polished, and each wax has a glass-like appearance before the recording is made.

The disc is rotated by a "gravity motor" worked with a falling weight. This gives a much more even speed of rotation than any ordinary electric motor. In addition there is no possibility of interference being picked up by the cutter from the motor windings.

Cutting the Record

The record is moved across the cutter and not in a similar manner to that obtaining in amateur home-recording systems. A suction nozzle moves in front of the cutter to pick up the dust from the surface of the record. The technical name for this dust formed by the cuts is "swarf."

The test wax is usually played over for the benefit of the artistes. An ordinary pick-up with a fibre type needle is used for play-back, and with most processes one play-back does not spoil the wax. With better class records, though, it is usual to play back only on a test record and to keep the final wax for the pressing, the thousands of records of one kind all being pressed in moulds made from the master wax disc.

K. U.

ARE THEY DISCUSSING TELEVISION?

An interesting photograph of J. L. Baird talking to H. G. Wells while on the way to America. A fortnight ago Mr. Baird married Miss Margaret Albu, well known in B.B.C. circles—so the journey ended in romance!

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THE VALVES WITH THE MICA BRIDGE CONSTRUCTION

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ABOUT BAND-PASS H.F. TRANSFORMERS

In order to sharpen tuning band-passing is being used in many modern sets. J. H. REYNER, B.Sc., A.M.I.E.E., raises several interesting points

A BAND-PASS tuner in the aerial stage is recognised to-day as one of the most effective methods of combating interference problems. Whether it will remain is a point on which some authorities express doubt, but for the present there can be no question about its efficacy, since it allows a greatly superior selectivity to be obtained with little sacrifice of signal strength.

This being the case, one somewhat naturally turns the attention to the possibility of such a circuit in the high-frequency stages of a receiver. Suppose we consider a three-valve set of the type so popular to-day, embodying a high-frequency (screen-grid) stage, followed by a detector and an L.F. amplifier. A circuit such as this contains two tuned circuits in the ordinary course of events. For real selectivity, particularly if one is within ten or twenty miles of a high-power station, the performance of the two tuned circuits is inadequate, especially as there is a danger of cross-modulation if the ordinary type of screen-grid valve is being employed.

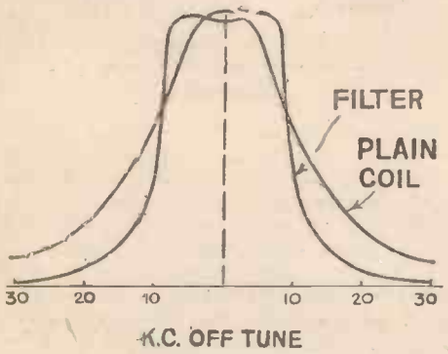

Fig. 1. Resonance curves of plain and band-pass circuits

This bugbear is obviated to a large extent and much more satisfactory results are obtained by using a band-pass filter in the aerial stage, and this form of circuit is employed to quite a considerable extent. If we carry the process one stage farther, however, there is no reason why we should not use a band-pass tuning arrangement in the anode circuit giving a double band-pass arrangement with four tuned circuits.

Such a system is not difficult to use, because the two band-pass circuits are each controlled by a common spindle, so that there are only two operating knobs, and not four. Indeed, with a little care, all the circuits could be linked up on a single control, in which case a very simple and yet effective arrangement would result.

I built a receiver on these lines a short time ago and was very surprised at the results. The outstanding point which struck not only myself, but all other people who listened to it, was the clearness of the reception. We are accustomed in these days of an over-crowded ether to mushy reception. Almost every receiver seems to suffer from this defect. Distant stations can be received at good strength but are not clear cut and with a silent background.

Cutting Out Mush

In a simple receiver this is due to the inherent unselectiveness of the circuit, whereas in a more powerful receiver the very amplification itself brings in these stray noises or "whiskers." A band-pass filter, properly designed, cuts off very sharply outside its band-width, so that it only accepts the frequencies to which it is tuned. If we have two band-pass filters the effect is accentuated to an extent which is most marked on actual reception.

Fig. 1 illustrates the point diagrammatically where we have two resonant curves, one an ordinary resonant curve from a single circuit, and secondly a resonant curve from a band-pass filter. It will be seen that, 30 or 40 kilocycles away, the signal strength received on the band-pass filter is considerably smaller than that of the single tuned circuit, although only a few kilocycles away the condition of affairs is reversed, which is just what we require for good quality reception.

Band-pass Types

An ordinary band-pass filter may be used in the anode circuit comparatively simply. Fig. 2 shows an arrangement using a Lewcos band-pass filter. This particular filter is arranged with a combination of a series aerial condenser and a tap on the short waves. On the long waves the tap is effectively at the top end of the coil, the correct degree of coupling being obtained by correct choice of the value of the series condenser. With this system the band-pass filter may be used in the anode circuit without difficulty, the only essential being the employment of a parallel-feed system as shown in the diagram.

Fig. 3 shows a different arrangement adopted with the British General band-pass filter. This particular component is made in two types, one for the aerial and one for the H.F. stage, and there is a specific tapping point on each coil, which is changed over by a switch at the same time as the wave change is carried out.

In the aerial coil this tapping is of the order of one-third of the full coil, being actually worked out to give the optimum signal strength, while in the anode circuit a centre tap is used in its stead; this, of course, being in line with the usual arrangement of an H.F. transformer, wherein a centre tap is found to give the best compromise between signal strength and selectivity.

Tests with this latter form of circuit show that it is desirable to use a different tapping point for H.F. work. If the same tapping is employed as is used for the aerial circuit, the signal strength is too weak and there is a noticeable drop in the signal when using a band-pass filter. An alternative is to use a full tap, as is indicated dotted in Fig. 2. In such circumstances the signal strength is excellent, but the selectivity, while being

(*Continued on page* 1128)

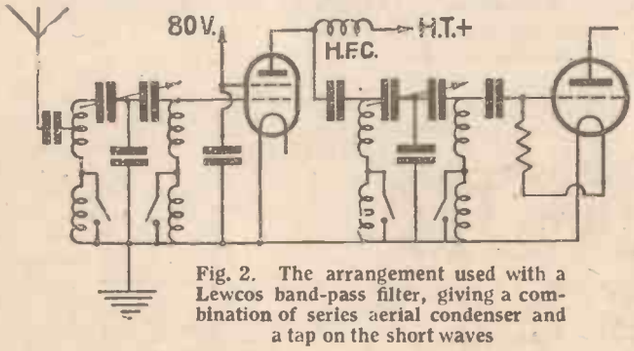

Fig. 2. The arrangement used with a Lewcos band-pass filter, giving a combination of series aerial condenser and a tap on the short waves

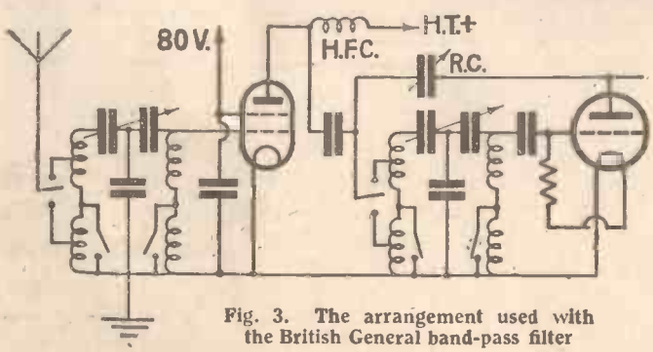

Fig. 3. The arrangement used with the British General band-pass filter

THE HOW AND WHY OF TUNING—XII

HOW TO MAKE A DUAL-RANGE COIL

Another of a comprehensive series of articles on tuning, specially written for newcomers to wireless

AS promised last week, I am now giving the necessary details for the construction of a simple dual-range coil, with reaction, and the simplest way of switching over from medium-wave tuning to the long waves. First of all, take a look at Fig. 1

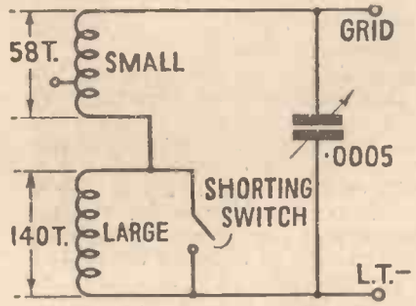

Fig. 1. The connections of a dual-range tuner

which shows the essential connections for a dual-range tuner.

Here we have two separate coils, a medium-wave coil of fifty-eight turns, tapped twenty turns from the earth, or low potential end, and a long-wave coil consisting of 140 turns. Really, the long-wave coil is a combination of the two coils just mentioned, for we connect the two in series for long-wave tuning and short-circuit the larger coil for medium-wave tuning.

This system not only saves the extra turns that would be needed if two entirely separate coils were used, but also enables a very simple, but highly effective, switching circuit to be employed. It will be seen that the lower end of the small coil is connected to the higher end of the large coil, thus forming a continuous winding of 198 turns. The variable condenser is connected across the two free ends of this coil series, that is, to the top of the small coil and to the bottom of the large coil.

Then across the two ends of the large coil is connected a simple two-point switch, such as is often used in the filament circuit to switch the set on and off. In one position of this switch the large coil is short-circuited, so that the variable condenser is then tuning only the small coil, thus covering the medium waves. In the open position of the switch the large coil is in series with the small coil, and the condenser therefore tunes both coils used as one large coil, covering long waves.

This switching system is used in many of the commercial dual-range coils and can be thoroughly recommended for aerial-circuit tuning. There is one point not yet explained about the Fig. 1 circuit, and that is the aerial tap. This is taken to the twentieth turn from the low-potential end of the smaller coil, and serves also for the long waves, when, of course, the amount of winding in the aerial-earth circuit is the twenty turns of the smaller coil plus the whole of the large winding. On the long waves very selective tuning is not usually necessary, and the common tap for the aerial serves quite well.

So far we have not considered this dual-range winding scheme in relation to reaction. Look at Fig. 2 for this additional feature. Here we have a coil with three distinct windings, the two already mentioned and a reaction winding coming between the small and large tuning windings. This reaction is common to medium- and long-wave ranges. By placing the reaction winding between the two sections of what becomes the long-wave winding, we find that adequate reaction is obtainable of the long waves without the necessity for adding more turns than are used for the medium waves. It will be appreciated that this simplification would not be possible if the reaction were placed at, say, the other end of the coil. It must come between the two coil sections.

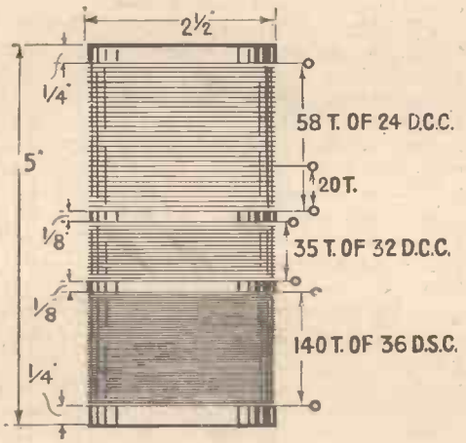

Fig. 3. Winding data for dual-range coil

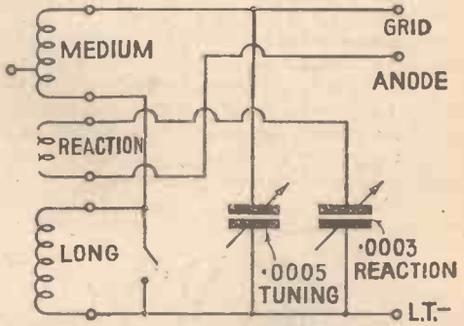

Fig. 2. Dual-range coil with reaction winding

The connections of the reaction coil in relation to the reaction condenser and the anode of the detector valve are also indicated in the Fig. 2 diagram. It will be noted that the end of the reaction winding nearer to the end of the medium-wave coil winding goes to the reaction condenser and that the end of the reaction winding nearer to the long-wave winding goes to the anode of the valve. These connections must be followed or reverse reaction will be produced.

An alternative method of connection for the reaction coil should here be mentioned. If desired, the end of the reaction winding shown connected to one side of the reaction condenser can be taken to earth, and the other end of the reaction taken to one side of the reaction condenser, whose remaining connection will then have to go to the anode of the valve.

The way shown by the diagram has the advantage that one side of the reaction condenser can be earthed, so that if the moving plates are earthed there is less chance of hand-capacity effects. The alternative method sometimes has the advantage of smoother and more evenly applied reaction but hand-capacity effects may be noticeable, due to the fact that neither of the reaction condenser connections are earthed.

Fig. 3 provides the intending constructor of a simple dual-range coil with all the essential data. It should be noted that the medium-wave winding, with its reaction,

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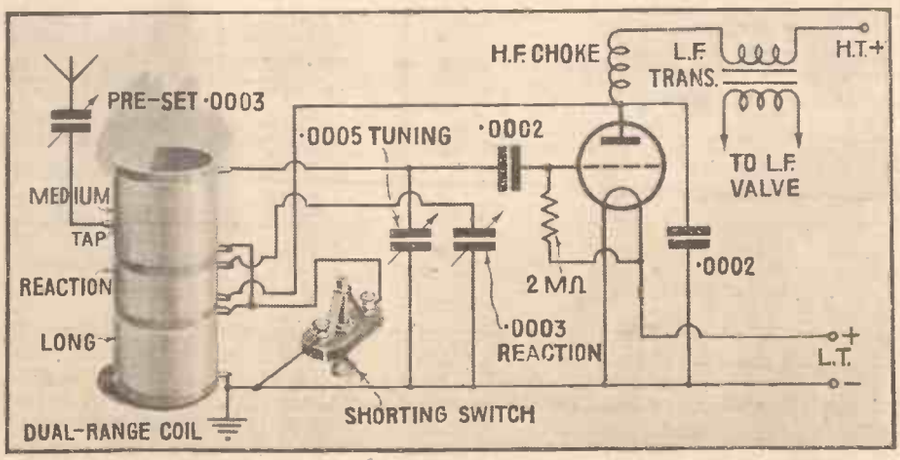
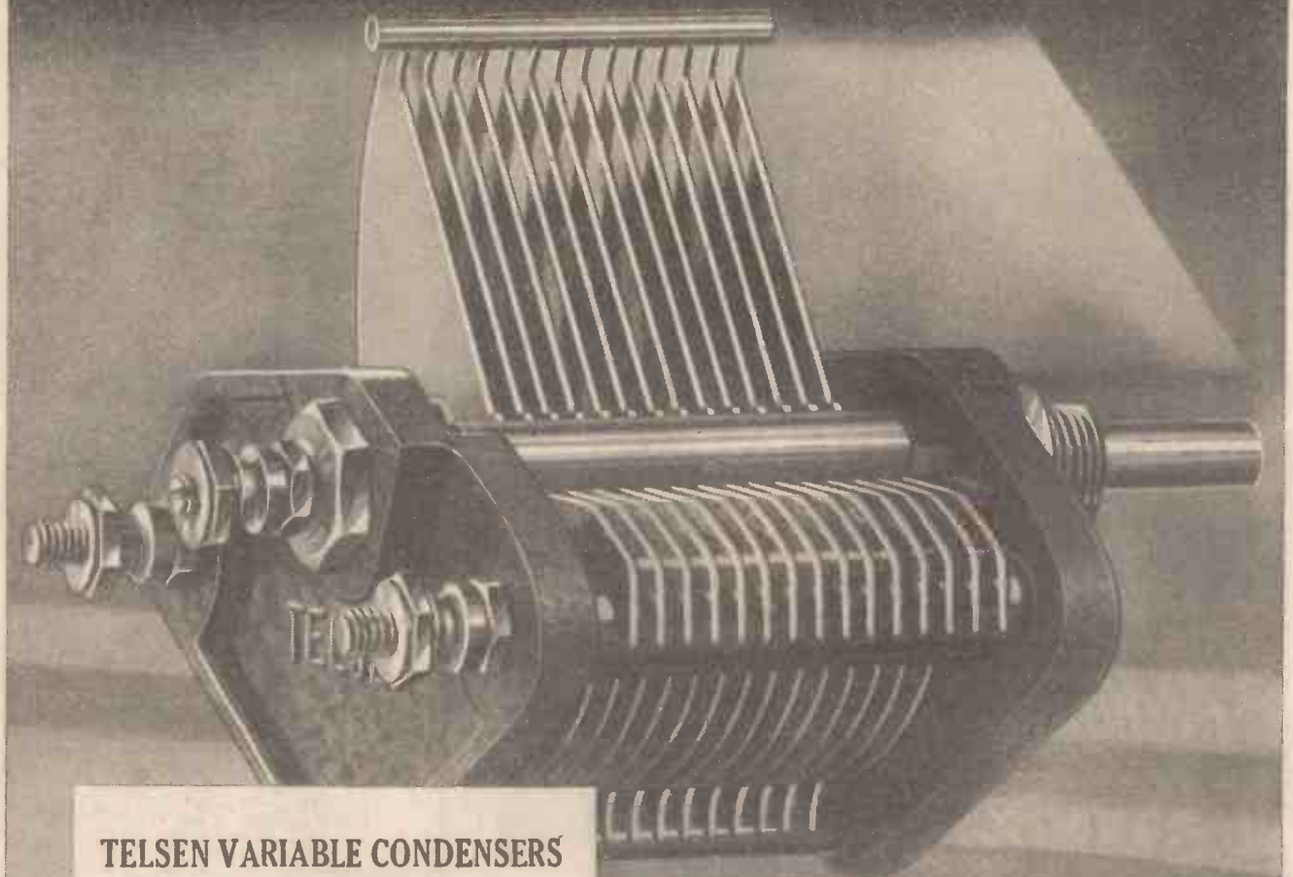


Fig. 4 .Suggested circuit for using dual-range coil

PRECISION



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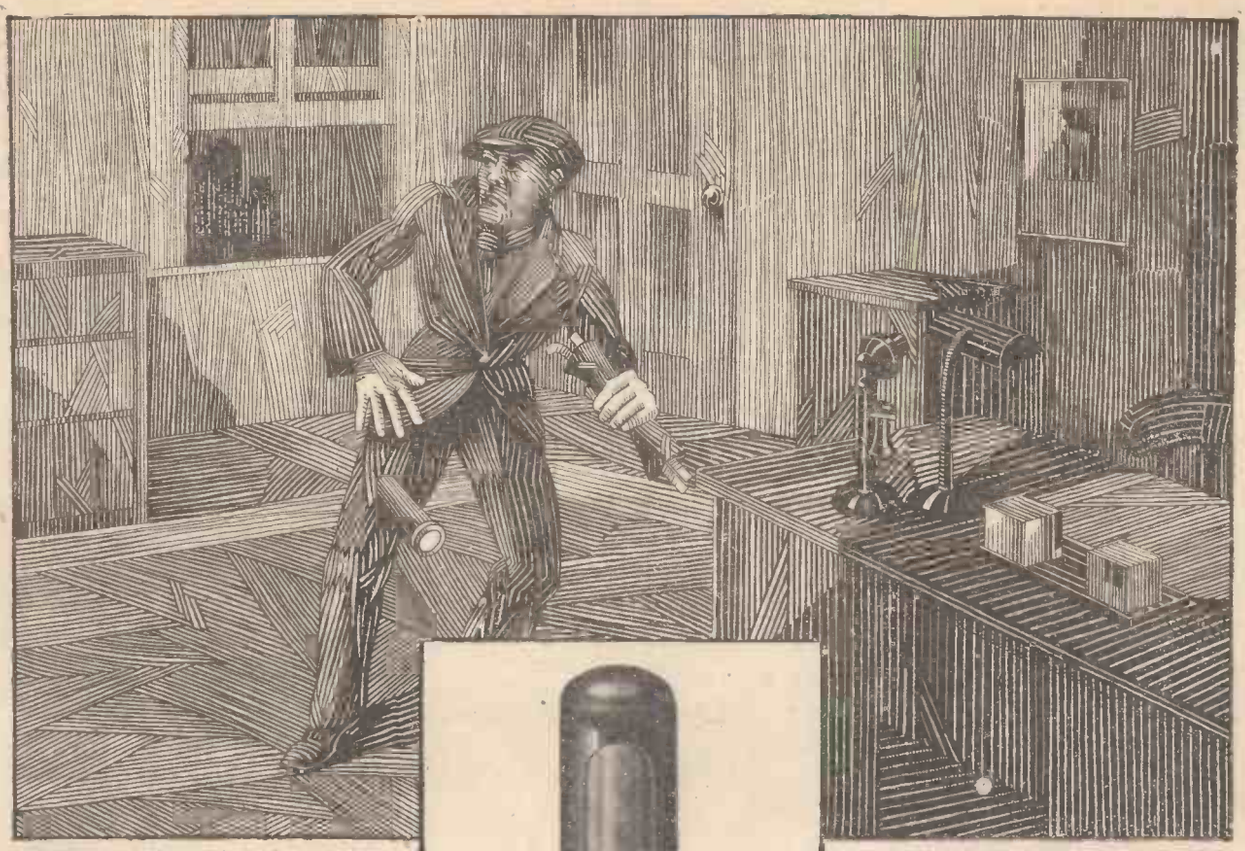

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—By RAYCRAFT

HIS stealthy, shadowy form steals across the room. The window was easy—his tools had dealt with that. Nothing stands between him and the desk. Nothing except . . . From the room above sounds the continuous relentless ringing of an alarm. He does not know he started it. His hands have touched nothing. His quiet feet disturbed nothing. *What started that Alarm?*

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OUR BROADCAST CRITIC TALKS ABOUT—FOLLIES

FOLLIES—or folly? Advertised in the daily press as a sop to discontented vaudeville listeners, described in the programme as sparkling, wise-cracking, quick-moving. May I examine it?

First, its humour. Such pinnacles of high comedy as the incident where the Funny Gentleman expressed strong opinions on punctuality, and then found the clock to be ten minutes slow, so that he missed his train, caused roars of laughter in the studio.

Whether they were from an audience there or whether they are previously rehearsed by the cast is probably one of the earth's secrets.

The Highwayman Scene gave possibilities for real comedy. There were no funny lines. I thought them all mediocre lines.

The scene about "The Springtime Reminds Me of You," with its effect in the West and East Ends of London, also Hampstead, were, I thought, poor in construction. The East End one was just passable.

The Train Scene had no point. I thought the engine whistle the best part. That was quite good.

The Shooting Scene with the gangsters was spoilt by the American being so badly done.

For the rest, a little filling in with "*Cherie, c'est Vous,*" and "Jolly Good Company."

Sparkling, wise-cracking, quick-moving—oh, yeah!

◆ ◆ ◆

I suppose you all listened to the Festival of Empire and Remembrance on Armistice Night? It is very difficult to judge anything of that description after merely hearing it broadcast. Only the *tunes* of the wartime songs came through on my loud-speaker, yet I was assured by a member of the audience that the harmonic effect in the Albert Hall was thoroughly satisfactory.

Incidentally, I wonder if anyone agrees with me that "If you were the Only Girl in the World" is the best tune the War produced?

Those who listened to the Festival by wireless must have come to the conclusion that sound was not enough to convey all that it meant. Judging from the description that was given me, the actual scene was indeed English and inspiring.

I thoroughly enjoyed Ronald Gourley. I liked the tunes to which he sang his amusing limericks. Apart from the fact that he was really funny, he was artistic with it. My heart goes right out to any comedian who can set me laughing, and excite my admiration for his artistry at the same time. I have no hesitation in saying that I consider Ronald Gourley's style of humour thoroughly acceptable; it is real high comedy.

◆ ◆ ◆

The mixing-up of tunes suggested by the audience seemed to me to be rather poorly effected. One ought to possess a good knowledge of harmony to bring off that sort of thing successfully.

◆ ◆ ◆

Ways and Means was the first respectable sketch in a vaudeville to which I have listened for some time. There were some clever lines, and I thought it well produced in every way. I should not mind hearing it again.

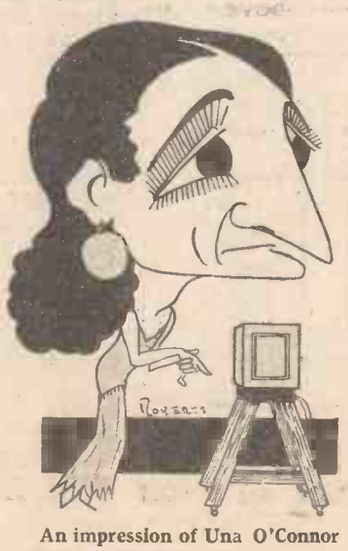
◆ ◆ ◆

Colin Wyatt yodelled so well that, for a moment, I thought he must have laid an egg. It is a strange art, withal; he seems to be master of it.

◆ ◆ ◆

Ronald Frankau is another entertainer of whom we might well have a good deal, pending the birth of a few more funny people. "I Want to be Vamped" (which I think I have heard before) is good fun. More, please!

I listened for a few moments to Darroll Richards, the tenor who sang with the B.B.C. Theatre Orchestra on Wednesday evening. His is the type of voice we need in light orchestral programmes; not too big or dramatic. I thought he came through exceedingly well.



An impression of Una O'Connor

There is something to be said for small orchestras, also. The theatre band was quite effective; undoubtedly this kind of broadcast serves a good purpose.

◆ ◆ ◆

Another light broadcast, earlier in the week, attracted my attention—that by the Leslie Bridgewater Quintet. There must be many to whom this type of concert appeals.

◆ ◆ ◆

Of course, you heard "Encore?" I reached home just in time to hear them playing excerpts from *The Geisha*. I was sorry Hayden Coffin did not sing "Star of My Soul." Never mind; I sang it for him!

After hearing those tunes again—tunes I heard as a boy—I came to the conclusion that I prefer them infinitely to the corresponding tunes, so to speak, of to-day. They are better built, better harmonised, better balanced.

Altogether, I thoroughly enjoyed hearing Hayden Coffin. I found myself wondering what memories were brought back to him as he sang the songs that made his name famous.

He is seventy next year. *Encore*, and happy days to him!

◆ ◆ ◆

Thinking of Armistice Night again, I wonder how you got on with *Resurgam*, which, by the way, does not quite mean: "I will arise." "I shall arise *again*" is the real meaning.

I felt it was rather a lot to swallow. Had the voices of the speakers been very wonderful, they might have brought it off better. As it was, I thought it missed fire somewhat.

◆ ◆ ◆

Another bad Saturday-night vaudeville—Bobbie Comber and Tommy Handley excepted, of course. They are always good.

The rest were, in my opinion, anything but good. Mabel Marks bored me.

The Roosters were chiefly noise with a little humour of rather a coarse kind; Trevor Watkins sang so sharp that I could not listen to him; Lena Chisholm and her partner, Ord Hamilton, who were advertised to be *in something new*, sang all the old fox-trot songs they could think of.

Jack Payne filled in a little time—admirably, of course—but it was obvious that he *was* filling in time.

What I want to know is—*who is responsible for these dire vaudevilles?* They are getting steadily worse.

WHITAKER-WILSON.

LOOK OUT FOR OUR SPECIAL XMAS NUMBER NEXT WEEK . . . USUAL PRICE 3d.

BUILDING THE TWO ST

Here are detailed instructions for building and operatin "Star" series of sets. Preliminary details and the layou were given last week

THOSE who were interested in the theoretical considerations we gave last week about the "Two Star 2" will now want to know how this second Star set is made. Firstly, the constructor must get together the components given in the list. These include standard products, all of which can be obtained without difficulty.

The two-gang condenser is completely screened. The band-pass coil is one of the standard Lewcos coils, and not the special Lewcos coil used in the "Three Star 3." Other parts of importance are the high-frequency choke, the low-frequency transformer, the fixed condensers, the valve holders, and the reaction condenser.

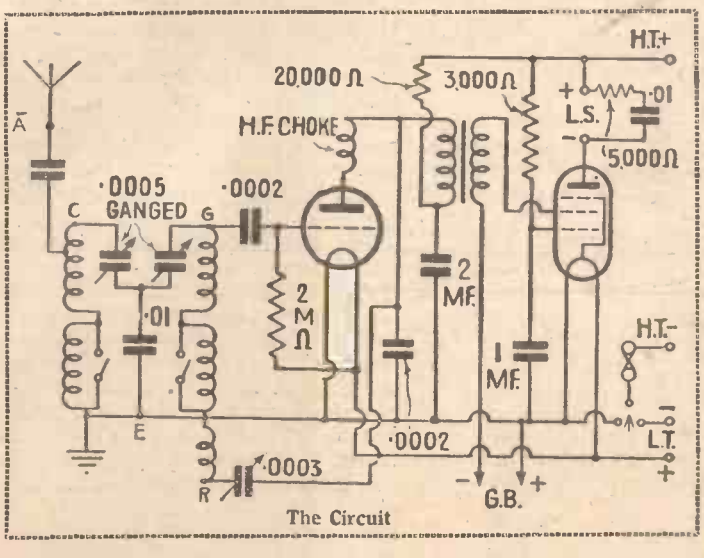
Let us emphasise the fact that the "Two Star 2" is not a chassis set. We are of the opinion, after many experiments with various layouts, that the metallisation of radio, about which we so justifiably enthused in connection with the "Three Star 3," has no real application in a two-valver comprising a detector and one stage of low-frequency amplification.

Novel Construction

Nevertheless, we found when making up one of the later hook-ups of this set that a panel might easily be dispensed with, since the variable condenser knob, reaction condenser knob, and on-off switch knob did not seem sufficient justification for slavishly following the stereotyped panel and baseboard design.

When you come to think of it, we have rather taken for granted that nothing can be done to alter two-valve set design, either in circuit or in layout. Well, we have found a way of deviating, if ever so slightly, from the accepted rules of the game. The "Two Star 2" is not a chassis set—it is a baseboard set! But there is no panel.

Instead, we have mounted the knob of the tuning condenser on its spindle, and this, with the spindles of the reaction condenser and switch, project through the front of the cabinet, which is of wood. The reaction condenser and on-off switch are conveniently and simply mounted on small aluminium brackets.



The Circuit

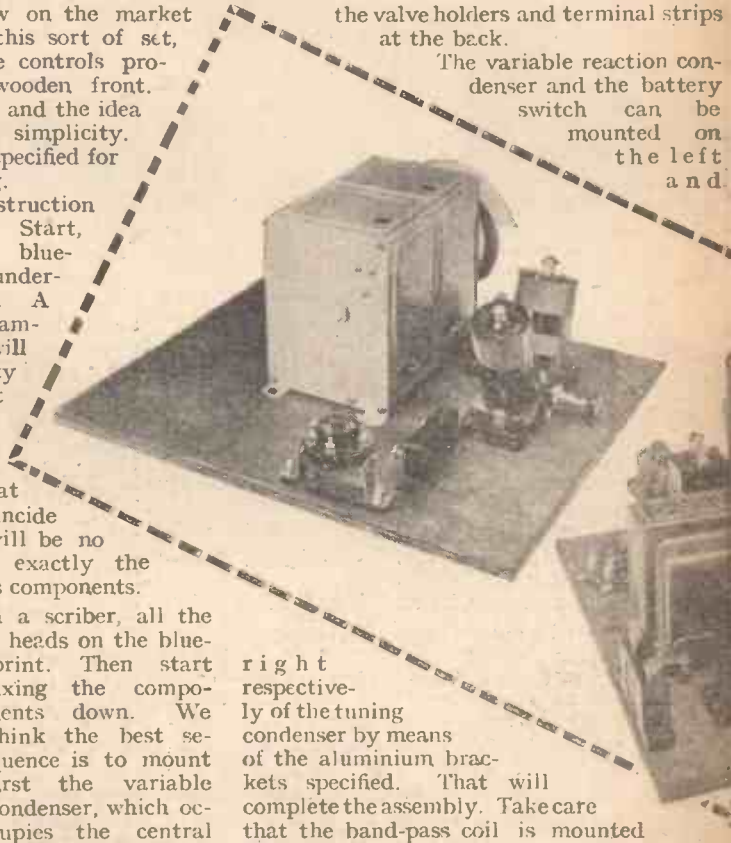
Several cabinets now on the market are designed to take this sort of set, that is, a set with the controls projecting through the wooden front. The effect is attractive, and the idea has the advantage of simplicity. Certainly, the cabinet specified for this set is very pleasing.

Let us start the construction of the "Two Star 2." Start, we suggest, with the blueprint. Make sure you understand all it indicates. A little time spent in examining the blueprint will save a lot of uncertainty later! Use the blueprint as a baseboard template, for it is drawn full-size, and if placed on the baseboard so that its corners exactly coincide with the wood, there will be no difficulty in locating exactly the positions of the various components.

Prick through, with a scriber, all the holes marked as screw heads on the blueprint. Then start fixing the components down. We think the best sequence is to mount first the variable condenser, which occupies the central position on the baseboard, then fix the smaller components, such as the fixed condensers, fuse, and grid leak. After, the band-pass coil can be mounted on the left of the tuning condenser, the high-frequency choke behind it, and the low-frequency transformer on the right.

All that remain are the valve holders and terminal strips at the back.

The variable reaction condenser and the battery switch can be mounted on the left and right respectively of the tuning condenser by means of the aluminium brackets specified. That will complete the assembly. Take care that the band-pass coil is mounted with the switch spindle pointing outwards.

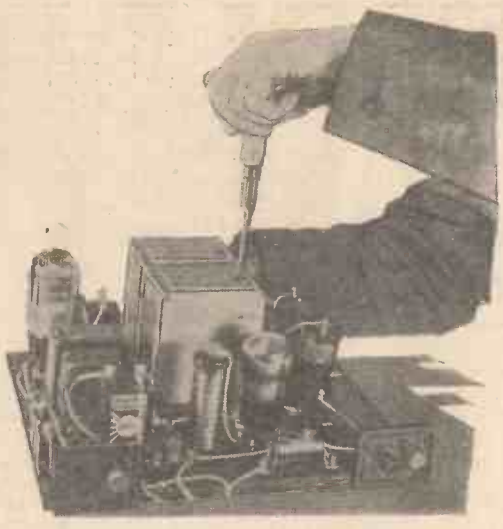


Now for the wiring—simple indeed if the blueprint is implicitly followed. Looking at this blueprint, the constructor will see that each connection is numbered. There is a reason for this. We want you to wire up the components in a definite sequence—and that sequence is obtained by following the numbers. Wire up connection No. 1 first, then wire No. 2, and so continue until you reach wire No. 34, which is the last of the actual internal connections, from band-pass coil to frame of condenser.

Of these wires, Nos. 24, 28 and 31 are

TAR 2

g the second of the t and wiring diagram



actually spaghetti resistances, which for the sake of simplicity and continuity are considered as wires.

After wire No. 34, we have a number of battery flexes, numbered 35 to 40 inclusive, as shown.

The wire we used to connect up the original "Two Star 2" set is 20-gauge round tinned copper, and this is covered with one millimetre insulating sleeving.

First measure off the length of wire needed, make a loop round the first terminal connection, slip on a suitable length of the sleeving, and then finally make the second loop round the remaining terminal connection on the other component.

When the battery flexes are being made it will save confusion if the correct wander plug or tag is put on as each lead is finished. We hesitate to repeat the truism—but follow the blueprint and you cannot go wrong!

The set is now almost ready for test, but first see that the odd little parts, such as the grid leak and fuse bulb, are clipped into their correct holders. Before fitting the set into its cabinet, it is a good plan to do the preliminary ganging, since the condenser cannot be got at when the baseboard has been inserted in the cabinet.

Assembly

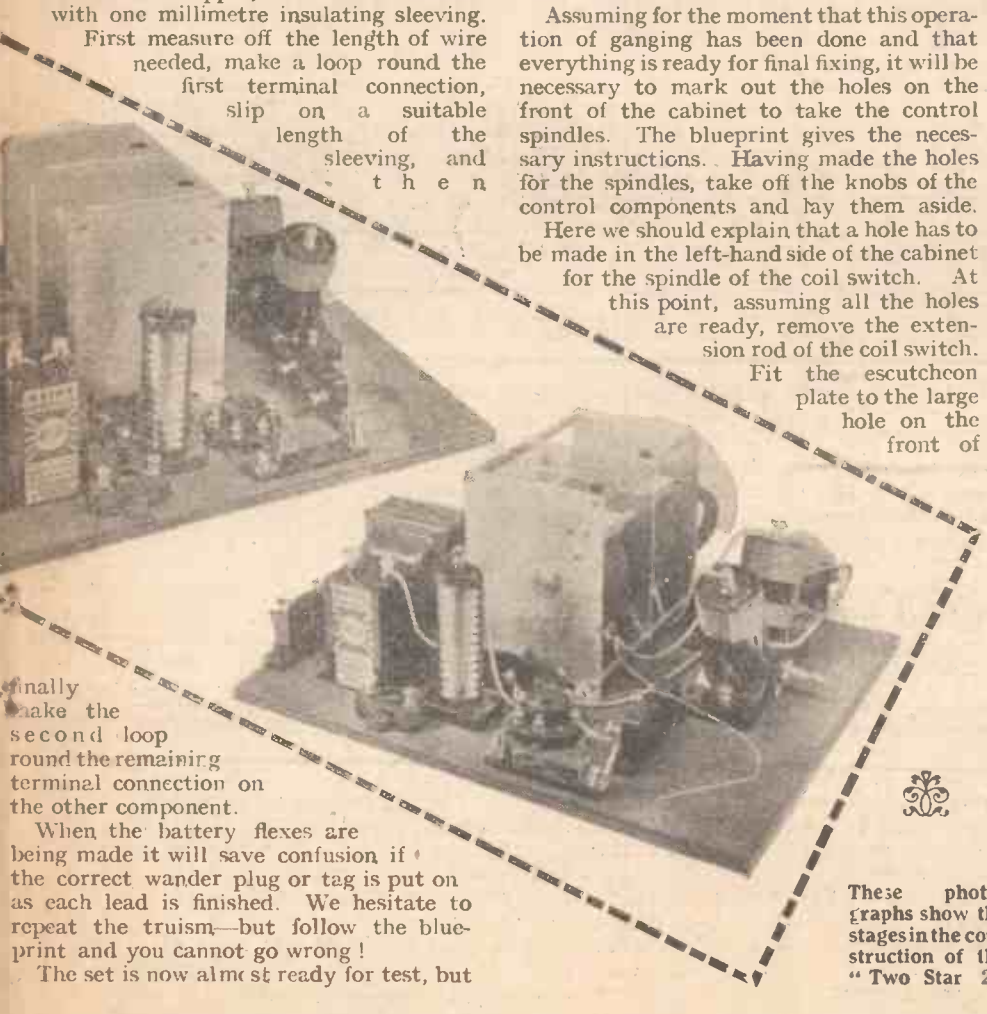
Assuming for the moment that this operation of ganging has been done and that everything is ready for final fixing, it will be necessary to mark out the holes on the front of the cabinet to take the control spindles. The blueprint gives the necessary instructions. Having made the holes for the spindles, take off the knobs of the control components and lay them aside.

Here we should explain that a hole has to be made in the left-hand side of the cabinet for the spindle of the coil switch. At this point, assuming all the holes are ready, remove the extension rod of the coil switch. Fit the escutcheon plate to the large hole on the front of the cabinet, making use of the simple metal clamp supplied with the tuning condenser.

Having made all these preparations, the baseboard can be slid into the cabinet, until it comes up against the front. The spindles of the tuning condenser, reaction condenser, and on-off switch will then project through the front of the cabinet—assuming that the holes have been accurately located! By the way, to keep the baseboard in position, it is advisable to put two or three screws through the baseboard so that it is firmly clamped to the bottom of the cabinet.

After fixing the control knobs, on the front of the cabinet, attention can be turned to the fitting of the extension rod to the coil at the side of the cabinet. It will be necessary to cut the extension rod to the correct length. Before doing this, put on the rod a nut, so that after cutting and cleaning up, the nut will, when undone, cut a clean thread that will make for easy fixing of the nut after the coupler has been fitted.

Having fitted the coupler, put on the small knob, which is pulled out for medium-wave tuning and pushed in for long-wave tuning.



These photographs show the stages in the construction of the "Two Star 2"

COMPONENTS REQUIRED

Baseboard, 12 in. by 10 in. (Camco, Peto-Scott Readi-Rad).

Two-gang .0005-microfarad variable condenser (J.B. type "R2," Utility, Lotus).

Band-pass coil, with reaction (Lewcos type B.P.F.)

Two five-pin valve holders (W.B., Telsen, Junit, Clix, Lotus, Wearite, Bulgin, Burton, Lissen, Graham-Farish).

Grid-leak holder (Readi-Rad, Telsen, Lissen, Dubilier, Wearite, Bulgin, Graham-Farish).

Two .0002-microfarad fixed condensers (Lissen, Telsen, Dubilier, T.C.C., Sovereign, Graham-Farish).

Two .01-microfarad fixed condensers (Dubilier, type 620, T.C.C., Lissen, Graham-Farish).

2-megohm grid leak (Lissen, Telsen, Dubilier, Sovereign, Graham-Farish).

One 1-microfarad and one 2-microfarad fixed condensers (Formo, Telsen, Lissen, Dubilier, T.C.C., Ferranti)

High-frequency choke (Readi-Rad, Telsen, Wearite, Sovereign, Climax, Lissen, Lewcos, Graham-Farish, Tunewell).

Low-frequency transformer, ratio 7-1 (Telsen "Radiogrand," R.I., Ferranti, Varley, Lissen, Lotus, Igranic, Climax, Brit. General).

Three spaghetti resistances, one 3,000 ohms, one 5,000 ohms, and one 20,000 ohms (Sovereign, Telsen, Bulgin, Lewcos, Readi-Rad, Lissen, Tunewell).

.0003-microfarad reaction condenser (Polar "Compax," Telsen, Formo, Readi-Rad, Robinson, A.W., Lotus, Graham-Farish).

Three-point shorting switch (Telsen, Readi-Rad, Wearite, Bulgin, W.B.).

Fuse holder and fuse (Bulgin, Telsen, Readi-Rad, Graham-Farish).

Connecting wire and sleeving (Lewcos, Jiffilinx, Quickwyre).

Two terminal blocks (Sovereign, Junit, Belling-Lee).

Two aluminium brackets as specification (Readi-Rad).

Four terminals, marked: Aerial, Earth, L.S.+, L.S.— (Bulgin, Belling-Lee, Clix, Eelex).

Two spade terminals, marked: L.T.—, L.T.+ (Belling-Lee, Clix, Eelex).

Four wander plugs, marked: H.T.—, H.T.+ G.B.—, G.B.+ (Belling-Lee, Clix, Eelex)

Four yards thin flex (Lewcoflex).

ACCESSORIES

Cabinet (Peto-Scott).

Loud-speaker (Celestion, Blue Spot, H.M.V., Tekade, Amplion, Mullard.)

H.T. battery (Drydex, Fuller, Ever-Ready, Lissen, Pertrix, Palaba).

G.B. battery (Drydex, Fuller, Ever-Ready, Lissen, Pertrix, Palaba).

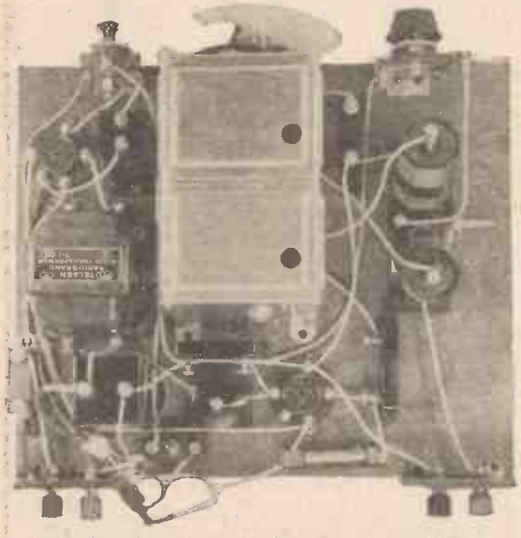
L.T. accumulator (C.A.V., Pertrix, Ever-Ready, Exide, Fuller).

"BUILDING THE 'TWO STAR 2'" (Continued from preceding page)

Operating Notes

Now let us deal with the operation of this set, which is really simple. First we must gang up the band-pass tuning circuit—quite easy if the suggested plan is followed. This work will, of course, be done before the set is finally boxed in.

Start with the two trimmers on top of the condenser unit almost full out. Tune in some fairly weak but consistent signal at about the middle of the tuning scale. Adjust the trimmer at the back of the condenser for maximum strength, at each adjustment of the trimmer making a re-adjustment of the main tuning knob. Then repeat the process for the trimmer at the front of the condenser, again working the main tuning knob in conjunction with the trimmer action.



This plan view shows the layout and should be compared with the reproduction of the blueprint given last week

Trimming

This trimming process is much simpler than it sounds, for the right ganging condition is easily defined. When the ganging is correct, stations will spread evenly in strength over a given number of degrees and will fall away sharply on each side of the spread limit. If the ganging is not right the locals will come in at two points on the dial, with a silent space in between. This will imply the condition of "double-humping," which is easily remedied by correct trimming adjustment.

To test out this set we used a Mullard PM1HL detector and the new Mazda Pen220 pentode output valve. With these two valves, using a 120-volt high-tension battery, the total anode consumption was only 7 milliamperes, so a standard-capacity high-tension battery would give economical running. The power output of the Mazda pentode, in spite of its very low anode dissipation, is quite enough for domestic volume requirements.

Operation of the correctly ganged set is extremely simple. The two band-pass tuning circuits are controlled by the single tuning knob. The strength of the weaker stations is increased very considerably by the reaction.

Although designed as a local-station set, the "Two Star 2" is quite a station-getter, as a recent test conclusively proved. The first impression we gained when testing out the final set was the wonderful quality of the local stations. Next we were pleased to note that London National, at a distance of only eighteen miles, was confined to 12 degrees on the 180-degree dial. Its maximum tuning point was 50 degrees. London Regional came in at 95 degrees, and was eliminated within 5 degrees on each side of this point.

We also noted a very welcome silent background—the band-passing eliminating, as we had intended it to do, all the tiresome background noises heard on the average so-called local-station set.

Midland Regional came in strongly and clear of London at 110 degrees. North Regional, really quite outside the serviceable range of a normal two-valver, came in at excellent strength at 138 degrees! Just above that phenomenal station Prague, at 140 degrees, was almost as loud as North Regional!

Then we got Brussels No. 1 at 148 degrees, quite fair loud-speaker strength. Realising that the set was behaving exceptionally well, we sought out other foreigners.

Going down the tuning scale, we next logged Rome at 125 degrees. We were impressed with the fact that Stockholm at 123 degrees was quite clear of Rome. And in the same way Söttens at 112 degrees was clear of Midland Regional. Then came Toulouse at 105 degrees, Strasbourg at 90 degrees, Brussels No. 2 at 86 degrees, Bordeaux at 80 degrees, North Regional at 70 degrees, Hilversum at 69 degrees, Heilsberg at 60, Turin at 59 and Gleiwitz at 38.

The most remarkable aspect of this log, apart from the number of full loud-speaker signals, was the completely silent background; the ease with which the stations could be completely separated was also strikingly demonstrated.

SUITABLE VALVES

	Detector	*Pentode*
Mazda	HL210	P220
Mullard...	PM1HL	PM22
Cossor	210Det.	230PT
Six-Sixty	SS210D	230PP
Osram	HL2	PT240
Marconi	HL2	PT240
Eta	BY1814	—
Dario	Det	—
Fotos	BC18	BD100
Tungsram	L210	PT230/51

On the long waves the two-valver never shows up very well, but on the "Two Star 2" we logged Daventry at 122 degrees, with Radio Paris at 138 degrees and Eiffel Tower at 108 degrees, all at loud-speaker strength and clear of interference.

Finally, we should like to emphasise that the "Two Star 2" is definitely a cut above the average, both in quality of reproduction and selectivity. We do not claim the set to be a station-getter in the same sense as the "Three Star 3." But you cannot fail to find a dozen or so of the more powerful foreigners when turning the knob to locate the locals.

"HOW TO MAKE A DUAL-RANGE COIL" (Continued from page 1120)

follows exactly the same specification as the coil shown by the diagram last week. The additional winding consists of 140 turns of No. 36 gauge D.S.C. wire. The whole coil therefore comprises three separate windings with six connection points. The ends of the windings can terminate in neat soldering tags, ready for connection in the circuit shown by Fig. 4.

I have shown here only the detector portion, but the low-frequency side can follow the arrangement clearly depicted last week. From the Fig. 4 circuit the constructor can see how easily the dual-range coil made up on the specification of Fig. 3 can be applied in practice.

Note that the aerial lead goes, through a .0003 pre-set type of condenser, to the tap on the small tuning winding, that is to the thirty-eighth turn from the grid end of the dual-range winding.

The connections of the separate reaction winding, common to both sections of the tuning arrangement, are clearly shown. Note that a .0003-microfarad reaction condenser is used, and that its moving plates are earthed.

The shorting switch can for convenience be mounted on the panel. If it is, see that the coil is placed not far behind, so that fairly short connecting wires can be taken to the coil windings.

I find the windings specified cover all the wavelengths in use for broadcasting, namely from 220 to 600 metres, and from 1,000 to 2,000 metres.

Using the Coil

The length of aerial used with the coil is not important, because the pre-set condenser will enable a good compromise between the conflicting requirements of selectivity, quality, and volume to be obtained. In general, a 70-foot aerial should be satisfactory. Reaction should not be pushed to the limit if good quality is of first importance, because then the resistance of the coil will be so lowered that loss of side bands and so loss of the higher audible frequencies will be inevitable.

Next week I will discuss some of the points to be noted about the leading makes of commercial dual-range coils.

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Weekly Hints — Constructional & Theoretical

By W. JAMES

Improving a Choke

ONE of the chief reasons for hum appearing in a mains set is that the smoothing choke is not of sufficient inductance under working conditions. Too many chokes have a small inductive value when carrying the load current.

It is not the initial inductance that matters at all, but the actual value of inductance when the choke is working. As big a value as possible should be used, therefore.

Some chokes have an air gap in the iron circuit. This is usually a good sign, especially when the choke is to be used to carry a heavy current, such as 50 milliamperes. If a buzz is heard from a choke, the chances are that a lamination is loose.

This may be fixed by driving a match stick between the laminations and the bobbin or by applying a little sticky material to the part of the core concerned. Sometimes the outer layer of wire is rather loose and may vibrate sufficient to cause a noise. This is cured by wrapping a few layers of tape over the winding.

Care in Earthing

In sets having many parts with screening boxes a little care is needed to obtain the best results, as poor earthing may prevent the maximum amplification and stability being obtained.

It does not do to take a wire from the earth terminal and to connect it first to one screening cover and then to the next and so on. Often it is better to use separate earthing wires, but this can only be found after trial.

Sometimes it is better not to earth a cover, but to leave it free. Then, again, some coils are provided with a cover connected internally to the earth or grid-bias end of the coil. It would not do to add a further earth to coils wired already in this way as it is possible that the bias would be short-circuited.

Earthing should be properly carried out. It is not satisfactory, for example, to place the earthing wire under a screw in a metal box without first cleaning the place where the wire will rest. Possibly the metal has an insulating finish and clearly if this is not first removed the contact will be very poor. Always, therefore, make a good joint and take the wire to the nearest earthing point associated with the circuit.

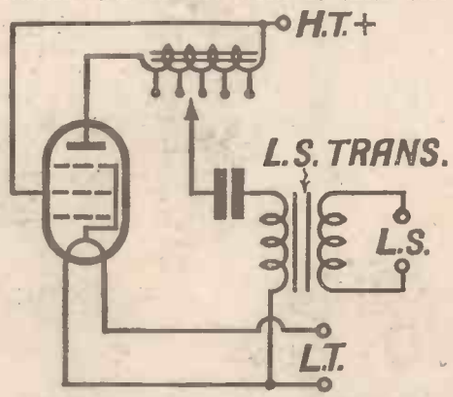
Connections to a Pentode

Some transformers fitted to speakers are arranged for connection with ordinary power valves and not pentodes.

The point then arises as to how to adapt the speaker and transformer to a pentode in order to obtain the best results. There is one method which has advantages. A tapped choke is connected between the high-tension and the anode of the pentode, as shown in the accompanying figure.

To a tap on the choke one side of a 2-microfarad condenser is joined, while the other side is taken to the primary winding of the transformer. The transformer is choke fed and no direct current passes through it.

This is often an advantage, as some transformers do not work at their best



The accompanying paragraph explains this method of using a speaker and a tapped choke with a pentode

when a fairly heavy direct current passes through their primaries. A further point is that the maximum power output may be obtained by choosing a suitable tapping point on the choke. The best tap is to be found only by trial and so experiment should be made. The condenser ought to be a good one or it may be broken down by the high-tension.

A Strange Trouble

The other day I received a letter from a reader who complained that since he had built a three-valve set having a screen-grid stage the volume of the local station was less than when a straightforward two-valve set was used.

He explained that the volume was less when fully tuned than when the aerial circuit was mis-tuned. This all goes to show that the trouble is due to overloading. The high-frequency stage is magnifying the strong signal collected by the aerial circuit and is overloading the detector to the point where it is nearly put out of action.

The remedy, apart from mis-tuning the aerial circuit, which, of course, reduces the strength of the signal applied to the screen-grid valve, is to fit a volume control. There are several types which may be arranged before the detector.

One type comprises a filament resistance joined in the negative side of the filament circuit of the first valve. This control is fairly good in practice. A further control is the one in which the voltage of the screening grid is varied. This also works satisfactorily up to a point.

Perhaps a better arrangement is to connect an adjustable condenser in the aerial wire to the set. This enables the strength of the input to the first valve to be varied. It is not suitable in a gang-tuned circuit unless a compensating capacity to balance the circuits is used.

"ABOUT BAND-PASS H.F. TRANSFORMERS"

(*Continued from page* 1119)

better than with a single circuit, is not as good as with a centre tap.

The question of signal strength is most interesting. It is well known that with a band-pass filter the voltage developed across the secondary circuit is a little less than that across the first circuit.

Where the band-pass filter is used in the anode tuner, however, the drop in signal strength is offset by a rather interesting effect. The amplification obtained from the H.F. valve depends upon the dynamic resistance in the anode circuit. In an ordinary tuned-anode or H.F. transformer arrangement the dynamic resistance of the circuit is reduced by the presence of the detector valve connected across the circuit. We nearly always use a grid detector these days, and this takes a certain amount of grid current, so that the grid-to-filament resistance of the valve has an appreciable damping.

The effect of this is that the amplification obtained from the valve is less than it would otherwise be.

In the case of a band-pass filter, the detector valve is not connected across the circuit in anode circuit in the H.F. valve. It is, instead, connected across the second tuned circuit in the filter, in which case the damping effect of the detector valve is very largely removed from the first circuit. As a result of this, the amplification obtained from the H.F. valve definitely increases, and tests which I have made show that this increase is of the same order as the drop in signal strength in passing through the filter.

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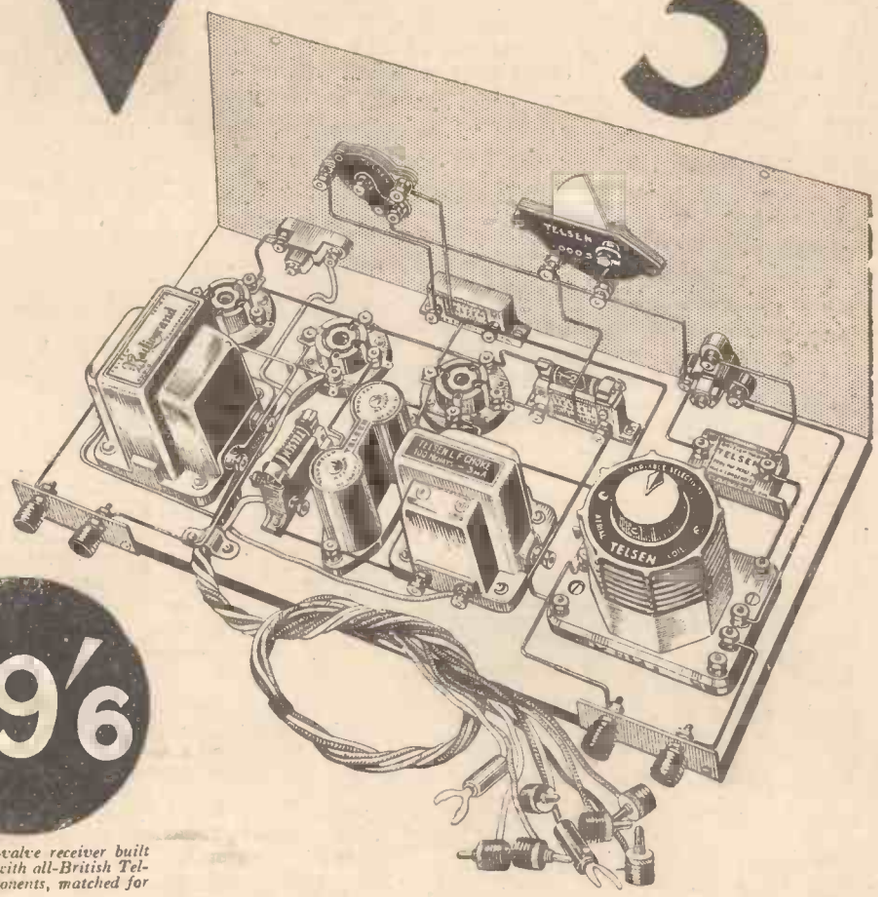

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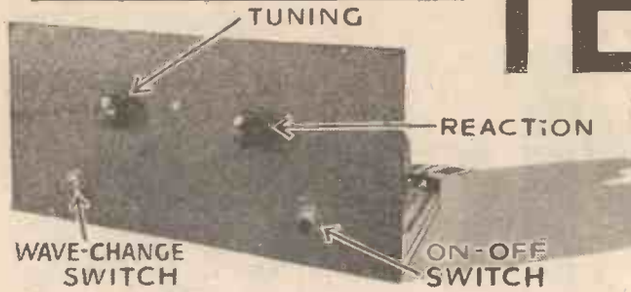
106

Mention of "Amateur Wireless" to Advertisers will Ensure Prompt Attention

SETS OF DISTINCTION

TELSEN VICTOR 3

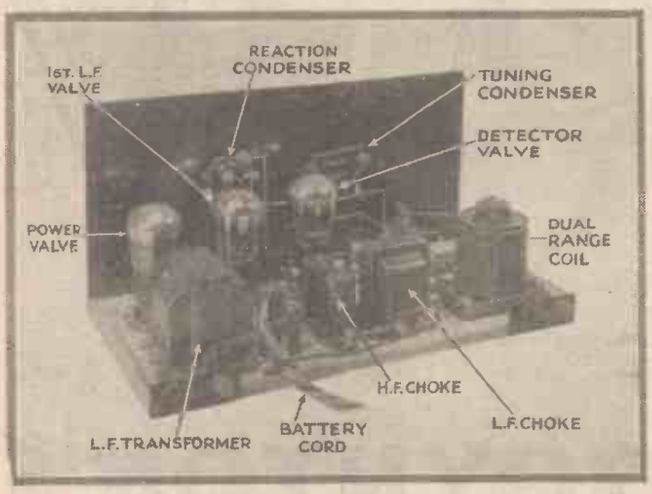


Makers: Telsen Electric Co., Ltd. Price: £1 19s. 6d.

I HAVE been trying out the new Telsen kit set—the Victor 3, selling at the sensationally low price of £1 19s. 6d. Here we have a three-valver built up entirely of Telsen components, selected with great discrimination from the very comprehensive range of inexpensive components turned out by the Telsen factory at Birmingham.

Simple Wiring

No one can question the value for money aspect of this new kit. It is undoubtedly the finest value yet attained. I was, for the purpose of my tests, supplied with a completely assembled Victor 3, and I must say it is a very neat-looking job. Before describing the set, let me say that the blueprint supplied to constructors is quite simple to follow. I see the wiring follows the AMATEUR WIRELESS system of numbering each connection, these numbers indicating the correct sequence of making the connections to the various components.



The Telsen Victor 3 is particularly easy to build, as this photograph shows

The tools needed to build this kit are a screw-driver, a pair of pliers, and a brad-awl—and for the wiring a pair of round-nosed pliers and a box spanner. Having gone over the instructions given by the makers, I am sure all my readers could tackle this kit, the construction of which is quite obviously free from snags. The Victor 3 is a straight three in every sense of the word.

In its layout the set follows the popular panel and baseboard arrangement, the panel being of metal and the baseboard of wood. The tuning condenser and the reaction condenser are mounted on the left and right respectively, and other panel components include the wave-change switch and filament on-off switch. A symmetrical layout has been achieved without in any way affecting the simplicity of the wiring.

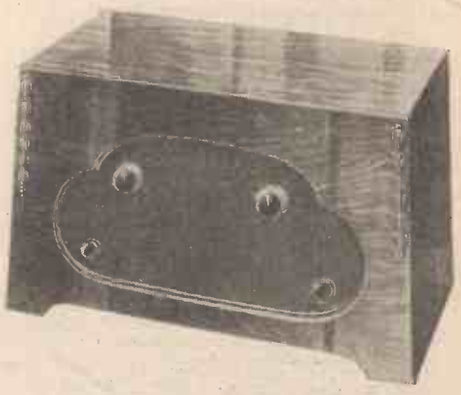
On the baseboard are grouped all the parts needed to complete the three-valver, including the Telsen dual-range aerial coil, the Telsen low-frequency components, and such Telsen accessories as are very well known to AMATEUR WIRELESS set constructors, such as the Telsen grid condenser and leak, and Telsen binocular high-frequency choke. The complete layout looks good—the brown bakelite mouldings of the components giving an air of distinction to a set that has more than mere appearance to commend it!

Some reference was made to the circuit of the Telsen Victor 3 kit in the previous issue of AMATEUR WIRELESS, but it will be as well to make this report complete by analysing the three-valve arrangement as I have done with previous kits. Here in the Victor 3 set we have what is still undoubtedly the simplest sequence of three valves, namely a leaky-grid detector followed by two stages of low-frequency amplification.

We all know that, in these ether congested days, the need is for selectivity. And that to achieve this desirable attribute of selectivity in a set we must use an efficient tuning system. There are many who contend that a single circuit is entirely useless for modern conditions, but such a contention will not bear the critical test of experience. It is debatable, in my opinion, whether many of the so-called modern three-valvers with elaborate tuning devices and a stage of high-frequency amplification really achieve more in practice than the straightest of straight threes as exemplified by the Telsen Victor. As the subject is debatable, let me get back to hard facts. One of these facts is that, on test, the Telsen kit, despite its simple valve sequence, or should I say because of it?—put up a splendid performance, all the more commendable when we remember the low price.

The makers' discrimination is best shown by their method of coupling together the two low-frequency amplifier valves. The first low-frequency valve is coupled to the detector by the choke-capacity system, which, owing to the fashion now prevailing, has been somewhat neglected.

The rest of the Telsen Victor circuit is fairly conventional, save for the inclusion



The Victor 3 in the special cabinet made by Messrs. Radiocabinets, Ltd.

of a .001-microfarad fixed condenser between the anode of the detector and the moving vanes of the differential reaction condenser. As already indicated, the tuning in this set is provided by a Telsen dual-range coil, which incorporates a pre-set type of coupling condenser. This provides a very satisfactory means of adjusting the selectivity of the set to meet the aerial and locality requirements of each constructor.

I connected up the recommended batteries and inserted the specified Mazda valves, which include the Mazda super-power output valve. Using my standard test aerial of 60 feet and a good earth, I was soon getting good reception from the London twins. At once I realised that there was to be not the slightest difficulty in separating these two powerful stations. Even with the selectivity device in the position for maximum volume—and therefore minimum selectivity—I was able to get both the locals entirely clear of each other. So at twenty miles from a regional centre this set, for all its simplicity, definitely separates the alternative programmes.

What about the quality? "Surprisingly good," say the makers. So do I? On an Amplion AB4 loud-speaker the tone was well balanced, speech being delightfully crisp and music not lacking either in brilliance or "body." This quality is partly due to the system of coupling, partly to the output valve—and partly to an adequate high-tension battery!

(*Continued in third column of page* 1132)

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DITHERING DIALS—A DOMESTIC TUNING EPISODE

"WELL, well!" I remarked comfortably sinking into my armchair and producing the pipe which Irene will never let me smoke except when we are alone. "What's on the wireless to-night?"

"Oh, Sydney, there's a perfectly marvellous concert from Vienna!" burst out Irene suddenly, consulting the programme. "We simply mustn't miss it!"

I stirred in my chair and my pipe gave a moist gurgle.

"But, I say," I murmured protestingly, "I don't know how to get Vienna. What's the National programme, Irene?"

"I haven't any idea, Jack, darling! I'd so love to hear that concert from Vienna!" cooed Irene dreamily. "Jack, dear, you could get Vienna, couldn't you?"

I didn't like the look in Irene's eye, so I rose—though aloofly. I switched on the wireless and began to twiddle various knobs. Now, personally, Daventry is good enough for me. I am no expert at this business of "tuning in" to different stations. In fact, so far as I am concerned, there is no tune about it. It is all discord.

I had scarcely touched the dials before a piercing shriek rang through the room, so startling me that I upset one of those wretched spindle-legged little tables with which our house is strewn. I hastily returned to the set, and a throaty groan reverberated from the loud-speaker, drowning what Irene was saying about the vase I had broken.

"I think the coil has escaped through the screen-grid and is strangling one of the valves," I remarked after a moment, just to show Irene that, though I might not be able to get Vienna, I was good at technical terms.

At the end of ten minutes' uproar I was beginning to be quite interested. Previously, I had had no idea that one could produce such a variety of oscillations from a single common or garden wireless set. I turned all the knobs at once and reflected on what jolly times burglars must have trying to find the right settings for combination locks.

Then all at once I got some morse signals with singular clarity. I listened appreciatively for a while, though my enjoyment was tempered by my ignorance of the morse code. Still, I had proved my ability to do more than oscillate.

"May I ask when we are going to hear Vienna?" inquired Irene in suppressed tones.

I made no reply but to gurgle my pipe at her. I then applied myself to the knobs once more.

"You might do better if you put away that ridiculous pipe, Sydney!" pursued my companion coldly. "Those fumes are enough to disarrange any sensitive mechanism."

This was a little too much. A man must stand by his own pipe.

"Possibly you yourself have a more delicate touch——," I murmured suavely, and gestured towards the set.

Irene flounced forward and twiddled vigorously. Half a minute later dreamy strains of music floated into the room.

"That's Vienna!" cried Irene triumphantly.

I leaned across and noted the position of the dials with no little astonishment. I picked up the programme and turned the pages. Then I looked at Irene.

"It was perhaps unfortunate you didn't notice before that the Vienna concert is also broadcast in the Daventry National programme," I remarked in a steely voice.

NEXT WEEK:

Our Bumper Christmas Number. Order your copy now. Usual price 3d.

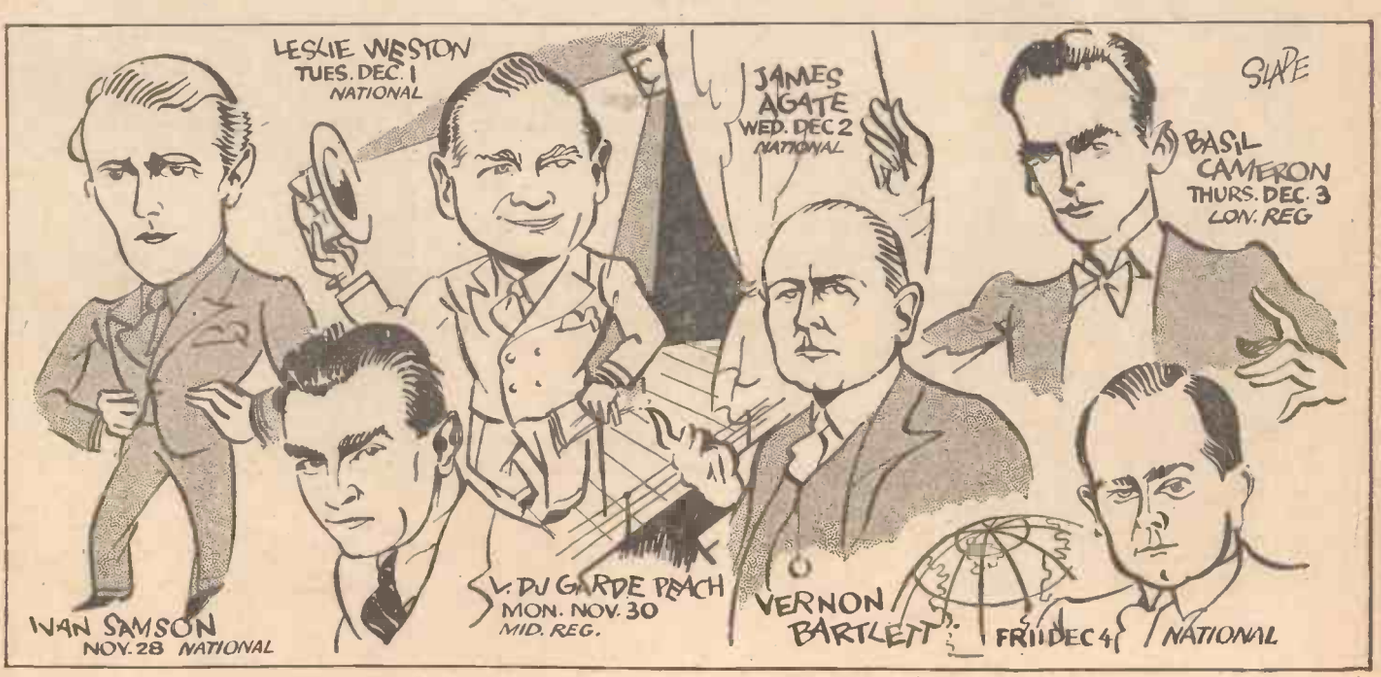
"TELSEN VICTOR 3"

(*Continued from page* 1130)

One of the outstanding features of my test was on the long waves, where I found that even at the minimum setting of the tuning condenser there was not the slightest trace of the local. This is an achievement in the coil design, for all too often in this type of set I find that the local breaks through on the first 30 degrees of the long-wave tuning.

Of course, in a set that relies on reaction for its high-frequency sensitivity, we must expect only the more powerful foreigners at loud-speaker strength. But on the Telsen Victor I got fifteen medium-wavers at full blast, clear of the locals. And four stations besides Daventry on the long waves. Good going! The Telsen kit is designed to reach a very popular price market. But it will attract many from the more expensive market. Its clean layout, coupled with its clear-cut reproduction of home and foreign stations, is a tribute to the range of Telsen component parts. The individual excellence of these inexpensive components has received adequate testimony already. In harness, altogether, as in the Telsen Victor 3, these popular components will certainly add to their laurels. SET-TESTER.

PERSONALITIES IN THE WEEK'S PROGRAMMES



good news for constructors

New LOTUS anti-microphonic valveholder at amazingly low price!

Now you can buy *sprung* valve holders of the renowned LOTUS quality at a price that defies competition.

There is nothing sacrificed to price about this new LOTUS Valve Holder Type VHK. It comprises two highly finished bakelite mouldings of excellent dielectric quality. These are assembled together by means of four resilient, phosphor-bronze combined sockets, springs and tags.

Special attention has been given to provide ample current-carrying capacity and the nickel-plated terminal units are accessibly placed.

Also the LOTUS 4-pin Anti-microphonic Valve Holders Type VH/27 with Terminals, Type VH/28 without Terminals, price 1s. each. Rigid Valve Holders for 4- or 5-pin valves, Type VH/30 without Terminals, 9d.; Type VH/31 with Terminals, 10d.

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RADIO COMPONENTS

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Q14

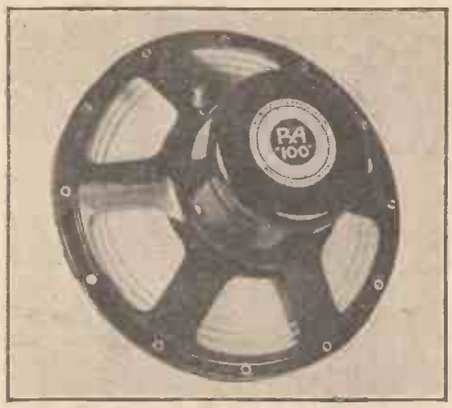
A weekly review of new components and tests of apparatus conducted by J. H. Reyner, B.Sc., A.M.I.E.E.

R. & A. 100 Speaker

WE have tested this week the R. & A. Type 100 moving-coil loud-speaker. This speaker is of the permanent-magnet kind employing a small cross type copper-finished permanent magnet. The magnet is securely bolted to a very rigid metal chassis which carries the diaphragm. The latter, which is approximately 7½ in. in diameter, is not of the usual pattern; it is constructed of some fabric-like material and doped to keep it stiff. The suspension is a part of the diaphragm itself, being formed by bending over the outer edge of the cone, this outer edge being ridged concentrically to give the necessary flexibility.

The moving-coil is approximately 1 in. in diameter, and is of the low-resistance type requiring an input transformer. The centring device is mounted behind the diaphragm; it is of normal type and made from a sheet of bakelite, and allows ample movement of the coil.

Tested on our standard amplifier the results from the speaker were good, the overall frequency response appeared excellent up to about 3,500 cycles. The sensitivity was quite up to standard for this class of speaker, and it should give good results when operated from a valve having an output of the order of half a watt.



The new R. & A. 100 moving-coil speaker

As mentioned above the coil is of the low-resistance type, a transformer is thus necessary in order to match the loud-speaker to the valve in use, and it is recommended that the transformer specially marketed for this speaker should be used. This is a multi-ratio instrument, and enables the speaker to be reasonably matched up to all normal output valves. The overall dimensions of the speaker are: diameter 10 in., depth 5 in. It retails at £2 5s., the output transformer being 12s. 6d. extra.

Bulgin Thermal-delay Switch

A COMPONENT of rather special type which we have tested this week is the Bulgin thermal-delay switch. As readers will know, some kind of delay switch in the H.T. circuit is essential in certain types of

(*Continued on page 1136*)

GIVE YOUR SET THIS CHRISTMAS PRESENT

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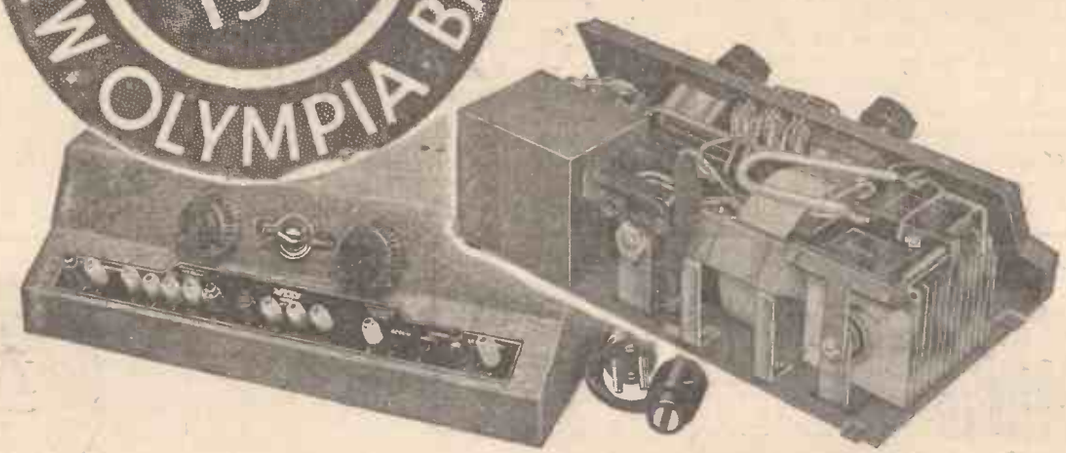

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"WE TEST FOR YOU"

(*Continued from page* 1134)

equipment in which high power valves are to be used, to prevent the application of H.T. until the valve heaters have warmed up.

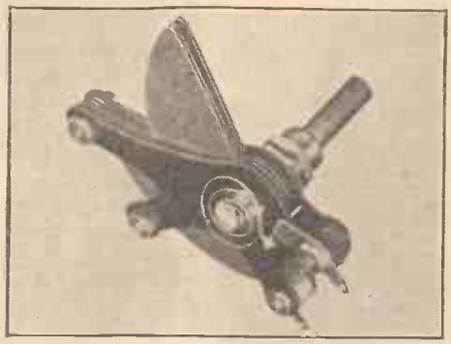
The switch consists essentially of a heater winding wound round, but insulated from, a strip of special bi-metal, riveted at one end and provided with a contact at the other. This switch forms one pole of the H.T. switch, the other being located just underneath the end of the strip itself. When the heater voltage is applied, the heat generated in the windings causes the strip to bend down towards the other contact and after a certain definite period it completes the circuit. Due to the control of a small bronze spring, the final movement of the contact strip is quite sudden and a distinct click is heard as the contact is made.

On test it was found that the switch operated in approximately half a minute, and took approximately a quarter of a minute to release. The switch is, of course, suitable for use in any receiver which has a four-volt supply available, but it must be remembered that when the receiver is in use the switch heater winding is constantly connected across the four-volt winding and this latter must, therefore, be capable of supplying the extra load which amounts to approximately ¾ ampere. The switch is housed in a neat casing provided with suitable ventilation holes. This component is marketed by Messrs. A. F. Bulgin & Co.

A.W. Condenser

THE A.W. solid-dielectric variable condenser, type 220, is a small, neat component. The design is quite conventional, the dielectric being of bakelised paper, the end plates being also of similar material. Terminals and soldering lugs are provided for the connections, the connection from the rotor to the appropriate terminal being made by means of a small piece of coil spring.

An H.F. test was conducted on the con-



One of the range of A.W. condensers

denser, and the following results were obtained for the equivalent series resistance. At 400 metres the resistance was 13.2 ohms, and at 250 metres, 19 ohms. These figures, though large, are above the average, for this type of condenser, and it should give satisfactory service in circuits where efficiency is not a primary consideration. The maximum capacity of the model tested was .0006 microfarad, and the minimum .00005 microfarad. "A.W." condensers are marketed by George Robinson, River Plate House, E.C.4.

New Osram Pentode

THE new Osram PT2 pentode output valve is a worthy addition to the already comprehensive Osram range of valves. It is of the 2-volt type and is intended for use only in the output stage of receivers, and should not normally be preceded by an intermediate low-frequency amplifying stage, but should directly follow the detector valve.

The valve is housed in a comparatively large glass bulb, through which the construction can clearly be seen. A long double-looped filament is used and the whole construction appears to be of a very rigid character, which is so necessary in this type of valve having three grids in close proximity one within the other. The valve is of the low consumption, high efficiency type and is thus suitable for portable and such-like receivers in which economy of high-tension current is of very great importance.

On test the valve was found to be quite satisfactory, the current consumption being, if anything, slightly less than was to be expected from a consideration of the published characteristics. With 150 volts on the anode, and 120 volts on the screening grid, the power output was found to be approximately 320 milliwatts, and this with a total high-tension current consumption of just over six milliamperes. It does not need to be stressed here that this is an excellent performance. The valve is provided as standard with a five-pin base, but it may be obtained with a four-pin base if required. It sells at 20s. and can be thoroughly recommended.

These BRITISH H.T. accumulators guarantee unfluctuating power

Every Receiving Set must have an absolutely dependable supply of Power which "comes through" evenly, steadily, without any variation or mains hum. Fuller H.T. Accumulators banish all troubles. They improve the selectivity of the receiver and purify its tone. The micro-porous pasted plates (exclusive to Fuller) have a texture not merely finer and smoother than that of ordinary plates, but much more durable in wear. Then there are patent double grease-cup terminals, effectively preventing corrosion and bad contacts. Fuller H.T. Accumulators are contained in moulded glass boxes and are supplied dry charged. Prices include one inter-battery connector. For your Multi-Valve sets especially, buy this Fuller Accumulator. You will be surprised at the difference. *And* pleased to find that "British" and "best" mean the same.

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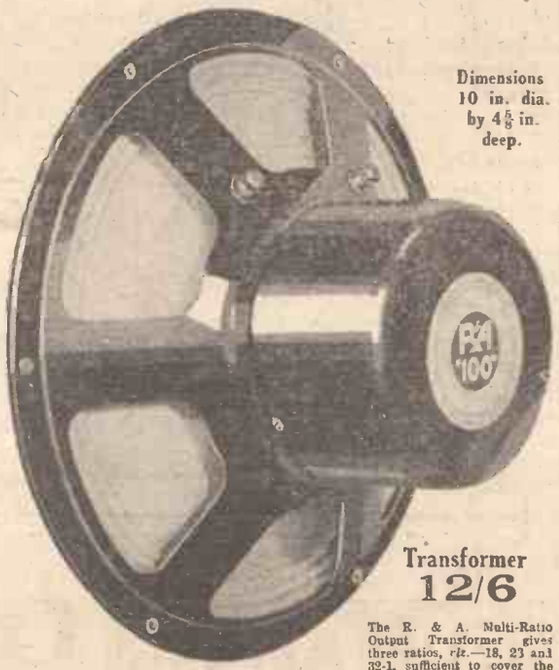

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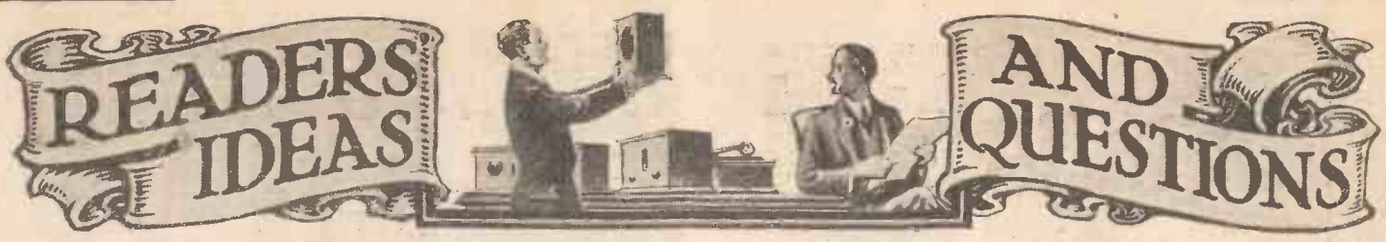


Metal Rectifier Mains Unit

SIR,—I have just completed and tested out a mains H.T. unit which incorporates an H.T.1 metal rectifier, a suitable mains transformer, and the necessary smoothing circuit components. Not having sufficient large-capacity smoothing condensers to hand, I omitted the smoothing condenser which was arranged, in the diagram I followed, directly across the output terminals of the rectifier. Whether this has any bearing on my trouble I cannot say, but, according to measurements taken with a milliammeter, I am only getting the equivalent of about half the proper power output from the completed unit. As all of the individual components I have used are above suspicion and answer to the usual tests that can be applied by the ordinary amateur, I wondered whether from the above few details you could suggest something that would enable me to get the full power output from my mains unit.

R. W. (Croydon).

Your having omitted the smoothing condenser from across the output terminals of the actual metal rectifier is the whole cause of your trouble. If this condenser is omitted, the output side of the rectifier does not work properly and therefore the current output is considerably reduced. If you will introduce a 4- or 6-microfarad capacity condenser across the rectifier and before the smoothing choke, you will immediately overcome your trouble. —ED.

Dry-cell Battery Voltage

SIR,—Why is it that the maximum voltage specified for a receiver, when using dry-cell H.T. batteries, is seldom or never more than 120 volts. The minimum voltage recommended by manufacturers, for even a small type power valve, is 120 volts, so that 150 volts or more would appear to be better for most satisfactory working. Why should I not couple up 100-volt and a 60-volt battery, thus making a total of 160 volts for the supply to my power valve? W. E. W. (Sussex).

You are overlooking the fact that the more voltage you apply to the anode of a valve, the more anode current it consumes. In the case of a power valve which is being worked from dry-cell H.T. batteries, this is an important consideration inasmuch as there is a definite limit to the amount of current that can be supplied by such a battery. As the maximum discharge rate of a triple capacity dry-cell battery is only about 20 milliamperes and as a power or super power valve with 120 volts on the anode will consume from 12 to 16 milliampères, it follows that it is not wise to boost up the anode voltage much higher than 120 volts.—ED

Eliminating Battery-terminal Strips

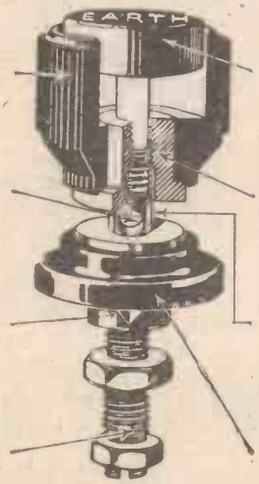
SIR,—I notice that in many of the receiver designs now being published, there are no terminals arranged on a strip at the rear of the set for facilitating connections to the batteries. Instead there are flexible wires coming straight from their various points of connection in the receiver, terminating at plugs for connection direct to the batteries. As I consider that suitable terminals on the actual receiver are more convenient, I should be glad to learn why this idea seems to be going out of fashion.

T. A. (Norfolk).

A great advantage is gained by having flexible leads from the "innards" of the receiver direct to the supply units—batteries or mains. This method of linking up the receiver and power supply eliminates at least one possible source of faulty connections. Also, where there are terminals on a receiver and a mains unit is being used for H.T. supply, if a connection becomes loose at the terminal of the receiver, the amateur is tempted to re-connect

(*Continued on page* 1140)

WHERE ELSE CAN YOU FIND THESE SPECIAL FEATURES ?



Bakelite insulated head, rotating about the button.

Cross-hole for 'phone tags, etc.

"Anti-twist" wedge to prevent terminal twisting loose on panel.

Slot with clamping nut, eliminating soldering.

Permanently engraved non-rotating button fixed rigidly to stem. Thirty-seven indications.

Brass screw-threaded insert securely fixed in the bakelite head.

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Insulation collar and bush for mounting on metal or any form of panel.

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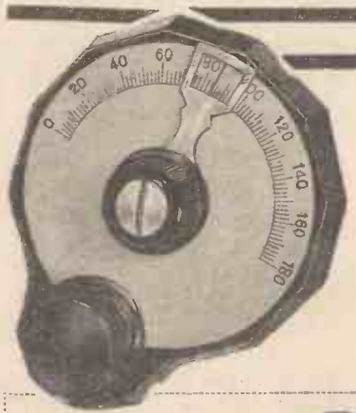

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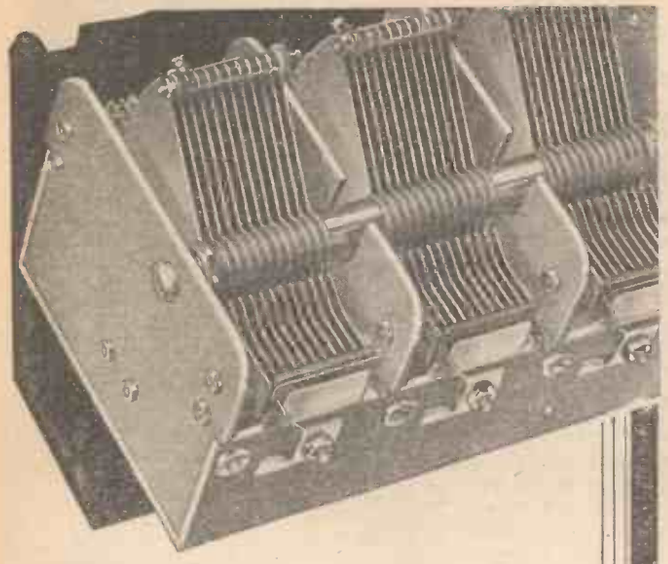

Real Ganging!

Anyone can couple up two or three condensers and call the arrangement a "ganged" condenser. But only Utility ganging will give the matching required to give satisfactory results. Utility ganged condensers are matched to a degree which makes the units virtually *identical* in value.

If you are building a band-pass receiver, remember that the more accurate the ganging of the condenser; the more satisfactory the performance will be. So make sure of the best possible results by using a Utility Gang. Every Utility Ganged condenser is matched to a *maximum* error of one-half of one per cent.; this is the highest possible standard of present-day practice.

Any circuit requiring a ganged condenser will be the better for a Utility ganged condenser.

SEMI-SCREENED	*FULLY-SCREENED*
Cat. No.	*Cat. No.*
W305, 2 Two Ganged 17 6	*W306, 2 Two Ganged* 22 6
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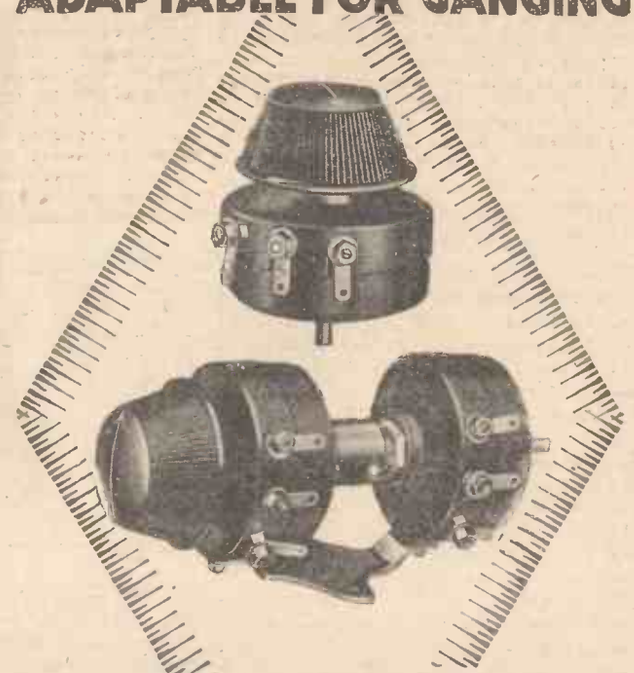
Belmont

THE ONLY VOLUME CONTROL ADAPTABLE FOR GANGING



Modern methods of volume control call for several units. But the public demand simplified controls and fewer of them.

Once more Varley are first to fill a public need... with a new range of volume controls... that can be ganged in various combinations ... and operated by a single knob. Any reasonable number may be ganged together, since the special mounting employed removes all strain from the spindles. The Ganging Equipment consists of a coupling link and mounting bracket and is sold separately.

The latest addition to the range of VARLEY L.F. CHOKES. Compact, highly efficient and suitable for all ordinary purposes—as Smoothing Choke, Output Filter Choke, etc. Inductance, no D.C., 20 Henries. With 50 m/a D.C., 14 Henries. D.C. Resistance, 450 ohms.

List No. DP23.
Price... ... ... **10/6**

VOLUME CONTROL.
Potentiometer type. Non wire-wound. Dissipates up to 1.5 watts. All values 6/6 each.

CP139 25,000 ohms } For control of aerial
CP140 50,000 ohms } input or screening grid voltage.
CP141 250,000 ohms For gramophone pick-up, etc.

GANGING EQUIPMENT - CP142 per set, to gang 2 units, 1/-

For each additional unit to be ganged, an extra set of Ganging Equipment is required.

Specified in the "Three Star 3"
1 Varley Volume Control 50,000 ohms.
1 " " 250,000 ohms
1 set of Ganging Equipment.

Varley

Advertisement of Oliver Pell Control Ltd., Kingsway House, 103 Kingsway, London, W.C.2. Telephone: Holborn 5303.

"READERS' IDEAS AND QUESTIONS"

(*Continued from page* 1138)

the wire without switching off the mains unit. Such a proceeding might lead to his receiving a shock and this is circumvented with a set not having battery terminals. Constructors who wish to use terminals on a terminal strip at the rear of a receiver designed with flexible leads for the battery connections, may do so if they are so disposed. Where a mains H.T. unit is being employed, it is a wiser plan to eliminate unnecessary connections as far as possible.—ED.

Matching-up Band-pass Tuning

SIR,—I have recently constructed a receiver incorporating a band-pass aerial circuit and, after several weeks of attempting to tune the receiver, I am still faced with the difficulty of trying to eliminate double-humping. I have adhered strictly to the layout, wiring, and components, except that I am using an alternative make of screened ganged condenser and a .04-microfarad fixed condenser which I have had for some year or more. I have no reason to doubt the suitability of these two changes in components and am therefore at a loss to account for my inability to obtain satisfactory results. Could you suggest anything that might be of assistance in enabling me to overcome my difficulty.

A. McP. (Glasgow).

If you have used an alternative make of ganged condenser for tuning your band-pass tuner, this is quite likely where you have gone wrong. Some makes of ganged condenser have a trimming capacity for each condenser of .0001 microfarad. Other makes of ganged condenser have a trimming condenser capacity of only .00005 microfarad. This smaller capacity trimmer may not be sufficient to match up the tuning of the particular make of band-pass coil you are using. We suggest you find out what capacity trimmer is incorporated in the ganged condenser advised by the designer of the receiver you have constructed and then advise you to verify these facts with regard to the make of ganged condenser you are actually using. At the same time we should warn you that an inductive type fixed condenser will sometimes upset the tuning of a band-pass circuit. In cases of doubt it is a wise plan to use non-inductive type fixed condensers in band-pass circuits.—ED.

Bias Resistance for Push-pull

SIR,—I am experiencing a little trouble in regard to determining suitable automatic bias resistances for an A.C. mains push-pull amplifier. The valves each consume 20 milliamperes at 180 volts with 20 volts grid bias. Calculating the resistance required for each valve gives 1,000 ohms. If I put in a 1,000-ohm resistance for the bias I only get a reading of 20 milliamperes on the meter which is connected in the plate circuits of the valves. Can you explain where I have gone wrong?

L. H. (Bath).

If you are using a 1,000-ohm resistance for the automatic bias, this is the cause of your trouble. This value of resistance would be correct for one valve, but as you are using two valves in push-pull, you must halve the resistance, as it will be carrying twice as much current. In other words, a resistance of 500 ohms is correct for automatic bias, with two valves in push-pull, when 1,000 ohms is correct for the working of one valve.—ED.

SPECIALLY ENLARGED ISSUE NEXT WEEK

Programme Popularity

SIR,—I do think it would be a good idea if the various programme relay stations throughout the country could be persuaded to publish a list of the number of items which are most frequently listened to. That would settle once and for all the question as to which are the most popular broadcast items. If the B.B.C. could be shown these lists, then perhaps it would alter its opinion as to how a Sunday programme should be conducted. Won't some of the relay stations please be bold enough to publish figures? A. J. P. (London, S.W.1.).

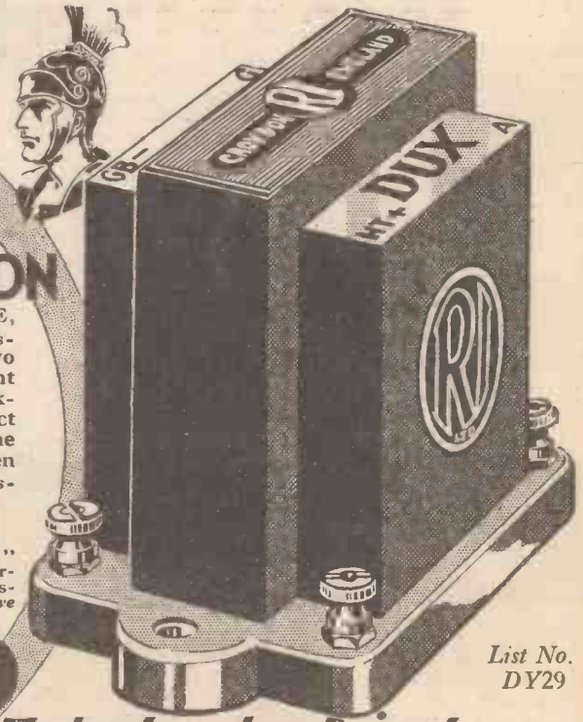
Care of Insulation

SIR,—I know that you have brought out a number of sets with wooden panels and I am quite willing to believe that in the case of big sets there is no loss owing to H.F. leakage. The overall amplification of the set counteracts any slight loss. But I do deplore the prevailing idea that ebonite is out of date for panels. A good many friends of mine are making up simple two and three-valve sets with practically no insulation at all—even the aerial and earth terminals are put close together on a strip of plywood. I know that if they tested through the set they would find high-resistance leaks all over the place, these probably accounting for flat tuning and all other kinds of trouble.

H. M. (Birmingham).

DUX

COMPLETES *the* CIRCUIT *of* SATISFACTION



Specified for the "A.W." THREE STAR THREE, "DUX" is the indisputably *Best Low Priced Transformer* for every suitable circuit. In less than two months the demand for this fine British component necessitated immediate and rapid addition of new workshops, more machines and more British labour—a fact that endorses the remarkable test reports of the reputable technical press, by whom "DUX" has been credited with *a performance equal to that of transformers costing many times the price.*

30 HENRIES

is the remarkable inductance given by "DUX" and, remember, the published technical information and diagrams given with this transformer, as with the highest priced article, *prove before you buy that "DUX" performance will be pre-eminently satisfactory.*

Ratio 1 to 3½ (standard) or 1 to 4½ (auto connection). Weight 11½oz. Size, 3¼ × 2 × 2½in. high

Ask for the "DUX" Technical Leaflet and the new R.I. Catalogue.

6/9

List No. DY29

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SIMPLIFIED SET BUILDING

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in the New "A.W."

"Three Star 3"

with the use of the

CONDENSER BANK

PRICE 9/6

The Formo Bank Condenser is fitted with coloured leads of the correct length for immediate wiring up. Only one mounting and a saving of space are two other features of this latest Formo achievement.

The Condenser illustrated above embodies the Formo "Vacuum Process" condensers as specified in the "A.W." circuit and is specially designed for this super-efficient set.

Formo Mains Condensers have set a new standard of high working and test voltages with a high insulation resistance that ensures long life and great reliability.

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SLOW MOTION & GANG CONDENSERS

are scientifically built precision instruments.
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6/-	18/6	30/-

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Attractively finished in handsome maroon Bakelite case, complete with leads. Price

Also De Luxe Model for Mains Units, Electric Receivers, and Battery Sets. Price £2 : 2 : 0.

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PIFCO ALL IN ONE RADIOMETER

P, 3a

RADIOGRAMS

TWO main studios, one with three microphones and effects studios will be required for a complicated broadcast on November 26 of Cyril Scott's operetta, *Janet and Felix*.

On December 5 the Alexander and Mose combination are also to make their bow under the title of The New Alexander (Whelan) and The Old Mose (Bennett).

The third of the series of anonymous debates on "Present Discontents in Scotland" will be on December 12. This time it will be in connection with rural Scotland.

A novel item in the Midland Regional programme of December 10 is a performance of William Walton's *Façade*, by Michael Mullinar and Christine Smye.

A programme recalling popular old tunes of the music halls and entitled, *Vignettes of Variety*, will be broadcast from the Birmingham studios on December 11. The Studio Orchestra supplies selections of popular music-hall tunes.

The two pianists attached to the Midland Regional station, Margaret Ablethorpe and Nigel Dallaway, will be heard in a joint recital for two pianofortes on December 7.

The first act of *Der Rosenkavalier* will be relayed on December 7 from the Prince of Wales Theatre, Birmingham, during the visit of the Covent Garden Opera Company. This will be the fourth broadcast from the "Prince."

A service from St. Chad's Cathedral on December 6 will be conducted by the Rev. Archibald McDonald.

Another discussion is promised for North Regional listeners on December 3. The subject this time is "The Use of Leisure," and the protagonists are Professor T. H. Pear and the Rev. Leslie W. Weatherhead.

A religious service will be relayed in the West Regional programme from the Parish Church of St. Mary Magdalen, Taunton, on December 6.

James Alec Simpkins will be heard in a programme with the Western Studio Orchestra on December 7.

Mr. Rowe Harding's talk on Welsh Rugby, on December 12, will be of particular interest coming a week after the Wales *v.* Springboks match. Mr. Harding will estimate Wales' chance in the international tournament.

On December 12 there will be a Welsh programme by the Western Studio Orchestra and the Tabernacle Skewen Male Voice Party.

Trefor Jones, the tenor, who "starred" in *Tantivy Towers*, will be heard in a programme with the Western Studio Orchestra on December 8.

A band concert is to be provided on December 12 by the Kinneil Military Band, which is being conducted by Mr. Alec Jordan.

A useful and economical gift

CLIX CONSTRUCTOR'S KIT

Contains an assortment of nineteen fitments specially selected for "Amateur Wireless" receivers.

3/5 VALUE FOR 3/-

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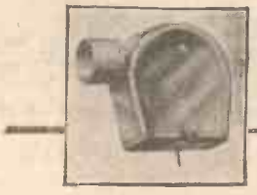

"Minor" B.T.H. Pick-up and Tone Arm. Price complete 27/6

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A WONDERFUL FREE GIFT to every purchaser of the NEW LISSEN SOLENOID SPEAKER UNIT

That extra loudspeaker for the other room is now available to you at small cost. See the completed loudspeaker above. That is what the Lissen free gift enables you to build. You buy the new Lissen Solenoid Cone Unit for 5/6. With it you will get—

(1) Special Cone Paper printed to exact size ready for cutting out and glueing up to make a 14-in. cone.

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(3) Sheet, size 28 in. by 35 in., lithographed walnut grained panelling, printed on reverse exact shapes and sizes for cutting out, including front fret. You have only to stick this on to cardboard to build up cabinet shown above.

(4) The postal tube in which these gifts are packed, and which is also used in the construction.

Anybody can easily build this speaker—the essential parts are all provided for you at an all-in cost of 5/6. The other sundries such as gum you probably have at home already.

Go to your radio dealer now —he will tell you anything more you may want to know about how to build this fine loudspeaker for 5/6 only.

LOOK WHAT YOU GET FREE!

NOW YOU CANNOT FAIL TO MAKE A SPLENDID SPEAKER

NEW LISSEN SOLENOID CONE UNIT 5/6

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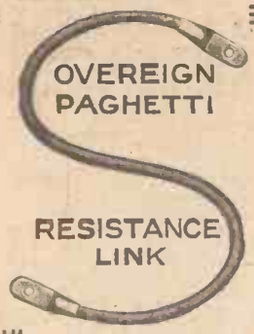

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Terminal Blocks as specified, each, 6d.

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BUILT WITH WEARITE COMPONENTS
Provides you with a
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H.F. CHOKE LIST
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RANGE 15—2,500 METRES
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INDUCTANCE 400,000 M.H.
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Not more than two questions should be sent with any one letter.

The designing of apparatus or receivers cannot be undertaken.

Modifications of a straightforward nature can be made to blueprints, but we reserve to ourselves the right to determine the extent of an alteration to come within the scope of a query. Modifications to proprietary receivers and designs published by contemporary journals cannot be undertaken.

Readers' sets and components cannot be tested at this office. Readers desiring specific information upon any problem should not ask for it to be published in a forthcoming issue, as only queries of general interest are published and these only at our discretion. 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 conform with the rules.

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The HOW AND WHY OF RADIO

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This book has been expressly written for beginners. It provides a clear conception of the general theory and practice of wireless reception in simple non-technical terms. It has been mainly compiled from the series of articles in "Amateur Wireless"—"The How and Why of Radio"—which proved so popular during the past twelve months.

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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.

For Gramo-Radio Enthusiasts

IF your electric-gramophone equipment is not quite up to the mark, then you should get it ready now for Christmas. In the new Harlie book of pick-ups, tone controls, and electric gramophone motors, you will find all the new equipment you need. **626**

New R.I. List

You should get the new Radio Instruments catalogue of components. Many of us are now engaged on bringing our old sets up to date and in this book you will find plenty of useful parts. **627**

Formo Condensers

I like the new Formo bank condensers. These not only save space, but are remarkably cheap. You can get a free leaflet describing these. **628**

Small H.T. Units

I see that H. Clarke & Co., the Atlas people, have brought out a small size A.C. eliminator, some with provision for trickle charging accumulators. If your H.T. battery is running down and you want to change over to mains, then get the new catalogue. **629**

Home-made H.T.

If you want to make up your own high-tension unit then you can't do better than write to Westinghouse for literature describing the new metal rectifiers. **630**

The Raycraft Kit

At Christmas time you should get a great deal of fun out of the Raycraft kit by means of which you can control apparatus via your wireless set by light rays. Audiovisor, Ltd., issue an interesting book describing the possibilities of the Raycraft outfit. OBSERVER. **631**

The "Three Star Three" Chassis.—We are informed that supplies of the Junit metal chassis have been temporarily disorganised owing to a fire in the Junit press-tool shop. The makers ask us to apologise on their behalf for the delay, and are happily able to tell us that the special endeavours which they have made to catch up with the demand will ensure that a full supply of the chassis will be available in the course of a day or so.

CHARGE YOUR H.T. FROM YOUR L.T. AT HOME.
Combination trickle. Charges efficiently, 1 to 12. H.T. 10-volt accumulators, 10/6. Postage 6d. Diagram only, 1/6.
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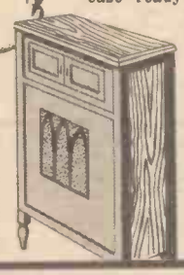

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Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (G5SW)	16.0
242.3	1,238	Belfast	1.2
261.5	1,147	London Nat.	68.0
288.5	1,040	Newcastle	1.2
288.5	1,040	Swansea	0.16
288.5	1,040	Plymouth	0.16
288.5	1,040	Edinburgh	0.4
288.5	1,040	Dundee	0.16
288.5	1,040	Bournemouth	1.2
288.5	1,040	Aberdeen	1.2
301.5	995	North National	70.0
309.9	968	Cardiff	1.2
355.8	843	London Regional	70.0
376.4	797	Glasgow	1.2
398.9	752	Midland Regional	38.0
480	625	North Regional	70.0
1,554.4	193	Daventry (Nat.)	35.0
AUSTRIA			
218	1,373	Salzburg	0.6
245.9	1,220	Linz	0.6
283.6	1,058	Innsbruck	0.6
352.1	852	Graz	9.5
453.2	666	Klagenfurt	0.6
517.2	580	Vienna	20.0
also testing on 1,237 m. from 8.0 p.m.			
BELGIUM			
206	1,456	Antwerp	0.4
215.6	1,391	Chatelineau	0.2
215.6	1,391	Bruxelles Conference	0.2
219.7	1,365.6	Binche	0.1
245.9	1,220	Schaerbeek	0.2
337.8	888	Brussels (No. 2)	20.0
509.3	589	Brussels (No. 1)	20.0
BULGARIA			
318.8	941	Sofia (Rodno Radio)	1.0
CZECHO-SLOVAKIA			
249.6	1,201.8	Prague (2)	5.0
263.8	1,137	Moravska-Ostrava	11.0
279.3	1,074	Bratislava	14.0
293	1,022	Kosice	2.5
341.7	878	Brunn (Brno)	34.0
489.3	613.1	Prague	100.0
DENMARK			
281	1,067	Copenhagen	1.0
1,153	260	Kalundborg	7.5
ESTONIA			
206.3	1,012.4	Tallinn	0.7
468.7	640	Tartu	0.5
FINLAND			
291	1,031	Viipuri	13.2
368.1	815	Helsinki	13.2
559.7	536	Tampere	1.0
1,796	167	Lahti	54.0
FRANCE			
223	1,345.2	Fécamp	5.0
245.9	1,220	Sunday after 11.0 p.m.	
237.6	1,261.2	Bordeaux-Sud-Ouest	2.0
240.9	1,245.3	Béziers	0.5
249.6	1,202	Juan-les-Pins	0.5
255.1	1,176	Toulouse (PTT)	1.0
266	1,128.5	Lille (PTT)	2.0
272	1,103	Rennes	1.2
286	1,049	Montpellier	2.0
287.4	1,043.7	Radio Lyons	30.0
294.6	1,018	Limoges (PTT)	1.0
307.6	975.2	Bordeaux (PTT)	15.0
312.6	960	Natan-Vitus (Paris)	0.5
315	950	Marseilles (temporary)	0.3
326.2	914	Grenoble (PTT)	3.0
328.9	912	Poste Parisien	1.2
345.2	869	Strasbourg (PTT)	15.0
369.4	812	Radio LL (Paris)	0.5
384.4	779	Radio Toulouse	8.0
447.1	671	Paris (PTT)	2.0
466	644	Lyons (PTT)	2.3
1,445.7	207.5	Eiffel Tower	15.0
1,724.1	174	Radio Paris	85.0
GERMANY			
31.38	9,560	Zeesen	15.0
216.3	1,387	Königsberg	1.7
218	1,373	Flensburg	0.6
227.4	1,319	Cologne	1.7
227.4	1,319	Münster	0.6
227.4	1,319	Aachen	0.3
232.2	1,292	Kiel	0.31
239.4	1,253	Nürnberg	2.3
245.9	1,220	Cassel	0.3
253.3	1,185	Gleiwitz	5.6
259.3	1,157	Leipzig	2.3
269.8	1,112	Bremen	0.2
276.5	1,085	Heilsberg	75.0
283	1,060	Magdeburg	0.6
283	1,060	Berlin (E)	0.6
283	1,060	Stettin	0.6
318.8	941	Dresden	0.3
325	923	Breslau	1.7
360.6	832	Mühlacker	75.0
372	806	Hamburg	1.7
389.6	770	Frankfurt	1.7
419	716	Berlin	1.7
453.2	662	Danzig	0.6
472.4	635	Langenberg	17.0
532.9	563	Munich	1.7
559.7	536	Kaiserslautern	1.7
559.7	536	Augsburg	0.3
556	530	Hanover	0.3
569.3	527	Freiburg	0.3
1,634.9	183.5	Norddeich	10.0
1,634.9	183.5	Zeesen	75.0
2,525	119.3	Konigswusterhausen (press)	15.0
2,900	103.5	Konigswusterhausen (press)	15.0
HOLLAND			
298.8	1,004	Hilversum	8.5
299.5	1,001.3	Radio Idzerda (The Hague)	3.0
1,053	285	Kootwijk (testing)	10.0
1,071.4	280	Scheveningen-Haven	10.0
1,875	160	Huizen	8.5
HUNGARY			
550	545	Budapest	23.0
ICELAND			
1,200	250	Reykjavik	16.0
IRISH FREE STATE			
224.4	1,337	Cork (6CK)	1.5
413	725	Dublin (2RN)	1.5
ITALY			
25.4		Rome (3RO)	9.0
247.7	1,211	Trieste	15.0
274.2	1,094	Turin (Torino)	8.5
315.8	951	Genoa (Genova)	10.0
331.5	905	Naples (Napoli)	1.7
368.1	815	Bolzano	1.5
441	680	Rome (Roma)	75.0
501.7	598	Milan (Milano)	8.5
542.5	553	Palermo	3.7
LATVIA			
526	571	Riga	13.0
LITHUANIA			
1,935	155	Kaunas	7.0
NORTH AFRICA			
363.4	825.3	Algiers (PTT)	13.0
416	721	Radio Maroc (Rabat)	10.0
1,350	222.2	Tunis	0.5
NORWAY			
235.5	1,274	Kristianssand	0.6
240.6	1,247	Stavanger	0.6
365	821.8	Bergen	1.35
367.6	816	Frederiksstad	0.8
453.2	662	Porsgrund	0.8
493.4	608	Trondheim	1.8
579.6	517.6	Hamar	0.8
1,091.7	274.8	Oslo	75.0
POLAND			
214.2	1,400	Warsaw (2)	1.9
234	1,283	Lodz	2.2
244.1	1,229	Wilno	21.0
312.8	959	Cracow	1.5
334.4	897	Poznan	1.9
381	788	Lvov	21.0
409.8	732	Katowice	16.0
1,411.8	212.5	Warsaw —Raszyn	158.0
PORTUGAL			
290.5	1,033	Lisbon (CT1AA) also on 42.9 m.	2.0
ROMANIA			
394	761	Bucharest	16.0
RUSSIA			
424.3	707	Moscow-Stalin	100.0
720	416.6	Moscow (PTT)	20.0
937.5	320	Kharkov (Rv20)	25.0
967.7	310	Alma-Ata	10.0
1,000	300	Leningrad	100.0
1,034.5	290	Kiev	36.0
1,079.7	277.8	Tiflis	10.0
1,117.3	268.5	Moscow Popoff	75.0
1,304	230	Moscow (Trades Unions)	165.0
1,481	202.5	Moscow	100.0
SPAIN			
251	1,193	Barcelona (EAJ15)	1.0
267.8	1,120	Valencia	5.0
348.8	860	Barcelona (EAJ1)	8.0
368.1	815	Seville (EAJ5)	1.5
409.8	732	Madrid España	2.0
424	707	Madrid (EAJ7)	2.0
451	665	San Sebastian (EAJ8)	0.6
SWEDEN			
230.6	1,301	Malmö	0.75
257	1,167	Hörby	15.0
307	977	Falun	0.65
321.9	932	Goteborg	15.0
435.4	689	Stockholm	75.0
541.5	554	Sundsvall	15.0
770	389	Ostersund	0.7
1,207	248.6	Boden	0.75
1,348.3	222.5	Motala	40.0
SWITZERLAND			
244.1	1,229	Basle	0.65
246	1,220	Berne	0.5
403	743	Söttens	25.0
459	653	Beromuenster	75.0
TURKEY			
1,204.8	249	Istanbul	5.0
1,517.4	197.7	Ankara	7.0
YUGOSLAVIA			
307	977	Zagreb (Agram)	0.7
430.4	697	Belgrade	3.0
574.7	522	Ljubljana	2.8

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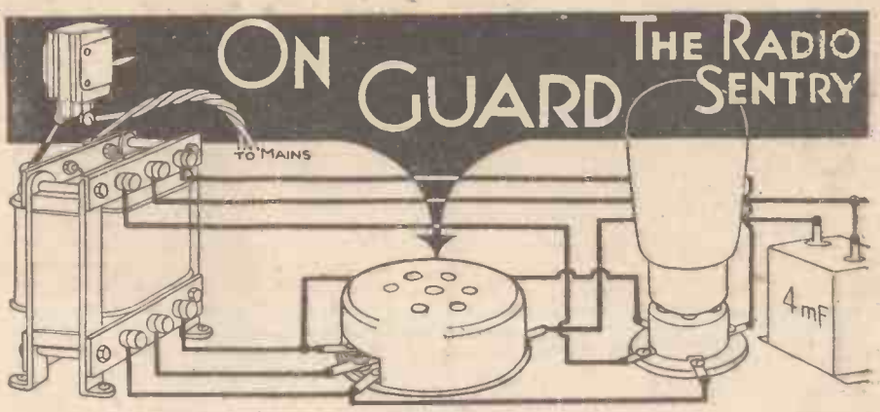

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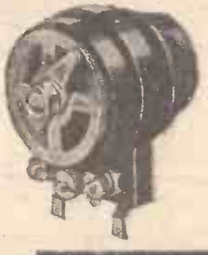

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Nickel Plated (Wire Wound)

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10,000	4/6
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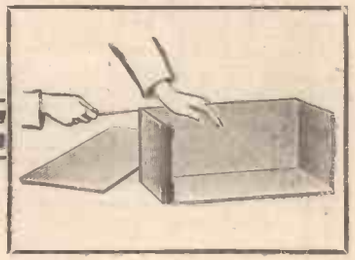

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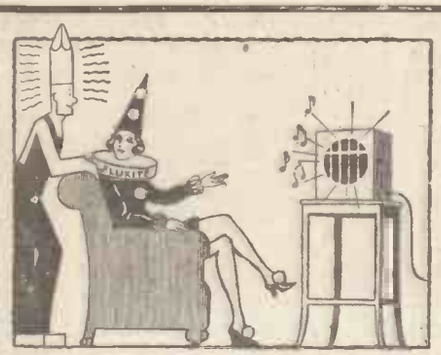

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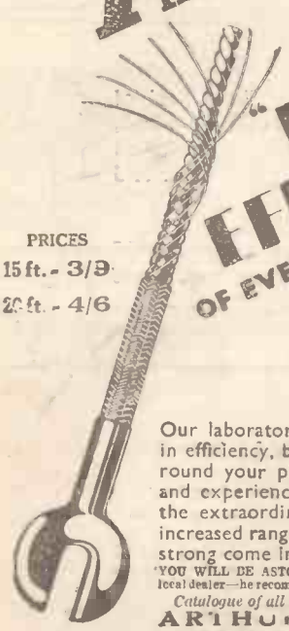

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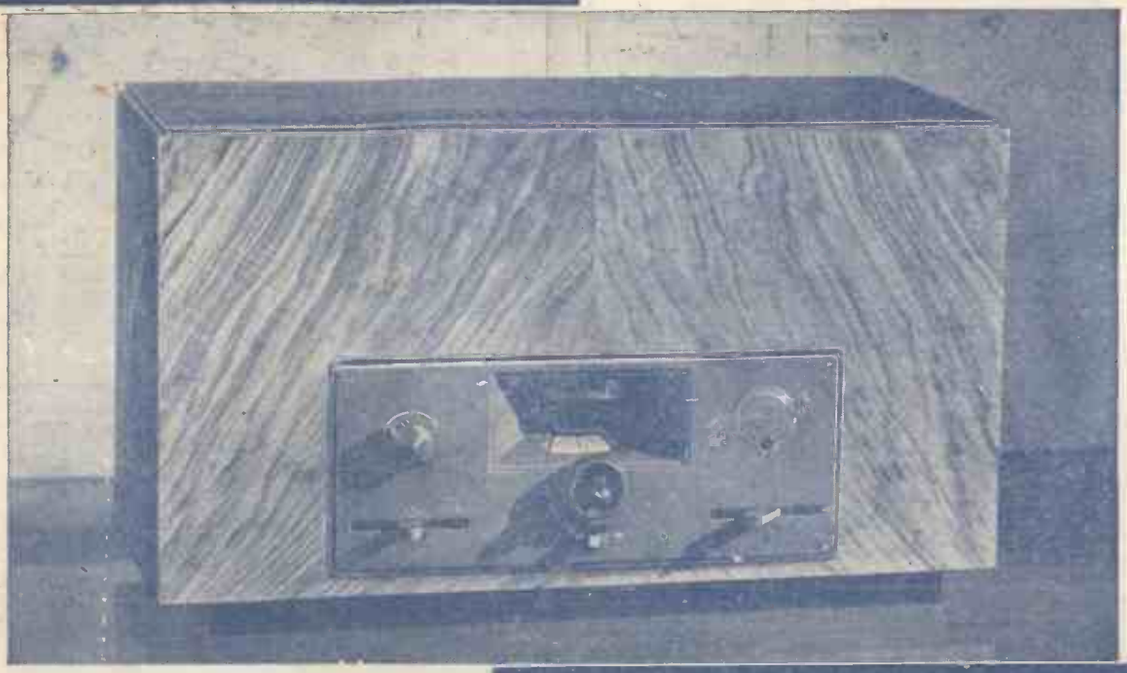

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