Amateur Wireless. March 25, 1933

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A NEW ALL-MAINS THREE FOR £7·15·0

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and Radiovision

ADDING Q.P.P. TO YOUR SET

Every Wednesday 3d

Vol. XXII. No. 563 Saturday, March 25, 1933

The HOME-LOVER'S NEW ALL-ELECTRIC 3

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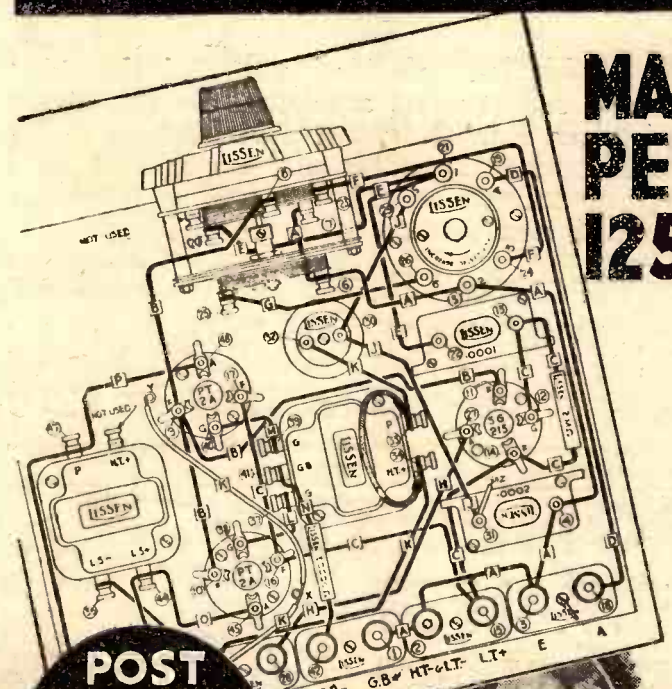

POST COUPON *for* BLUE PRINT

MATCHED HIGH-MU PENTODE OUTPUT 1250 MILLIWATTS

All-mains Power at last for Battery users—1,250 milliwatts output from an ordinary high-tension battery—it is impossible to name any receiver so compact, so easy to construct, so simple to operate, yet giving such astounding volume as you can get from this Lissen Quiescent Circuit with its Screen Grid Detector Valve and Matched High-mu Pentode Output.

Lissen have designed a circuit to take the fullest advantage of the new Quiescent Push-Pull. Lissen have produced special new components to get the utmost out of this new idea—new specially matched High-mu Pentode Valves, new Q.P.P. Hypernik Transformer, special Centre Tapped Output Feed Choke, new Dual Range Coil, new Ganged Condenser Tuning Control Unit. Never before were so many new features embodied in one circuit.

FREE BLUEPRINT & FULL INSTRUCTIONS

Lissen have published a BLUEPRINT and full instructions for building this new receiver. You can obtain your copy FREE by posting the coupon below direct to factory, or from your Lissen dealer, from whom the parts required can also be obtained.

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To Lissen Limited,
Publicity Dept.,
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Please send me FREE BLUEPRINT and Instructions for building the Lissen S.G. Detector Quiescent Push-Pull Receiver.

Name .....

Address .....

A.W.P36. .....

LISSEN S.G. DETECTOR QUIESCENT PUSH-PULL RECEIVER.

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

No. 563. Vol. XXII. MARCH 25, 1933

Amateur Wireless & Radiovision

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

EDITOR: BERNARD E. JONES. TECHNICAL EDITOR: J. H. REYNER, B.Sc., A.M.I.E.E. RESEARCH CONSULTANT: W. JAMES. ASSISTANT EDITOR: H. CORBISHLEY.

NEWS & GOSSIP OF THE WEEK

AN AMAZING MAINS SET

IF you have A.C. mains then you can't do better than build the "Home-Lover's New All-Electric Three" described in the centre pages this week. It is an amazing mains set, so efficient, easy to build, and cheap. It costs only £7 15s. for the whole outfit (less valves), set, mains supply unit, speaker and cabinet!

ALL GOING TO LUCERNE

LOVELY place, Lucerne! Placid lakes, snow-capped mountain peaks, and all that. Shortly, too, this famous Swiss resort will become the *venue* of a host of Post Office officials, when they meet in the middle of May for the formulation of a new protocol to replace our present wavelength muddle. Seeing that a meeting of the International Broadcasting Union would also be called, anyway, in May or June, the powers that be have decided to go to Lucerne and hold their meeting while the administrations are hammering out their technical suggestions. In the event of an *impasse* the technical people will go to the rescue of the administrations.

SWINGS AND ROUNDABOUTS

Frequency Gains and Losses under New Plan

WE are now a little clearer as to how the International Broadcasting Union hopes to gain greater frequency separation for the adjacent wavelength high-power stations. *It is by reducing the separation of the remaining low-power stations.* Cunning, but imminent with chaos? Well, let us give the plan, when it comes, a fair chance. It is now hoped that really high-power stations next to one another in wavelength allocation will get 11 kilocycles separation This does not mean that all existing stations will simply space themselves out and squeeze up the low-power stations, because part of the plan is to rearrange the stations so that those near in a geographical sense will be far apart in frequency or wavelength.

BLOW TO LAND-LINE RELAYS

UNTIL now Continental stations have interchanged programmes over extensive land-line networks at a very cheap rate, the evening rate being charged even for the expensive "music" lines. It has now been decided by the authority responsible for these international networks that the broadcasters must pay more, and in future one and a half times the day-time rate will be charged. This can be borne by the larger broadcasting organisations but it will be rather a blow to the smaller people. These relays are becoming more extensive every day, and as the broadcasters insist on the high-quality type of line it is perhaps not unnatural that they should be asked to pay for the privilege. By the way, the B.B.C. will be taking opera relays over land-lines from Milan before the end of the present year.

RELAYS FROM AMERICA

FEW listeners realise the variety of channels used by the B.B.C. when they relay an American programme or speech, such as the highly successful Roosevelt effort. In addition to the Post Office 'phone channels, of which there are several, the B.B.C. has its own reception at the Tatsfield Listening Post, where short-wave sets with automatic gain control devices pick up several channels and pass on the best to the Control Room at Broadcasting House. There the engineers have the choice of the best that the Post Office can offer, and the best from Tatsfield. No wonder these relays are improving!

SONG PLUGGING AGAIN!

The Remedy Not B.B.C.'s Task

FOLLOWING the sensational disclosures about payments being made to broadcast artistes and dance bands by prominent music publishers, the B.B.C. states that it has evidence that some artistes employed in the studios in every type of light entertainment have accepted payment by certain music publishers to broadcast special songs. *These artistes will not be asked to broadcast again.* Evidently the publishers are getting a little restive of this hole-in-the-corner method of putting over their wares, because a group of them have recently intimated that their payments to artistes are to be cut down. As the B.B.C. points out, the remedy for this state of affairs rests with the music publishers and not with the B.B.C. For our part, it all seems

Miss Olive Groves, the popular broadcaster, is now just as popular in the television programmes. Here she is before the television photocells, with one of the latest condenser microphones on the right

NEXT WEEK: THE TWO LATEST DEVELOPMENTS IN RADIO!

NEWS & GOSSIP OF THE WEEK—*Continued*

rather a waste of money, because only the really good numbers gain anything from plugging, and their merit would get them over anyway. All the plugging in the world will not make a "dud" number good, nor make the public think it is.

ON WITH LIGHT ENTERTAINMENT

ON May 1 Mr. Eric Maschwitz will take over his new duties as Director of Light Entertainment of the B.B.C. On April 28 there will be a pleasing little function at the Café Royal when Mr. Val Gielgud, the Productions Director, bids farewell to those members of his staff who will form the personnel of the new department. In the near future, then, it will be a case of Eric, or Little by Little the lighter side of broadcasting is improved!

RAKING THE ETHER AT THE B.B.C.

Mr. Maschwitz's Assistant Gets a Nice Big Set

WORKING under Mr. Eric Maschwitz will be Mr. Arthur Brown, who has just been equipped with a sensitive receiver to enable him to search the Continental ether for foreign broadcasting talent for the new Light Entertainment Department. This looks as though the new Department intends to draw upon the world for its programmes, and not restrict itself to the London and provincial stages.

NO MORE SPONSORED PROGRAMMES?

What will Happen to Radio Paris on Sundays?

NOW that the P.T.T. has officially indicated its purchase of the Radio Paris station, listeners must be wondering what will happen to those sponsored programmes of gramophone records and light music they are accustomed to tune in on Sundays. At present we cannot say, but the new owners take possession, so to speak, on April 1, and before that date there will no doubt be announcements in English from the station. Possibly the much-discussed Luxembourg station will replace the relays from Paris. At the moment this is sheer conjecture.

NOT LEAVING No. 10 JUST YET

RUMOURS that the B.B.C. is leaving the No. 10 studio, the converted wharf by Waterloo Bridge, are premature. Of course, they will have to evacuate these premises when Waterloo Bridge is pulled down or patched up, but that will not be during the present year, anyway. Soon we may expect to find the B.B.C. advertising on these lines: *Wanted, near Broadcasting House if possible, a nice light airy barn, big enough to hold an orchestra of 117 players and 260 singers. Owners of halls only as large as the Concert Studio need not apply!*

ALLAYING PANIC BY RADIO

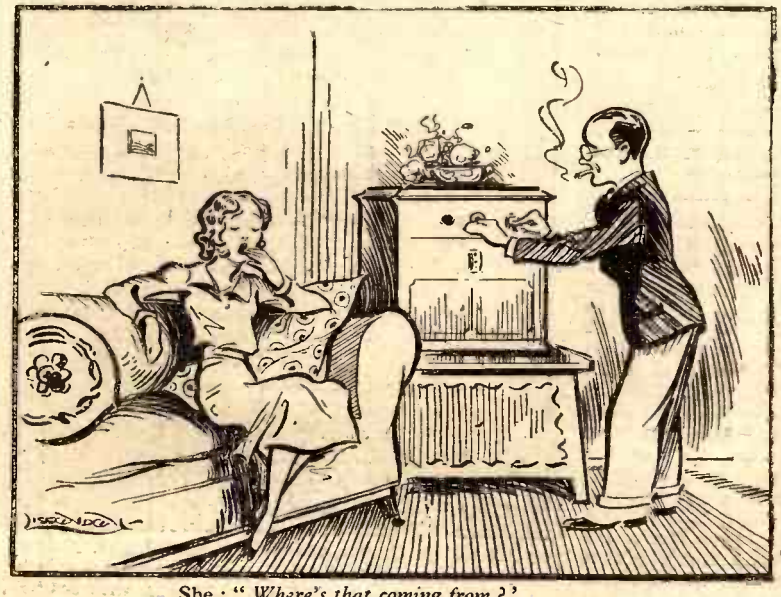
ONCE again radio has come to the rescue in saving a nation from panic. It is largely through President Roosevelt's reassuring broadcast talks over the American chains that the American public has weathered the storm of the bank crisis. This is where the microphone is being used to very good advantage. An example of the opposite method of using the microphone is the recent outpourings of Hitler in Germany, where fiery messages about the Polish Corridor dispute have been broadcast to fan the fire of public resentment. The League of Nations is considering what action can be taken to put a stop to this sort of thing.

GLADSTONE MURRAY FOR CANADA

MAJOR GLADSTONE MURRAY, the genial diplomat of the B.B.C., has left for Canada to advise the Canadian Broadcasting Commission on the organisation of a national broadcasting service for Canada. Major Murray was specially asked to undertake this task by the Prime Minister of Canada. He will visit New York while on the other side, and is expected back at Broadcasting House in May.

BETTER DERBY COMMENTARY

FOR the broadcast commentary on the Derby this year the B.B.C. has secured a place in the Grand Tier. This means that the commentators will be able to speak without interruption, from which they frequently suffered in their former position in the Press Stand.



She: "*Where's that coming from?*"
He: "*Albert Hall, I think?*"
She: "*Well, he's not half so good as Henry!*"

DANCE MUSIC FOR APRIL

IN the schedule for April the late evening dance music will be very similar to the present month, except that Harry Roy will be heard on three of the Mondays and Sydney Kyte on the remaining Monday. The rest of the week is taken up with Lew Stone on Tuesdays, Roy Fox on Wednesdays, Henry Hall on Thursdays, Savoy Orpheans and Geraldo, Fridays and Ambrose on Saturdays. A hot bunch!

MUSICAL PILGRIM'S PROGRESS

KEEN amateur students of music will be glad to hear that Mr. J. D. N. Rorke has now definitely fixed up a contract with the B.B.C. for a series of twelve talks on a "Musical Pilgrim's Progress." Mr. Rorke has the Walford Davies microphone manner, charmingly intimate, and highly informative.

AN "O.B." RECORD

AMBROSE has broken all dance band records for Outside Broadcasts. Last Saturday Ambrose and his orchestra completed five years of uninterrupted broadcasting on

Ambrose, the popular dance band personality who, last Saturday, broke all dance band records by completing five years of uninterrupted broadcasting on Saturday nights from the May Fair Hotel

Saturday nights from the May Fair Hotel. This is the longest period for which any dance band has broadcast without a break.

EXTENDING THE EMPIRE SERVICE

AS mentioned last week, the B.B.C. proposes to extend the Indian zone programme one hour each side of the present schedule. This takes effect on April 2. The gap between the two African zone programmes between 8 and 8.30 is also being filled, so that there will now be a continuous programme to South and West Africa from 6 to 10.30 p.m. By the way, as British Summer Time comes into force on April 9 the Empire listeners to Daventry after that date will notice an apparent error of one hour in the chimes of Big Ben. This will, for a time, be explained by the Empire announcers.

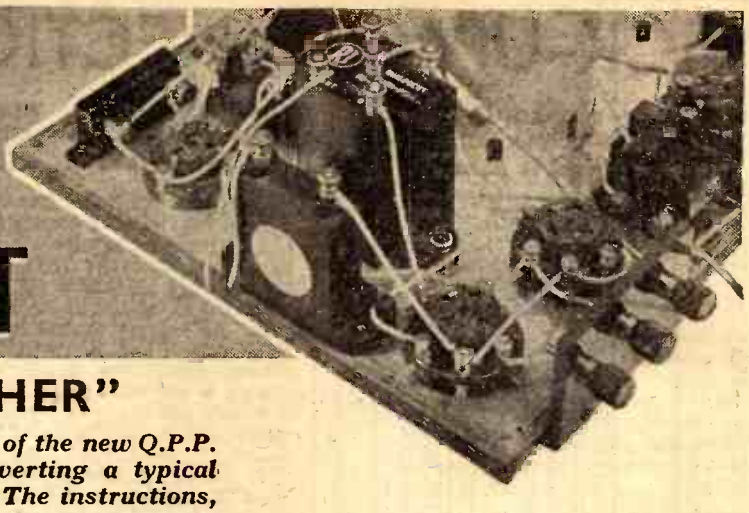
AFRICA SPEAKS!

WE have previously mentioned in these notes the B.B.C.'s desire to exchange programmes with other parts of the Empire, as a sort of *quid pro quo* for the Daventry transmissions of the British programme to overseas listeners. The first of these new programmes given by the B.B.C. on March , when a descriptive commentary . . relayed from Table Mountain, South Africa. Lord Clarendon, who was the first Chairman of the present Corporation, and who is now Governor-General of South Africa, will inaugurate the broadcast.

NO ROYAL COMMAND BROADCAST?

THIS year the Royal Command performance falls on May 22. It is certain that the B.B.C. will not attempt to broadcast the whole of the show, and it is possible that none of the show will be broadcast. So much of the show depends, quite naturally, on visual appreciation that, even with a commentator, the B.B.C. has decided the material is not very suitable for broadcasting. Another urgent job waiting for television!

ADDING Q.P.P. TO YOUR SET



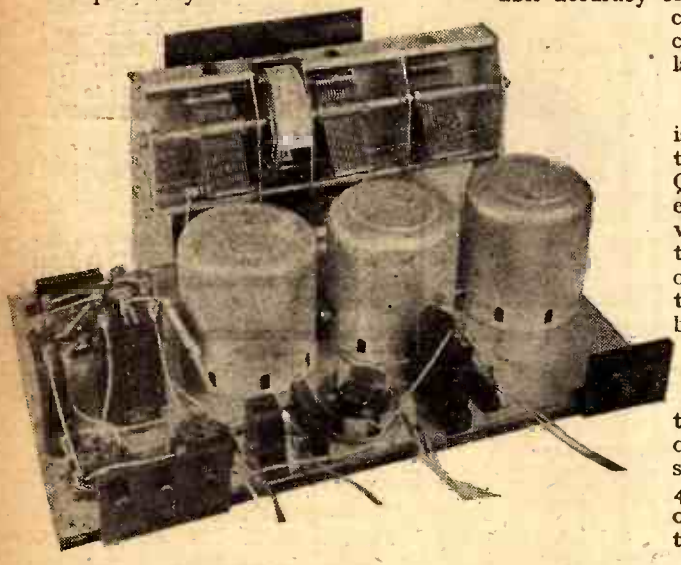
I.—THE "ETHER SEARCHER"

Battery users should not hesitate to take advantage of the new Q.P.P. coupling and here instructions are given for converting a typical battery set—the ever-popular "Ether Searcher." The instructions, however, are applicable to practically any battery-operated receiver

Q.P.P. COUPLING saves high-tension and gives battery-driven sets an output comparable with that of mains driven outfits.

You will find it well worth while fitting Q.P.P. to your set.

It's quite easy.



This is a rear view of the "Ether Searcher," showing the low-frequency end of the set where the Q.P.P. modification is made. The position of the detector H.F. choke is slightly changed to permit the mounting of the new parts

A Q.P.P. output stage can be fitted to any battery-driven set.

The Q.P.P. arrangement entirely replaces the present power or low-frequency side of your set. You have only to remove the existing transformer or resistance coupling to make provision for the two low-consumption pentodes to be fitted in place of the existing valves and to provide a suitable Q.P.P. input transformer and an output arrangement to match up with the pentodes.

Just to show you how easy it is to convert a set to include Q.P.P. coupling, we have taken one of the most popular "A.W." sets, the 1931 *"Ether Searcher," and altered the low-frequency output to include quiescent push-pull.*

The alteration is very small and the additional components necessary are shown by an accompanying panel.

It will be recalled that many well-known components were used in the original "Ether Searcher," and the amazing success of this set was largely due to the excellent selectivity provided by the special matched set of Colvern screened coils. A J.B. ganged condenser was used to control the three tuning circuits, and provides remarkable accuracy of control. None of these components, of course, is changed in the new Q.P.P. layout.

It's quite cheap, you see.

And the big advantage is that two low-consumption pentodes are used in Q.P.P. in place of the existing triode power valve. You will thus have the most modern power output stage it is possible to devise, and so you will bring your set up to date.

The saving in H.T. is remarkable.

The bias is adjusted so that the total consumption of the power stage when no signals are passing is only 4 milliamperes. The drain on your H.T. battery is thus ruthlessly cut down.

Neither quality nor volume suffer. The Q.P.P. coupling makes your battery-driven "Ether Searcher" sound as though it were fitted to a very generous mains H.T. supply.

The section of the blueprint shown illustrates the new component mounting and the small amount of wiring entailed.

A special Q.P.P. transformer is used in place of the L.F. transformer, originally specified for the "Searcher."

The positions of the one or two components (the H.F. choke for example) are altered to provide space for the Q.P.P. valve holders. In the main, however, the layout is kept as closely as possibly to that originally specified. The Q.P.P. transformer has its centre G.B. terminal connected through a grid stopper resistance with the bias lead.

(*Continued on next page*)

EXTRA COMPONENTS NEEDED for THE Q.P.P. "ETHER SEARCHER"

CONDENSERS, FIXED
One 1-mfd. (Lissen, Dubilier, T.C.C., Ferranti).
One .006-mfd. (Dubilier 670, Lissen, T.C.C., Ferranti).

HOLDERS, VALVE
1—Telsen valve holder (W.B., Lissen, Benjamin, Ready Radio, Tunewell, Lotus).

RESISTANCES, FIXED
1—25,000-ohm resistance (Erie, Dubilier).
1—150,000-ohm resistance (Graham Farish, Erie, Dubilier).

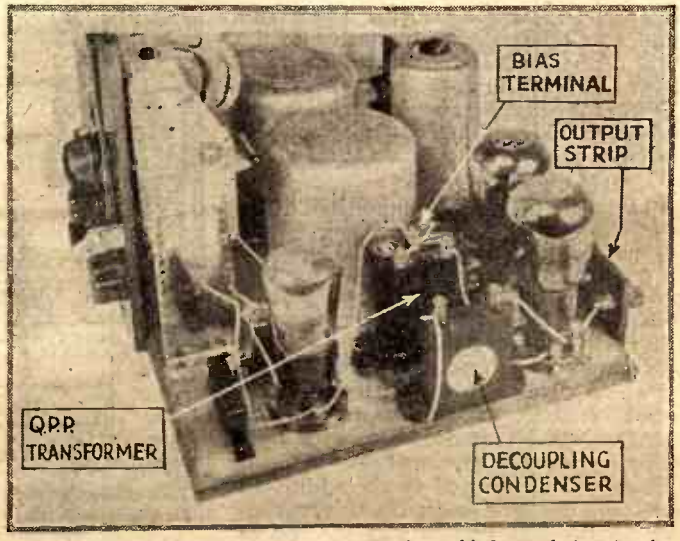
SPEAKER
Fitted with Q.P.P. Transformer (Rola type F6-PM-QPP-22A).

TRANSFORMER
One Q.P.P. transformer (R.I., Lissen, Varley, Multitone, Peto-Scott, Ferranti).

SUNDRIES
Piece of ebonite 3 in. by 2 in.
Wire and sleeving (Lewcos).
Terminal marked H.T.+ (Belling-Lee, Clix, Eelex).

ACCESSORIES

Cabinet (Camco Clarion).
2-volt accumulator (Lissen, Exide, Ever-Ready, Fuller, Pertrix, Block).
120-volt H.T. battery (Lissen, Ever-Ready, Drydex, Pertrix).
16-volt G.B. battery (Lissen, Ever-Ready, Partrix, Drydex).
Speaker fitted with Q.P.P. transformer (Rola).

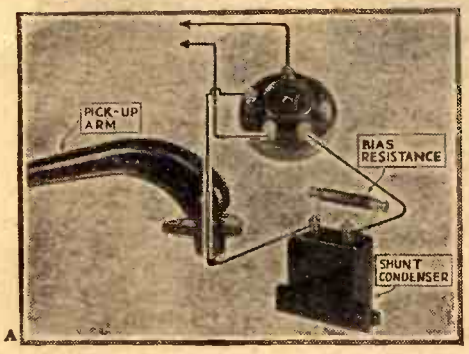


The details of the Q.P.P. stage can be seen from this lettered photograph which shows the detector and power output stage with the valves inserted

A BLUEPRINT OF THE ORIGINAL FAMOUS "ETHER SEARCHER" CAN BE SUPPLIED, PRICE 1/-

PICK-UP CONNECTIONS FOR MAINS AND AMERICAN SETS

Pick-ups can easily be added to a battery set where the connections are straightforward, but you may find it puzzling to add a pick-up to a mains-driven or American-built set where the connections are not easy to follow. This article tells you how to wire up a gramophone pick-up



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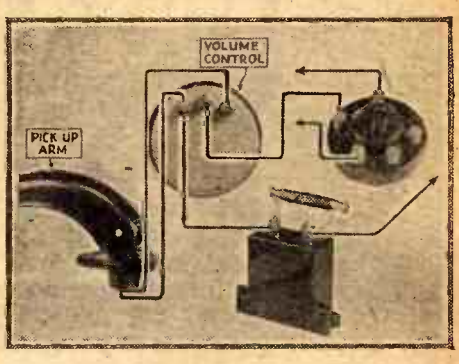


B

IF you have any difficulty about adding a pick-up to your mains-driven or American set, then these pictorial diagrams will help you.

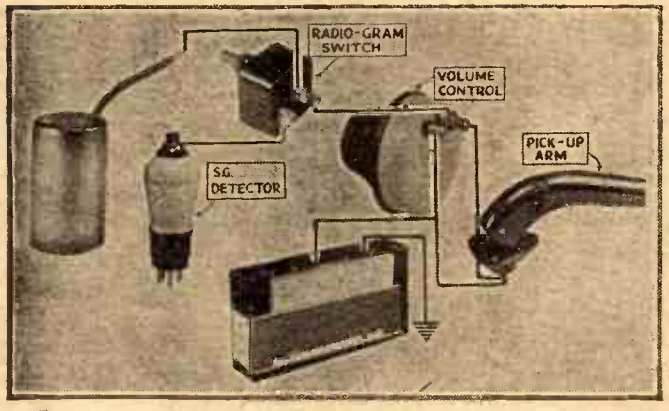
Automatic bias is a feature of most mains sets and it is necessary to connect the pick-up between the grid terminal and the earth side, so that the bias is applied to the grid through the pick-up.

A. The simplest connections for a pick-up added to a mains set having indirectly heated valves (with automatic bias in the cathode lead) are shown by A.

The bias resistance, with its shunt condenser, is shown on the negative side, while a wire is shown going straight from the pick-up to the grid terminal. The pick-up can be disconnected when not in use (in which case there is no need for a switch), or a two-way switch can be fitted with the centre pole connected to the grid terminal. One of the other terminals will then be connected to the pick-up and the other to the wire which at present goes to the grid terminal. The detector or first L.F. valve should be chosen for this modification, according to the size of the set.

B. No volume control is shown in the A arrangement and B shows a simple wiring scheme which you should use if a volume control is not fitted integral with the pick-up. The only addition, you see, is a potentiometer, which should have a value of about 50,000 ohms.

C. A wiring scheme which is suitable for most American sets in which a screen-grid detector is used is shown at C. This circuit shows a volume control for the pick-up, a two-way radio-gramophone switch, and a separate grid-bias battery for the gramophone pick-up. This cuts out any bias arrangement which there may be in circuit when the set is normally working on radio.



C

This arrangement is wired up in the following way: One side of the two-way switch is connected to the anode terminal of the screen-grid valve and the other side to the lead from the coupling coil, which is normally clamped under the anode terminal. The centre terminal of the switch is taken to the "on" terminal of the volume control "pot." The rest of the connections to the pick-up and bias battery are straightforward.

If you have a pick-up with an integral volume control, then the "pot" shown in C will not be needed. With some American sets no bias battery is needed and the return side of the "pot" is then taken to an earth point on the chassis.

"ADDING Q.P.P. TO YOUR SET"

(*Continued from preceding page*)

The pentode screening grids have a 1-mfd. condenser connected between them and earth, in order to stabilise the low-frequency stage.

As a separate detector, high-tension tapping is provided, there is no need for decoupling in the detector stage.

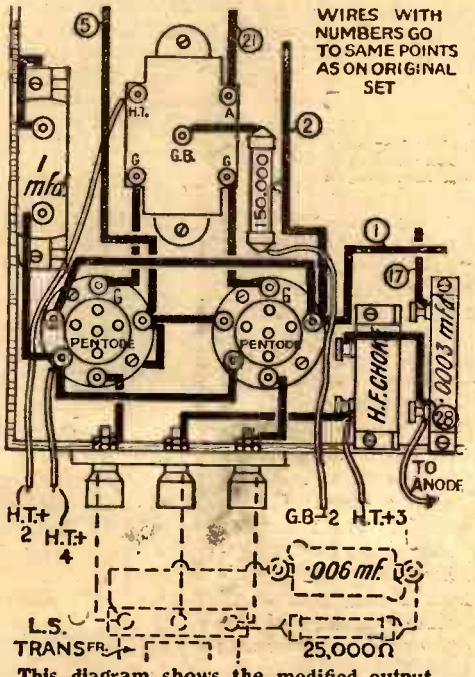
The output of the Q.P.P. valves is taken to a centre-tapped choke arrangement on the special speaker specified. The centre tapping of this choke is connected to the third high-tension terminal to the main 120-volts supply.

A tone compensating circuit consisting of a .006-microfarad condenser and a 25,000-ohm resistance in series must be connected across the speaker input terminals.

In order to save serious alteration in the set itself, this condenser and resistance are not shown on the set, but are fitted across the output terminals, or across the actual speaker connections. The necessary parts are shown in the list of components.

The wiring is easy to carry out. Apart from the battery flexes, there are only the few short rigid wire connections. These should be done, as was the rest of the wiring in the Ether Searcher, with rigid wiring, enclosed in insulated sleeving.

When you have wired up the additional parts, you can now insert the valves, connect up the high-tension and proceed to set up the Q.P.P. stage so that you get good volume with a minimum of high tension.



This diagram shows the modified output arrangements in the "Ether Searcher" conversion to Q.P.P.

The pentodes will require a larger bias than normally and as much grid bias as possible should be used on the Q.P.P. grid tapping.

It is a great help if you have a milliammeter to check up the current consumption while the Q.P.P. stage is being adjusted. Each valve should be tested at a time, the other being removed. The milliammeter should not be inserted in the main negative high-tension lead, but in the direct anode lead to the pentode. You should bias until the current consumed by each pentode is not more than 1½ to 2 milliamperes, and, of course, when both pentodes are inserted, the total steady high-tension consumption of the power stage will be only 4 milliamperes.

The detector and screened grid valves can then be reinserted and the set worked as before.

If you already have a speaker which you intend to use in place of the special Q.P.P. type specified, then you must have a tapped Q.P.P. output choke of which there are many on the market. And, of course, the tone corrector of .006-microfarad condenser and 25,000-ohms resistance must be connected across the two anode terminals of the choke.

The high-tension consumption of the pentodes should be checked at intervals of about one month or six weeks and the bias adjusted as necessary to secure the correct anode current value.

RADIO ADVENTURES between CROYDON AND THE CAPE

An interesting article describing radio experiments carried out on the new Empire air route between Croydon and Cape Town.

RADIO tests are made by the operators of the huge "Atalanta" air liners on the new Empire air route from Croydon to Cape Town. This is a trip of 8,300 miles over Europe, the Mediterranean, and the whole of Africa from north to south, which in the new Imperial Airways liners only takes eleven days!

The Cairo-Cape Town air route is a difficult area for medium-wave wireless. The African Continent, more than 4,000 miles from north to south, with the equator as its approximate centre line, is subject over vast areas to severe electrical storms which move backwards and forwards at different seasons of the year. In the majority of cases these disturbed areas cover some 1,000 miles of the air route at one time, and the intensity of the electrical disturbance is such that any medium-wave communication—even between fixed ground stations—may be impossible for considerable periods.

On the Short Waves

A Marconi expert has carried out an extensive series of practical tests over a period of six months, flying over the route in aircraft specially fitted with experimental wireless gear.

It was found possible by means of a combination of short (40-80 metres) and medium wavelengths to establish reliable ground and air communication over the whole air route, with a good safety margin always available, and also on several occasions very long range "D.X." communication was established.

On the first test flight the engineer was in touch with the stations along half the African route, from Cairo (R.A.F. station at Heliopolis) to Nairobi, and the intermediate stations, over ranges up to more than 1,300 miles.

5,000 Miles Away!

Record long-distance communication was established later *with the British Post Office station at Portishead, near Bristol, while the aircraft—the Imperial Airways flying-boat "City of Swanage"—was in the air over the White Nile, 5,000 miles away!*

Other long-distance contacts of this nature were also established with Norddoich, Germany, at 5,000 miles, and Coltano, Northern Italy, at 3,900 to 4,000 miles, while news messages were received from the wireless station at Miami Beach, U.S.A.

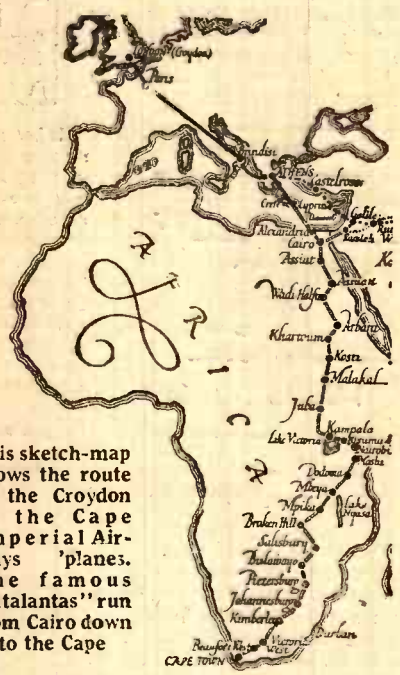
Even when you're flying over the "Dark Continent" these days, you see, you're not out of touch with the rest of the world!

An "Atalanta" air liner has just flown from Croydon to Cairo under the charge of Major H. G. Brackley, and its personnel included an engineer to operate the medium and short-wave wireless gear, together with Marconi-Robinson wing coil direction finding equipment.

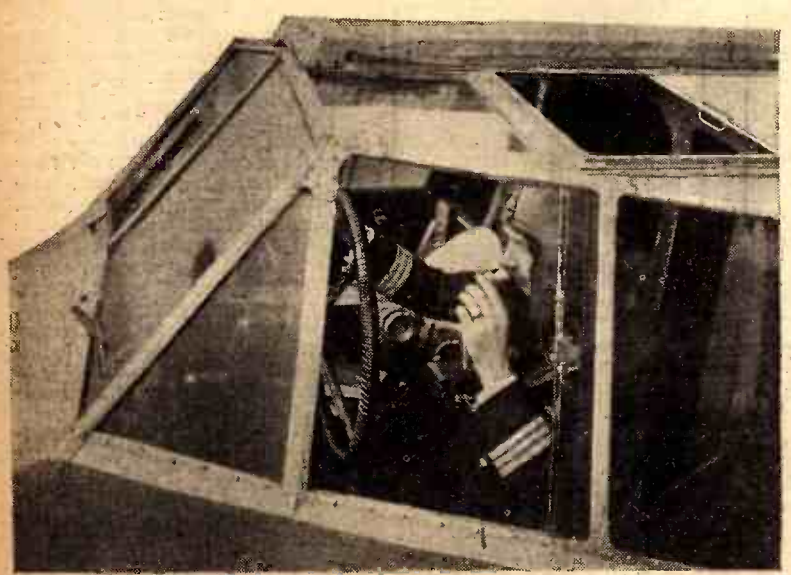
On the medium wave-band, communication was maintained with Malta and with Cairo over ranges up to 600 miles morse and 400 miles for telephony, while on short waves the range for continuous-wave telegraphy was more than 1,000 miles and for telephony 450 miles.

It should be possible for short-wave enthusiasts with sensitive sets to pick up the "Atalanta" signals.

A chain of stations for the Croydon-to-the-Cape air liners has been started. There are stations all through the heart of Africa from Kampala, Uganda, to Cape Town—all possible quarry for you if you have a sensitive set.



This sketch-map shows the route of the Croydon to the Cape Imperial Airways 'planes. The famous "Atalantas" run from Cairo down to the Cape



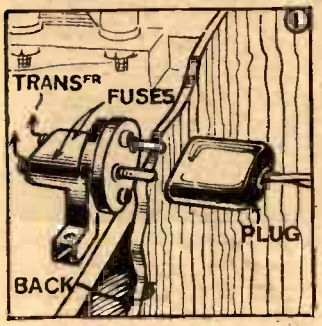
Here is the radio operator in one of the Imperial Airways 'planes, using the voice tube when carrying out long-distance radio telephony

On one of the first flights made on the Croydon-to-the-Cape route, very severe electrical storms were experienced, and the aerial had several times to be reeled in owing to the severe atmospherics. The approach of a "line squall" had also to be watched. Heavy electrical storms were experienced while flying over the famous Valley of Kings, north of Luxor. There is now an aerodrome for the Empire air route quite close to the home of Tut-ankamen.

As the African planes have talked to Croydon while down near Cape Town, there is every possibility of amateur reception of the Croydon-to-the-Cape transmissions.

TEN STAR CIRCUIT FEATURES ARE EMBODIED IN THE "HOME-LOVER'S NEW ALL-ELECTRIC THREE"

FOR the benefit of readers interested in circuit technicalities, we have analysed the circuit of the "Home-Lover's New All-electric Three-valver," described in our centre pages this week. We can conveniently speak of the circuit by referring to ten outstanding points.

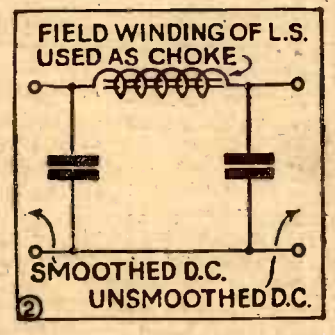


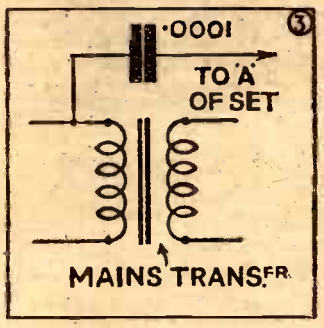
(1) **Safety.** *In all mains-operated sets the question of safe working has to be considered. You will find the new Home-Lover's set is adequately protected, so that there is no more danger in using the set than there is in using any battery-operated set.*

How has this immunity from the fairly high voltages involved been achieved? Firstly by the safety back of the cabinet. You cannot meddle with the internal connections of the set unless you take off the back, and when you do that you automatically disconnect the mains input because the mains plug is part of the back.

In addition to this wise and simple precaution we have included twin fuses, one on each side of the mains input.

(2) **Moving-coil loud-speaker.** *This year's Home-Lover's set is notable for the use of a moving-coil loud-speaker in a specially economical way. You know that a moving-coil of the energised type has to obtain its field winding current from the mains. We do this in the Home-Lover's set by placing the field winding in the smoothing circuit of the rectifier. In this way we dispense with a choke.*

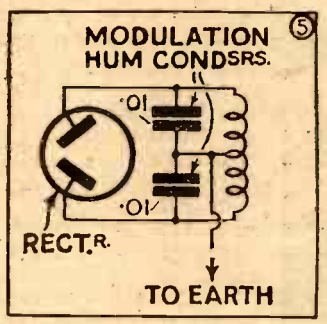




What this means in practice is that we save watts power. Instead of power being wasted in a choke, this power is used to energise the loud-speaker field winding, which would otherwise impose an additional load on the mains rectifier. It is the nearest approach to "something for nothing" in wireless. Of course, there is a slight loss of high-tension volts through the speaker winding, which is of higher resistance than a choke, but this loss is not nearly as great as the saving in other directions.

(3) **Mains aerial.** *We do not wish to over-emphasise the value of this, especially as we are dealing with only a three-valver with one high-frequency stage. Nevertheless, if you live fairly close to a regional station, say within twenty miles, you can obtain quite reasonable loud-speaker results by the mains-aerial attachment.*

It consists of a .0001-microfarad fixed condenser connected between one side of the mains transformer and the aerial terminal of the set. Its use is optional, and if you have any sort of facility for an external aerial wire of course you should not limit yourself to the mains aerial.



(4) **Electrolytic Smoothing Condensers.** *This is one of the first sets in which full use has been made of the great advantages of the electrolytic type of smoothing condenser. The advantages: Plenty of capacity and inexpensive.*

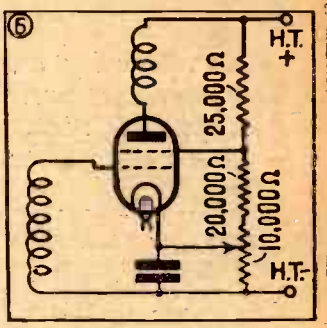
It is not generally appreciated that by using an electrolytic type of condenser for the reservoir position we avoid the bad effects of a sudden surge when switching on. Normally the valves take a little time to heat up, and while they are doing so the full voltage is applied to their anodes, with the danger that the coating of the filament may undergo a bad strain.

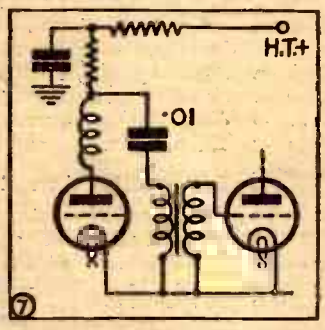
This is avoided by the electrolytic condenser, which temporarily takes up the surge when switching on. All chance of damaging the valves is therefore avoided.

(5) **Modulation Hum Elimination.** *It will be found we have used two .1-microfarad fixed condensers connected between the anodes of the mains-valve rectifier and the earth point. This simple device eliminates a form of mains hum that is caused by the high-frequency signal modulating the mains and producing a 50-cycle note. On strong signals this is sometimes quite marked. With the two condensers fitted as suggested this hum is entirely cut out.*

(6) **Variable-mu Valve.** *The circuit point about the use of this type of valve in a mains set is the arrangement of the network across the high-tension supply. Here we have taken special care to choose the values of the different resistances in this network so that when the grid bias is varied the screen-grid and anode volts remain practically constant.*

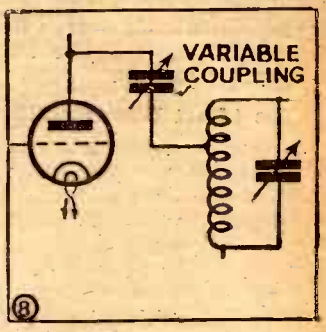
It should be noted that when this variable-mu is well engineered, as in this circuit, the control of the volume is very smooth. This is an important advance of the present Home-Lover's Set.





(7) **Parallel-fed Transformer.** *No expense has been spared to get really good quality on this set. For this reason we have fitted a parallel-fed low-frequency transformer so that a very high primary inductance is obtained.*

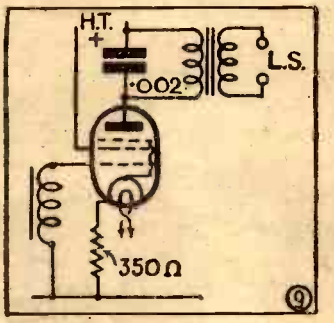
The low-note response of this set is definitely an advance on the original model. Partly this is due to the better frequency response of the moving-coil loud-speaker as compared with the moving-iron type, but it is also due in no small degree to the parallel-fed transformer.



(8) **High-frequency Coupling.** *To meet the varying conditions of to-day we have arranged to vary the coupling capacity between the anode of the variable-mu and the grid of the detector valve. This variation is obtained by a small knob working a condenser contained within the tuned-grid coil.*

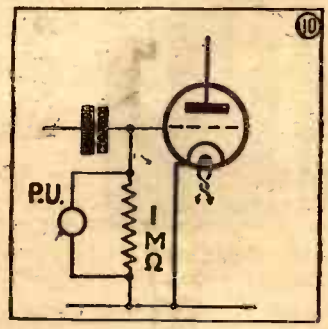
The idea is to find the best compromise for any given locality or for any given reception condition and then to leave this control alone and work on the normal volume and reaction controls.

This condenser performs for the tuned-grid circuit of the detector the same job as does the pre-set condenser for the aerial-tuning circuit, only within rather smaller limits, of course.



(9) **Pentode Output.** *This year's set has the advantage of a pentode power valve. This gives greater amplification and greater power output, with a better high-note reproduction.*

The transformer in the speaker chassis is fitted with a .002-microfarad condenser to limit the high-note response which might otherwise tend to be excessive. Another incidental advantage of the transformer is that feed-back is further reduced.



(10) **Gramophone Pick-up.** *We have found by experiment that there is no need for a negative bias on the grid of the detector valve when using a pick-up, that is when using the detector valve as a first low-frequency amplifier. So all you have to do to obtain pick-up reproduction is to connect the pick-up across the grid-leak of the detector.*

Terminals so connected are fitted to the set. Note that when you are on radio the pick-up must be disconnected. Further, it is advisable to fit a potentiometer between the pick-up and the terminals.

FULL CONSTRUCTIONAL DETAILS ARE GIVEN ON PAGES 504 TO 506

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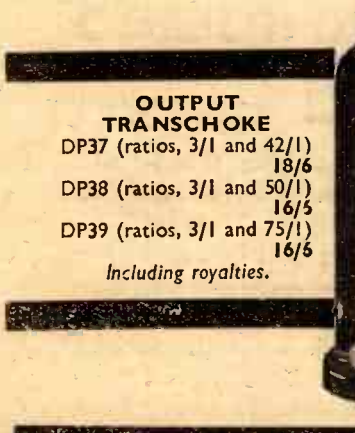

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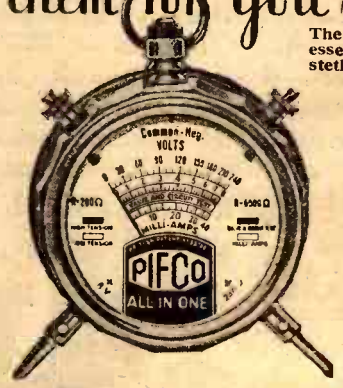

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On Your Wavelength!

AN INTERESTING DECISION

A PROBLEM which invariably arises when an electric supply company changes over from D.C. to A.C. has recently been brought before the High Courts. The dispute arose between the Chester Corporation and one of their consumers, who carries on business as a wireless retailer. The Corporation held that they were liable only in respect of the "scrap" value of the customer's D.C. apparatus—a battery charging plant—which they estimated at £2, whilst the retailer very naturally argued that he ought not to be penalised by a change which had been forced upon him, and claimed for a new A.C. installation, costing something over £40. The High Court decided in favour of the consumer and against the Corporation.

As a matter of fact the Electricity Commissioners—who is the ruling authority in things electrical—state quite definitely that the cost of converting customers' D.C. apparatus to A.C. is the responsibility of the local supply company making the change, and in practice the point is never seriously disputed in the case of heavy plant consuming considerable power. The real difficulty arises in connection with mains-driven wireless sets which may take only a few shillings-worth of current in a year, and may cost nearly as many pounds to convert. Of course, a battery-charging plant comes under the general category of commercial apparatus consuming a fairly heavy load, so that the decision may not be held legally binding in the case of a wireless set, though it is certainly a step in the right direction.

A FIRESIDE "POSER"

ON my way home, one day last week, I overtook a neighbour struggling up the hill from the station with a hefty-looking parcel, which turned out to be a brand-new wireless set. I was invited to come round later in the evening to hear it being put through its paces. On arrival I found the family assembled in state, Father standing near the set looking slightly self-conscious, Mother sitting in an armchair keeping the young son and heir in order with a stern eye, and Granny comfortably ensconced near the fire, looking tremendously alert and alive. To cut a long story short, after giving us a most successful session—including a number of "foreigners"—the set was switched off, and conversation started on the marvels of wireless in particular and science in general. In the course of the talk someone suggested that before long we should be getting into communication with Mars or some of the other planets. This brought Granny into action. "What always puzzles me about the planets," said the old lady, "is how we have already managed to find out all their names."

I made this my cue to say a hasty good-night, leaving the family to think the answer out for themselves.

A WAY OUT

A FRIEND of mine the other day got out of a little difficulty in a very ingenious way. He was engaged at his desk when the telephone rang. He reached out to lift the instrument down, but let it slip, and the telephone fell with a loud bang on to the floor and disembowelled itself. The microphone split into four pieces

He retrieved the instrument and placed the receiver to his ear, and discovered that at the other end of the line was a person to whom he particularly wanted to speak. Most people would have given it up as a bad job, and simply commiserated themselves on the unfortunate chance which had put the telephone out of action at this critical moment. Not so my friend. Having decided that the microphone was useless, he wasted no further time on it, but held the earpiece in front of his mouth and shouted into that. He then rapidly transferred the earpiece to his ear again and obtained his friend's reply. In fact, he carried out an animated conversation for some minutes, whipping the receiver from his ear to his mouth.

RECEIVER AND MICROPHONE

NEVERTHELESS, it did the trick, and he managed to complete his conversation satisfactorily. The ordinary air waves from the mouth are capable of causing the diaphragm of the earpiece to vibrate just the same as the diaphragm of the microphone, and these will induce current in the receiver coils which are transmitted back to the telephone line in the same way as with the ordinary microphone, only, of course, not so effectively. It is necessary rather to shout at the instrument in order to produce satisfactory speech at the far end.

I once heard of a signal officer in the war who found, at a very critical moment during an attack, that the battery on his microphone had given out. It was essential that he communicated with headquarters, and that right quickly. Fortunately, he remembered the same thing and shouted into the earpiece with perfect success. He was able to get the necessary information through and the position was saved. Truly, there are more ways of killing a cat than choking it with cream.

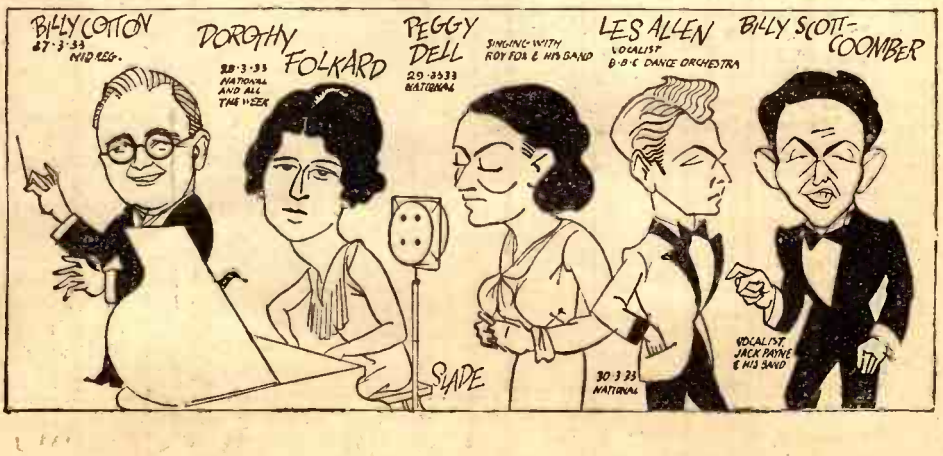
HAVE THEY TRIED?

IT is always rather amusing when writers in the lay papers tell us about certain aspects of wireless of which they have obviously very little first-hand experience. There are still, for instance, some who would have us believe that to bring in American medium-wave stations demanded the kind of hair's breadth tuning that we used to indulge in on the short waves before the invention of satisfactory slow-motion dials. Actually, on a good night, stations like WCAU, WIOD or WPG are easier to tune in than Continentals such as Budapest. One reason why they are easier is that there is no difficulty about separating them from other stations, for the medium waveband is not overcrowded in the small hours. But the chief reason is the uncanny strength with which they come in when conditions are favourable. Simply move your dials slowly over the settings covering the band between about 230 and 300 metres and, if there are any Americans going, you will pick them up without the slightest trouble. Naturally, it is advisable to make the set sensitive, but it is unnecessary to bring it into oscillation and to tune by the squeal.

A LITTLE PREVIOUS

ANOTHER recent stunt in the lay papers has been the ecstatic announcement that the cold-emitter wireless valve had at length been invented and that sensational results (why are results always sensational?) would follow. This was apropos of the Westinghouse metal detector, the Westector, a very interesting component, but hardly to be called a cold-emitter valve. The Westector is a recent development for radio-frequency purposes of the metal rectifier used in so many A.C. mains power packs and battery eliminators. It *is* a valve in the sense that it passes current.

PERSONALITIES IN THE WEEK'S PROGRAMMES



On Your Wavelength! (continued)

in one direction only; but so did the crystal or the coherer, for that matter. It is certainly not a cold emitter, because it does not emit. What it does is to rectify current and not to amplify. It has many very attractive possibilities and I expect that we shall hear a good deal more of it. One of the drawbacks originally was that any metal-plate detector must have a far larger capacity than the valve; but various ingenious ways of overcoming this difficulty have been worked out.

NEW VALVES IN SIGHT

FOR a long time now I have been pointing out in these notes that in this country we were hardly keeping up with the march of world progress in the matter of new valve types. I showed that one kind that we very badly needed was the high-frequency pentode and another the dual valve specially designed for operating automatic volume control. I now hear that some makers will be putting both of these valves on to the market before so very long. The H.F. pentode will be a wonderful help in super-heterodynes and the "double diode-triode" will be welcomed, despite its mouthful of a name. This valve, as the name suggests, is really two in one. There is, first of all, the two-electrode portion whose function is detection. It is much less liable to introduce distortion than any kind of triode or tetrode detector. This is followed by a three-electrode amplifying part, contained within the same bulb. Besides its application to ordinary circuits, the double diode-triode is the very thing for automatic volume control.

ALL THAT GLITTERS . . .

THERE is a story of the great Chaliapine that when he received, many years ago, his first fee for making a gramophone record he insisted upon payment in gold and solemnly bit each sovereign to make quite sure! It occurs to me that many of the younger readers of AMATEUR WIRELESS who have never handled, much less bitten, a sovereign will wonder precisely what the point of the story is. Gold is a very soft metal and making your teeth sink into a coin was not an uncommon test of its genuineness in the pre-war, pre-broadcasting era. The other day Chaliapine completed thirty years' service with H.M.V. as a maker of records, and to commemorate this he was presented with one of solid gold. His old instincts reasserting themselves, his mouth opened, he popped in the record (or, rather, part of it) and bit. There was that nice squashy feeling that betokens the genuine article, and everyone was satisfied.

JUST A FEW TURNS

GOING round one of our well-known wireless factories the other day, I stood and watched the fellows who were winding the neat little H.F. chokes that we now use. The former on to which the wire was wound had ten slots, each of which was filled to the brim. In front of the operator was a turn-counter, and I was interested to see that each slot held 325 turns. Ten times 325 is 3,250, and working out this little sum made me think of the bad old days when we used to do jobs of this kind for ourselves. Many and many a choke have I and other old hands wound with the aid of a hand-drill fixed horizontally between the jaws of a vice. Either you discovered the gearing by ratio of the drill and counting the turns that you made with the crank, or you concocted a turn-counter from an old cyclometer or something of that kind. One task I never shall forget was winding ten thousand turns of fine wire on to the secondary of a home-made low-frequency transformer.

The first practical wireless book ever published was brought out by the firm which a little later founded "A.W." In that book, of which I still possess a copy, there are full instructions for making the *three* L.F. transformers required for a home-constructor's (!) five-valve set. Each needed 2,500 turns of No. 38 d.s.c. for its primary and 10,000 turns of No. 42 for its secondary. If you have ever handled No. 42 you can realise what kind of a task that was. Heroes, weren't we?

LOOK OUT FOR THESE

QUITE a number of new big noises will shortly be testing within the limits of the medium waveband. Most of them will start operations by transmitting items after the normal closing-down time, and that is the time to go for them if you want to hear them in their early days. Two which should quite literally be going strong within the next week or two are the new Budapest and the new Vienna, each of which can radiate 120 kilowatts when it feels so inclined. They will use the wavelengths of the existing stations and, as we already hear, the latter pretty well, I don't, somehow, think that the new ones will be difficult to pick up. Other big fellows coming along shortly are the two Brussels stations, which are going up from 15 to 75 kilowatts; Kalundborg, whose 7.5 kilowatts are to be increased to 50 or 60; and Madrid, which is likely to have an output rating of 120 kilowatts. In Eastern Europe both Bucharest and Belgrade, now quite small stations, will blossom out into 60-kilowatters during the summer.

Keep the fuse as close as possible to the battery terminals or input flexes. Here you can see a bulb-type fuse mounted close up to the L.T. terminal block and wired between low-tension and H.T. negative

BIG BEN'S LITTLE BROTHER

IF you are passing down Tottenham Court Road (should I add London? Should I add Eng.?), you may be surprised, at the hours and quarters, to hear what is apparently the voice of Big Ben coming from somewhere in the sky. Actually, it isn't Big Ben and it doesn't come from the skies. The sounds come from a giant amplifier-cum-loud-speaker installed on the roof of the Marconiphone building and the chimes are produced by an electric clock which has been specially designed to imitate those of its Westminster big brother. It was intended originally to broadcast the genuine article, but the authorities would not give permission for this. Hence the very excellent imitation.

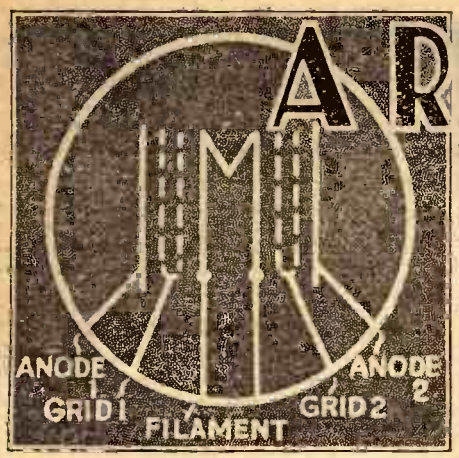
SEE HOW THEY GROW

MY own experimental sets always rather amuse me. They generally start off with the idea of complete and utter simplicity of operation—one tuning knob—one volume control—one switch. As I write I have just glanced at one of them which was put together a few days ago. I observe that its knobs have now reached a total of nine and that two pairs of terminals have somehow sprouted on the panel. And what exactly are the nine knobs? Reading from left to right, as they say about photographic groups, we have, first of all, reaction, then the radio volume control. Next comes tuning, then gramophone volume control, then tone control, then Q.P.P. balancing potentiometer, then a special switch for throwing into circuit a milliammeter, whose duty it is to record the plate current of the Q.P.P. valves. Last comes the filament switch. Of course, I shall shortly scrap the present model and simplify it by combining, for instance, the radio and gramophone volume controls. Here a ganged potentiometer will enable one knob to do all the work. Other simplifications will also be made and I shall bring my knobs down to some modest number. That done, I know that, do what I will, they will start sprouting again, and they will probably have reached a round dozen before I undertake once more the pruning process.

MODULATION HUM

IN some mains sets what is known as modulation hum is a good deal more than a nuisance. The ordinary kind of hum is heard only as a background and generally makes itself noticeable during programme intervals, being drowned when an item is coming through. Modulation hum, though, is a very different pair of shoes. It is virtually inaudible when no signal is coming through, but increases in violence and beastliness as soon as one does. The general causes are lack of screening or defective insulation somewhere in the set, and it may also be caused by leakages to earth in the mains themselves. Whatever the cause, modulation hum is not incurable, as a rule, provided that you take steps of the right kind.

THERMION.



A REVOLUTIONARY VALVE DEVELOPMENT

J. H. Reyner gives first details of the remarkable Class B valve which is likely to revolutionize battery-operated receivers

IT seems that the battery user is being catered for very thoroughly after a period of comparative neglect. At any rate, the latest development in battery output valves is somewhat revolutionary. For surely this is not an exaggerated term to apply to a valve which gives 2 watts output for a standing current of 4 milliamps only. Yet this is what the new Cossor 240B valve will do.

Actually the valve itself requires to be associated with what is known as a "driver" valve which consumes a further 2 or 3 milliamps, but even if we consider the two valves together the consumption is remarkably small for such a large power output—an output equal to that of the average mains set of to-day.

The Mullard people are also releasing a somewhat similar valve (the PM2B) and there is some talk of mains valves on similar principles capable of giving 20 watts. Probably, the other valve manufacturers will soon follow suit. What has taken place to allow of this tremendous increase in output?

Prospero and Ariel unveiled: Eric Gill's sculpture at the main entrance of Broadcasting House has now been revealed to the public, and workmen are busy dismantling the scaffolding on which Gill has been busy working on the figures

The story is an interesting one. For many years now, almost from the earliest days of the valve, we have very carefully avoided grid current. If the grid is made positive, grid current will flow and therefore for an amplifying or output valve we always arrange that the grid shall never be positive. A permanent bias is placed on the valve, and the arrival of a signal causes the grid voltage to change between the limits of zero and approximately twice the bias voltage.

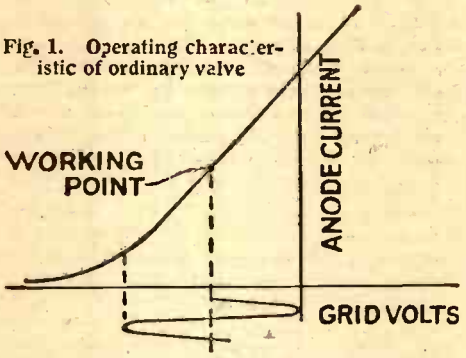


Fig. 1. Operating characteristic of ordinary valve

This is illustrated on the characteristic shown by Fig. 1, which indicates quite clearly the ordinary working point and the limits of grid swing under the ordinary conditions of use. The power output which we can obtain under these circumstances is proportional to the maximum value of the current, i.e. the current at $V_g = 0$.

But the current at zero grid voltage is nothing like the limit which the valve can give. If we continue to plot the characteristic on the positive side, we find that the current goes on increasing until it eventually begins to "saturate" at a value three to four times as great as the value with zero grid volts. When saturation occurs it means that the electrons emitted by the filament are all being attracted to the grid, and therefore the anode current will not increase any further.

It is, however, quite practicable to work up to a current three times as great as that at zero bias. Now the power output is proportional to the square of the current, so that if we have three times the peak current we obtain *nine* times the power output. An ordinary small power valve will give about 200 milliwatts output under ordinary conditions, so that if we can find some means of increasing the anode current swing in the manner we have just described we can obtain something like 1,800 milliwatts output

So far this has been regarded as impracticable because as soon as we make the grid positive, current commences to flow to the grid. The effect of this is to connect a resistance across the transformer which is feeding the valve. Even a high-resistance leak such as 250,000 ohms across the secondary of our transformer will reduce the amplification quite appreciably, and we find that if we make the grid more than one or two volts positive the effective resistance of the grid-to-filament path of the valve falls down to something below 10,000 ohms. This would act as an almost complete short circuit on the average transformer, and the system would not work.

It does not follow, however, that we cannot re-design our input transformer to operate successfully under these rather different conditions. After all, in the ordinary power valve we make the valve deliver voltage into the loud-speaker which has a relatively low resistance. Why can we not do the same thing here? Scientists accordingly tried, and found that it was successful. By designing the preceding valve as a small power valve and using an output transformer in place of an intervalve transformer of the usual type, it was quite possible to develop the voltage across the grid of the final valve despite the fact that this valve was taking grid current.

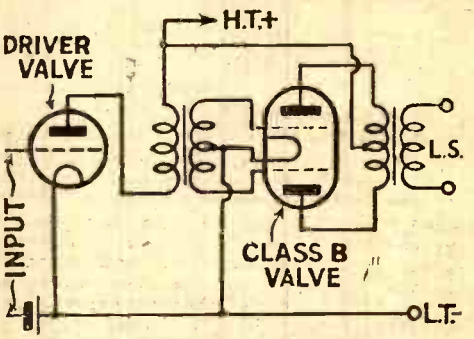


Fig. 2. Circuit for Class B amplification

This, then, is the essence of the system. The output valve is deliberately made to run into grid current, thereby enabling the anode current to swing over a very much wider range than usual, and delivering nine or ten times as much power. The output valve is preceded by a driver valve which is designed, in conjunction with a special transformer, to supply the voltage to the output valve, and operates in fact under the same conditions as a small power valve.

This is a radical change in our ideas concerning L.F. amplification. There are

(*Continued at foot of page* 518)

Practical Mains Working

This week PERCY W. HARRIS continues his complete series on mains working for beginners by explaining how the output from the valve rectifier is smoothed so that all the irregularities in the high-tension supply from the mains are eliminated

IF you have 50-cycle mains, the pulses of direct current, which are delivered between the centre tap of the rectifier filament heating winding (positive) and the centre tap of the high voltage winding (negative), will occur at the rate of one hundred a second. The figure is one hundred and *not* fifty, because a "cycle" counts from zero up to the maximum in one direction, down to zero, up to maximum in the *other* direction and back to zero again—in fact, a *completed* cycle of changes.

Using Both Halves

We saw last week how, in our rectifier valve and the windings, first one plate and then the other of the valve became positive. Thus we have, so to speak, turned round one of the halves of each cycle and made it face in the same direction as the other. The two halves of the alternating current cycle, positive and negative respectively, have been turned into a pair of positive pulses.

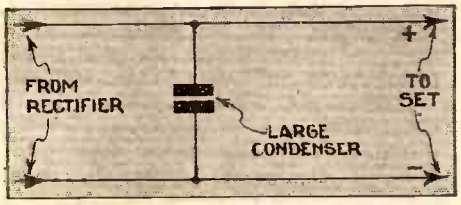


Fig. 1. A condenser helps to smooth the rectifier output, but on its own is not enough to prevent irregularities in the output from reaching the valves in the set

If, without any smoothing, we were to apply these direct-current pulsations to the plate of a valve, a loud 100-cycle note would be produced, quite apart from anything that happened in the grid circuit.

Our actual requirement is high-tension voltage which must remain constant all the time, and we want the grid to do the whole of the controlling, varying the current flowing in the plate circuit so as to give the speech or music desired. We do not want anything else super-imposed on that speech or music which would inevitably be the case unless we completely smooth our high-tension supply.

A Simple Analogy

A simple but imperfect analogy for our smoothing process can be found by imagining that our smoothing device is a cistern, that our output from the smoothing device corresponds to a pipe from the cistern going to the household supply, and that our input to the smoothing device is a crude pump which, as the lever is worked up and down, gives a series of jerky supplies, there being one spurt of water for each downward thrust of the pump handle.

The cistern acts as a kind of reservoir, and as the water flows steadily out it has not the slightest jerk or irregularity in it. A similar state of affairs exists in our mains unit, where a series of jerky pulses of current is supplied to one side of the smoothing cistern, while out of the other comes a perfect uniform unvarying supply of high-tension when required.

The analogy is imperfect in many ways. For example, if you take out the water from the cistern more slowly than you put it in the cistern will overflow, but in the smoothing portion of our mains unit there is no equivalent of the "overflow," for as soon as the smoothing unit becomes fully charged, its back pressure is equal to the incoming pressure from the rectifying valve and nothing further goes into it.

It is possible to work out a more complete analogy than this, but one must not lose sight of the fact that we are not so much concerned with perfect analogies as with getting a sound idea of how it all works!

Charging The Condenser

If now we connect a large condenser such as 2-microfarad or more across our positive and negative terminals, each pulse will go to charging this condenser, and very rapidly it will reach the same voltage as its supply and no more will be forced into it. The condenser can now, if necessary, be entirely disconnected from the rectifier circuit, and if the condenser is a good one, it will hold its charge for a considerable time.

We will imagine, for example, that it has been charged at 200 volts. What now happens if we connect a circuit across its terminals? A current will immediately start to flow, and simultaneously the voltage will fall till the condenser is completely discharged. The flow of current will be smooth, without any pulsations, but as there is only a definite amount of energy stored in this condenser, the flow will be only of a short duration and, of course, the voltage will fall all the time.

As we desire a constant voltage and a steady supply, this simple method of charging up a condenser from a rectifier and then discharging it separately through a load is obviously of no value to us, but you will notice that we have completely got rid of the jerk delivered to the condenser by the rectifier circuit.

Condenser Not Enough

What we really want to do is to arrange things so that while our smooth supply of current is being taken out, so an unsmooth supply is put in to make up for what is lost. Why not then join up as in Fig. 1, which shows a large condenser connected both to the rectifier supply and to our set?

This scheme is not practical, unfortunately, as although the output to the set will be decidedly less "bumpy" than would be the case if the condenser were not there, we still get a similar trouble, for our set is connected directly to the rectifier which is the source of these pulses, and the effect of the condenser is only to absorb the worst of the jerks, most of which are passed straight on to our set.

Now very fortunately there is a device known as a low-frequency choke which is of great value in our smoothing circuit. It consists of a coil of wire sufficiently thick to carry the current we require without undue losses, and an iron core which adds considerably to the inductance. If we try to push a pulsating current through this choke, we find that it resists any rise in the current and similarly tends to retard the fall.

How The Choke Acts

The reason is that before the current can flow through the choke in one direction, a magnetic field has to be built up around the wire and in the core, and this takes a certain time to grow. Energy is absorbed in the building up of this magnetic field, and once it has reached its steady state a current can flow with little opposition through the choke provided it does not vary its strength.

If, however, we suddenly try to reduce the current flowing through the choke, this magnetic field with the energy stored in it starts to collapse, and in doing so generates a voltage or pressure tending to keep the current at its former strength. In a word, the low-frequency choke in the smoothing circuit tends to retard both rise and fall of current. The amount of this tendency depends on the amount of wire and iron in the choke. There are thus two factors in a choke which we have to consider for our purpose here, its inductance or degree of retarding power to change, and its resistance or current-carrying capacity.

Real Smoothing

Now let us see how we can use a choke to help us towards the goal at which we are aiming. In Fig. 2 I show the output from our rectifier joined to a large condenser C with a choke L in one of our output leads to the set. We now have our first real smoothing circuit for the condenser takes charge of the pulses, and the choke in the lead to the set from the condenser resists the pulses being passed on to our receiver. The steady discharge from the condenser to our set passes practically unimpeded, for the choke offers no real opposition to it, but it resists vigorously any rises and falls which the direct connection to the rectifier might tend to give us.

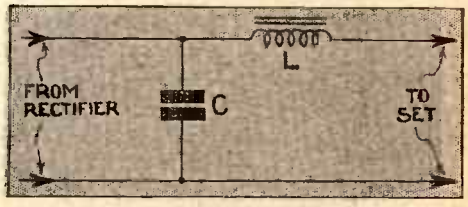


Fig. 2. Real smoothing with a condenser and a choke arranged on the output side of the mains rectifier as shown above. The combined action of the choke and condenser prevents any variation in the set's supply, even though the input to the rectifier is constantly changing

DO YOU KNOW—

THAT you may find a counterpoise in place of an ordinary earth is a help in cutting out interference and generally improving performance? This is often the case where the earth lead direct to the ground or to a convenient waterpipe would have to be very long. A counterpoise consists only of a separate wire connected to the earth terminal, but not taken to any earthed point. It should be arranged immediately beneath the aerial if possible, and should be just as carefully insulated as the aerial wire itself.

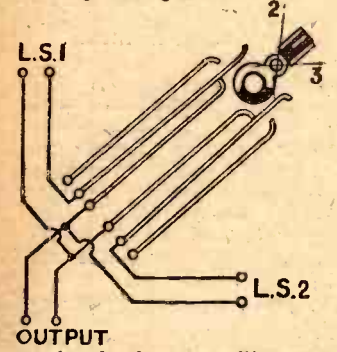
THAT the holes through which metal coated S.G. valves are passed in a set should be made large enough to prevent the valve touching the screen? This is rather important in short-wave sets where noises may be caused by intermittent contact between the valve coating and the screen.

THAT it pays to keep the business end of a screwdriver fairly sharp? The points of drills should also be kept clean and sharp and a few seconds work with a small oilstone will save a great deal of unnecessary labour.

That Radio Dodge

SWITCHING YOUR SPEAKER

IT'S such an easy matter to wire up an extension speaker that it is worth while going to the little extra trouble of fitting the switch to control both the speaker near the set and the distant one. The sketch shows a simple switching arrangement which is



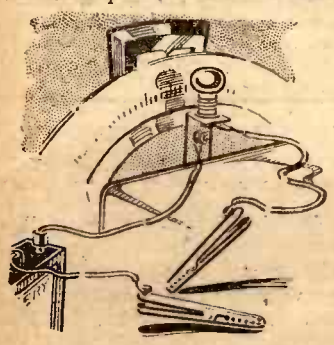
very handy for controlling two speakers wired in this way. A three-position switch is required. The centre position of the switch puts both speakers into circuit, while the side positions bring either speaker into use as required.

HOLES IN SPEAKER FRETS

PLOT the centre of the hole. Take an odd strip of aluminium about 1 in. by 10 in. and drill a small hole at one end. Drive a nail through this hole into the centre of the hole you want to cut. Mark the radius of the circle along this. Take a sharp-pointed knife and pierce at this point, making a short slit. The knife can now be made to cut the circle by turning it with the metal strip. When about half-way through, take the nail from the centre and turn the wood over.

TESTING A SET

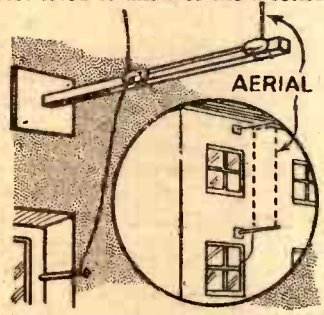
IF when testing out the continuity of the circuit in the set you use the dial lamp as an indicator, fit two lengths of flex to the lamp-holder terminals and



connect a crocodile clip to one of them in order to facilitate making temporary connections. A bias battery can be used as shown, a lead with a crocodile clip being attached to its other terminal.

A USEFUL AERIAL

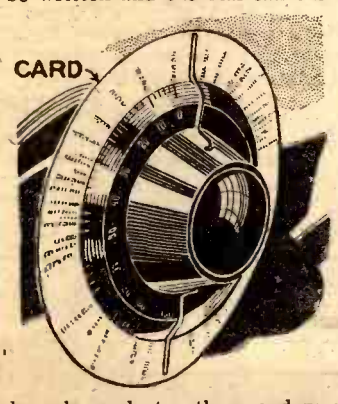
THE sketch shows a very cheap and efficient aerial which can be used where space is too restricted to allow of the erection



of the conventional horizontal wire. Two flat pieces of wood are used to support the extreme ends of the aerial and at right angles to these are bolted two struts of square sectioned wood, each about 4 ft. long. Egg insulators are wired on to these wooden supports and the aerial wire is stretched between them.

A STATION NAME DIAL

HERE'S a good idea for converting an ordinary slow-motion dial into one clearly showing the names of the stations. Cut a piece of card to fit the dial, making its diameter about 2 in. larger than the dial itself. On this the names of the stations can be written and the dial can then

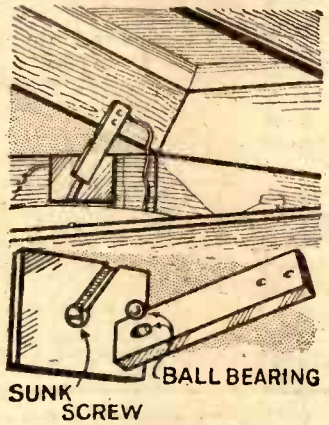


be clamped to the condenser fixing, by the one-hole fixing nut. The long-wave stations, on the lower side of the indicator, can be written in red to distinguish them. A pointer can be formed by fixing and bending a piece of stiff wire to the control knob as shown in the sketch, so that there is a pointer both for the medium- and long-wave sections of the dial.

ILLUMINATING THE RADIOGRAM

IT is rather wasteful to have a light running all the time in the lid of a battery-driven radiogram. It is a good plan to have a switch in order automatically to cut out the light when the lid is shut.

The sketch shows how a simple



switch can be made, including a strip of brass screwed at one end to the lid of the radiogram. At the other end, a small recess is made and a ball-bearing inserted. A track is made for the ball-bearing in the strip of wood or ebonite clamped to the side of the radiogram cabinet. When the lid is opened, the ball-bearing comes to rest on the fixing bolt and the contact for the switch is made.

AN AMAZING MAINS SET—THE "HOME LOVER'S NEW ALL-ELECTRIC THREE," DESCRIBED THIS WEEK. IT COSTS LESS THAN £8 TO BUILD, INCLUDING SET, MAINS UNIT AND SPEAKER.
SEE PAGES 504—506

LEAD-IN

A STRAIGHT unjoined lead-in is often a great advantage. Instead of breaking the wire at the lead-in tube, why not thread it through? There is no risk of a dirty joint and therefore the resistance is kept low.

SCREWDRIVERS

IT is, unfortunately, sometimes necessary to adjust a set with a metal screwdriver while it is working. Insulation tape wrapped round the blade obviates all possibility of accidental "shorts"; if the tape is doped with cellulose or shellac it will not get so sticky as is usually the case. For voltages up to about 100 volts or so, two coats of good cellulose enamel will suffice without the insulation tape. This can be made to serve a double purpose if a nice brilliant colour is used, since you will not always be losing the screwdriver. At least, you will soon find it again!

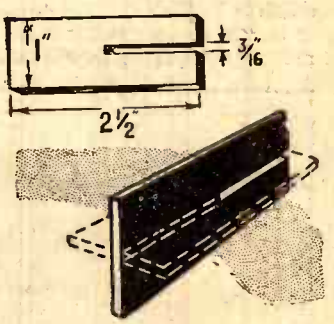
SCREENING

THE increasing use of chassis-type sets and sets with the baseboard covered in metal foil is leading to a large number of short circuits to the screen being earthed. If the whole chassis or screen is shellacked before fixing the components the danger of short circuits will be lessened, while the metal will be kept bright. Cellulose "dope" can be used with equal success.

SIMPLE CHOKE FORMER

A USEFUL former for winding short-wave chokes can be made as follows:—

Cut two pieces of ebonite the same size (2½ in. by 1 in. is a good size). Through the centre of each piece cut a slot the same width as the ebonite and half as long. If these slots are a tight



fit the two pieces can be pushed into one another and no other fixing is necessary.

A NOVEL SCRIBER

A SIMPLE scriber can be made by driving a gramophone needle into a wooden handle, such as a piece of the stiffening rod from a packet of Glazite. The point should be driven in first and the needle then pulled out and the blunt end pushed in.

A SCREENING CAN

A GOOD screening can for a valve can be made from a cocoa tin. Screw the lid to the baseboard, cut slots in the tin for the leads to come through, and you have a can complete. If you are screening an S.G. valve, a hole in the can will be required for the anode lead. See that the soldering tags on the valve-holders do not touch the sides.

SOLDERING TO TERMINALS

SOLDERING to a terminal stem is often difficult on account of the threads. In such a case a flat filed on the stem helps since you can solder on to a flat surface more easily. On Belling-Lee type "B" terminals the stem is split. Here one leg thus formed can be broken off, leaving a flat surface to solder to.

What Our Readers Think

The Editor does not necessarily agree with the views expressed by readers and does not accept responsibility for the letters published. Letters cannot be published which do not bear the sender's full name and address

Balanced-armature v. Moving-coil

SIR,—I have read the letter from Radio Service Laboratories on the above subject with interest, as I have thrown out three different makes (modern) of moving-coil speakers in favour of a Blue Spot R66 model. No doubt, there are other good balanced-armature speakers on the market. This speaker is great, provided it is properly mounted with the correct chassis and a suitable baffle.

Theoretically, good moving-coil speakers may do everything that is claimed in Radio Service Laboratories' letter, but is this all that matters?

How many moving-coil speakers (used with batteries) stand up to "peak" passages in music, or high soprano notes when the power is down to, say, 70 volts? Even with full power, in my opinion, the bass is not true to life, however pleasing it may be, because it appears to "float," especially in mains sets.

In practice, the majority of battery users, I think, do not keep the voltage up to its initial value, for economy's sake, and here balanced-armature speakers of good make, score.

My set covers broadcast and short waves, using super-regeneration in addition for the latter if desired, and I have had American stations on the above speaker at tremendous strength, using batteries run down to 60 volts, where moving-coil speakers chattered and faltered.

E. L. G. (Hale).

Reception in India

SIR,—I have just read the letter of G. R. C. in your issue of Jan. 21, 1933, and I should like, for the benefit of readers who may be misled, to state my experience of radio reception in Northern India.

In my experience, medium- and long-wave loud-speaker reception of Europe is only possible with two or more stages of H.F., and even then atmospherics render listening almost impossible on most evenings.

Short-wave reception is different, but here again for L.S. reception without considerable mush H.F. is essential.

May I add, in conclusion, that I have been a radio enthusiast and experimented since the inception of wireless, and have tried everything in India from a modest 2-valver to various types of super-hets.

F. K. (20th Mountain Brigade, Northern India).

Place-name Pronunciation

SIR,—In your issue dated February 18, W. T. (Godrer Craig) criticises the B.B.C. announcers in the pronunciation of three Welsh place-names. I would like to point out to W. T. that he is almost as far from the correct pronunciation as the announcers in question.

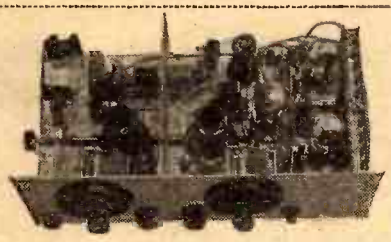
The places are: Aberavon, Cymmer, and Pontypridd, and the correct way to say them is Aber-avvon, Kummer, and Pont-y-pree(dd); the dd has no equivalent in English, the nearest approach to this sound being the th in "the" (not "thee").

In the Welsh language you spell all words as they sound and pronounce all words as they are written; you cannot possibly go wrong, as each consonant has one sound only and there are no silent letters.

I would like to add that it is one of the oldest languages in the world, and is believed to have originated in Central Asia.

D. D. (London, S.E.).

The Editor invites letters from readers on all interesting radio subjects. For the most interesting letter published each week a general-purpose valve or other component to the same value will be given.



The "Melody Ranger" constructed by W.O.B. (Dundee)

MELODY RANGER PERFORMANCE

SIR,—You will be pleased to hear of the results I have obtained with the "Melody Ranger" receiver I won in your recent competition. The results have been so surprising that it will be difficult to refrain from using too many superlatives.

When one remembers the absence of multiple-tuned circuits, the selectivity is astonishing. When the aerial coupling and reaction condensers are properly adjusted, stations can be separated which I have found it impossible to do on much more expensive and complicated sets.

I can tune in thirty-nine transmissions on the medium waveband and eleven long without any interference. This is really a very good performance, as it is not a good place for reception round this part of the country, and my aerial is only about 25 feet of wire round the room.

On the short waves I have had several American stations, Buenos Aires, Nicaragua, and a number of Continental stations. When I first started with this set I could not get it to oscillate on the ultra-short band. I put it down to my poor earth connection. I tried three different detector valves with the same result, but was successful when I used an S.G. valve, as a detector just plugged in without any anode voltage. In fact the results were so good I use this S.G. detector on both the short-wave bands.

The reaction control is a delight to use on all wavebands, the set going in and out of oscillation without any backlash. I was also surprised at the way the two dials keep in step. These "Melody Ranger" coils are certainly a great achievement, especially so when one considers their tuning from 12 to 2000 metres.

The quality of reproduction is splendid. I am using a Mazda P.240 output valve with Farrand inductor speaker, and the volume on most stations has to be turned down.

All my friends have been very impressed with the set's performance, and several have decided to build it. I also had two readers of "Amateur Wireless" round who had seen the result of the competition and wondered if it was "any good." They soon decided that it was very good and said they should build it. A photograph of the finished set is enclosed.

W. O. B. (Dundee).

A FINE ALL-ROUND SET

SIR,—I am writing as I promised to report on the performance of the "Melody Ranger" which I was fortunate enough to win a short while ago.

I am using H.T. accumulators and a 40-ft. outside aerial, and my local station is the North Regional transmitter, which is about 28 miles away.

The set is equally successful on all four wavebands, and the reserve of power is really surprising. The volume control can be turned right off for North Regional and National, thus economising high-tension, whilst low-power stations on the medium waves can be tuned in at quite good loud-speaker strength.

I am able to separate Langenberg from North Regional and Hilversum from North National. On the short waves I have logged quite a large number of stations, including Buenos Aires, Pittsburg, and Bound Brook (N.J.), the latter at full loud-speaker strength. Moscow and Zeesen also come in at great strength, Zeesen often not needing any reaction at all.

To sum up, the "Melody Ranger" is a fine all-round set, and I, who am very critical, am entirely satisfied with its performance.

A. C. H. (Rotherham).

Sets of the Season

Columbia Super-het Seven

ALTHOUGH this set is described by the makers as "the symbol of luxury," the price is within the reach of most set buyers. Which means, I suppose, that luxury radio has now ceased to be the prerogative of the plutocrat and has become possible for the man in the street.

I like this set because it gives you such splendid results with so little effort. Easy to set up in the house, it immediately works when you get it going. And works so well that there is little to criticise and almost everything to praise.

For a start the handsome appearance of the cabinet work will please even the most fastidious of set buyers. The lines are

The Columbia Super-het Seven is built for hard usage so strong is the chassis that it will bear the weight of an adult standing upon it

modern, and not too severe. The dimensions are on the large size, but this is an advantage for good-quality reproduction. The overall height is 19 in., the width just over 18 in., and the depth is 12 in.

You can see from the illustration how neatly the controls are arranged. They work in a powerful six-valve super-het circuit, the seventh valve being a rectifier for the mains supply.

Well-developed Circuit

A word on the circuit sequence. First there is a high-frequency-amplifying valve, a variable-mu screen-grid. Then comes the first detector or "mixer" valve. Injected into this valve's circuit is the local oscillation to produce the super-het frequency by means of a separate oscillator valve.

Then we get a variable-mu screen-grid for the intermediate-frequency amplifier. This brings us to the second detector, which works on the anode-bend system. This is transformer coupled to the power valve, which is a PX4, giving to the loud-speaker when fully loaded a maximum undistorted power of over 2 watts.

The mains-rectifying valve not only supplies all the receiving valves with anode current, but also the energising current for the moving-coil loud-speaker, which is housed above the set chassis in the top part of the cabinet.

This excellent circuit has been interpreted in the very best tradition of the Hayes factory. I ought now to tell you something of the controls, which are a delight to work. For a start we have, of course, one-knob tuning. Few readers realise the care and ingenuity needed to give one-knob control of the tuning in this type of set, where we have band-pass aerial tuning, first detector tuning and oscillator condenser variation—on medium and long waves! All this is done in this set with a four-gang tuning condenser to such good effect that when you turn the knob you might easily imagine you were operating a "straight" set. Can I offer higher praise?

Ingenious Controls

One of the best controls I have tried is the tone control fitted to this set. It has a wide range of frequency variation. By its aid you can easily cut down much of the background noise inseparable from the reproduction of very weak stations, and with care you can tone down the heterodyne whistles that often attack even the strong stations.

The volume control works well. It cuts down the amplification of both the variable-mu valves, thus providing a progressive variation of the amplification without introducing any audible distortion at small volumes.

By the way, this control works on the pick-up terminals, so that if, as I strongly recommend you to do, you fit a pick-up to the back of the set there is no need to go to the trouble of fitting an external potentiometer.

High-resistance speakers can be fitted externally, up to two of them making little or no difference to the volume output.

One of the most attractive features of the layout of the controls is the wide horizontal tuning scale fitted above the tuning control. This scale is of the roller type, which means that the scale turns bodily when you alter the wave-range by means of the combination switch knob.

BRIEF SPECIFICATION

Makers: The Columbia Graphophone Co., Ltd.
Price: 24 guineas.
Valve Combination: Super-het sequence, with PX4 power valve and U12 mains rectifier.
Power Supply: A.C. mains.
Power Consumption: 95 watts.
Type: Table-cabinet set, with mains aerial and energised moving-coil loud-speaker. Pick-up volume control included. External loud-speakers can be added.
Remarks: A thoroughly good super-het set, notable for its wide range of programmes and ease of control.

The two wavelength ranges are fully calibrated and the markings are made easy to read by the ingenious "flood lighting" behind them.

I have tried out this set at two localities, one twenty miles south of Brookmans Park, and the other down at Dorking in Surrey. At the latter point I was able to get plenty of stations on the mains aerial, which speaks well for the reserve of power. With only a very short aerial—about 20 feet of wire—and no earth, I got so much volume from the main stations that I had to keep the volume control down.

At the nearer point to Brookmans Park, I could get Mühlacker just clear of London Regional. Most of the adjacent foreigners were tuned in without appreciable side-band splash.

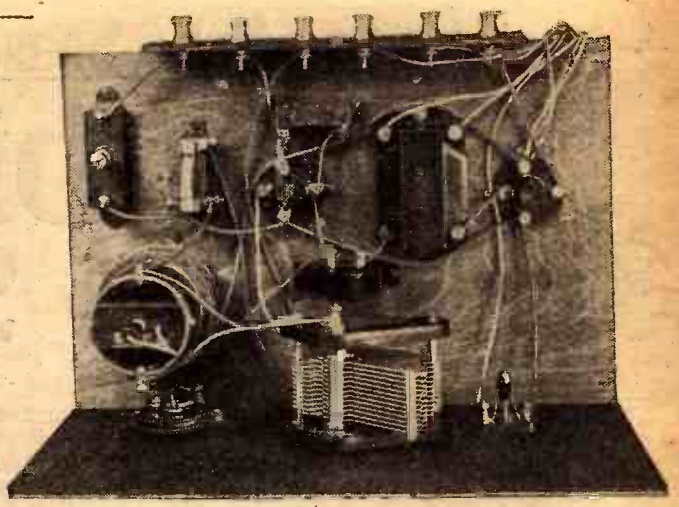
Quality depends to some extent on the adjustment of the tone control. With this control set to maximum brilliance the overall tone is very pleasing indeed. The bass is rich and the treble is adequate.

SET TESTER.

Successful "A.W." Sets

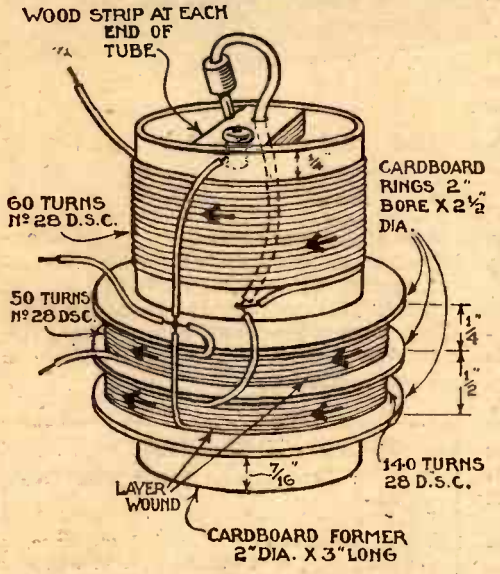
(I) THE "25s. TWO"

One of a series of brief details of the popular receivers which have been described in previous issues of "A.W."



A plan view of the set, showing how the home-made coil is mounted

THE "25s. Two," which was originally described in "A.W." 503, is not by any means a makeshift set, and it is not a compromise in the way it works. It is an efficient and straightforward transformer-coupled two-valver, capable of giving good speaker reproduction on local stations, and two or three leading Continental stations.



Details of the simple coil are shown by this sketch. Instructions for winding are given in the accompanying article

COMPONENTS

Three-ply panel, 12 in. by 6 in.
Baseboard, 12 in. by 8 in.
Three-ply terminal strip, 8 in. by 2 in.
.0005-microfarad variable condenser (Lotus, Lissen, Polar, J.B., Telsen, Ormond, Formo, Igranic).
.0003-microfarad reaction condenser (Telsen, Readi-Rad, Polar).
Filament switch (Sovereign, Lissen, Bulgin, Readi-Rad, Wearite, Junit, Lotus, W.B.).
Dual-range coil (Readi-Rad).
Two valve holders (Lissen, W.B., Clix, Benjamin, Lotus, Telsen, Junit, Wearite, Bulgin).
High-frequency choke (Lissen "Disc," Readi-Rad, Bulgin, Wearite, Telsen, Formo).
Low-frequency transformer (Lissen "Torex," Lotus, Bulgin, Varley, Telsen, Ferranti, Graham-Farish, R.I., Burton).
.0002-microfarad and .0003-microfarad fixed condensers (Telsen, Lissen, Formo, Ormond, T.C.C., Dubilier, Sovereign, Graham-Farish).
2-megohm grid leak (Lissen, Dubilier, Readi-Rad, Graham-Farish, Telsen).
.0003-microfarad maximum pre-set aerial condenser (Sovereign, Formo, Ormond, R.I., Polar, Telsen).
Seven wander plugs, three red and four black (Eelex, Belling-Lee, Clix).
Two spade terminals, one red and one black (Eelex, Belling-Lee, Clix).
Two sockets (Eelex, Belling-Lee, Clix).
Six brass pillar terminals (any radio shop).
Connecting wire and sleeving (Lewcos).
Three yards of thin flex (Lewcoflex).

ACCESSORIES

108-volt H.T. battery (Lissen, Drydex, Ever-Ready, Fuller, Palaba, Pertrix).
9-volt grid-bias battery (Lissen, Drydex, Ever-Ready, Fuller, Palaba, Pertrix.)
2-volt L.T. accumulator (Lissen, Pertrix, C.A.V., Exide, Fuller).
Speaker (Sovereign, Lissen, Celestion, Telsen, Blue Spot).

"The 25s. Two" is a straightforward leaky-grid, detector and transformer-coupled arrangement and serves as an ideal set to which later modifications may be made. An important thing, taking the price into consideration, is the fact that a pick-up can be used for gramophone reproduction, and the set is fitted with a radio-gram switching device.

Use is made of a novel coil which combines easy wiring with good inherent selectivity. You can buy the coil ready made, but quite a lot of fun can be had from winding it yourself.

This job should be tackled before you start mounting together the few other parts which make up the "25s. Two." The coils wound on a 2-in. diameter piece of paxolin or impregnated cardboard tube, and a piece 3 in. long will be required. Only one gauge of wire is used for all the windings, which greatly simplifies matters and less than 3 oz. of No. 28 gauge d.s.c. (double-silk covered wire) will be enough for the complete coil.

There are actually three windings on the former, one being for the medium waves, the second for the long waves and the third for reaction. The medium-wave winding is wound flat on the former, while the long-wave and reaction windings are bulk-wound between grooves at the other end of the former. These grooves can be made by glueing three cardboard rings, 2 in. bore and 2½ in. diameter, on to the former as shown, but a much better job can be made of the coil if the special bobbins obtainable are used. These are turned out of ebonite and are simpler to fit on the main tube. The reaction winding takes up a ¼-in. space between the flanges of its bobbin and the long-wave winding a ½-in. space.

As all the wire is the same, and all the turns are wound in the same direction, you can hardly go wrong in the construction of the coil. The medium-wave winding consists of sixty turns, wound side by side and with the ends secured through little holes drilled at the ends of the former. The reaction winding consists of fifty turns in the same direction, wound on in bulk.

The long-wave section at the bottom of the coil has 140 turns wound in the same way.

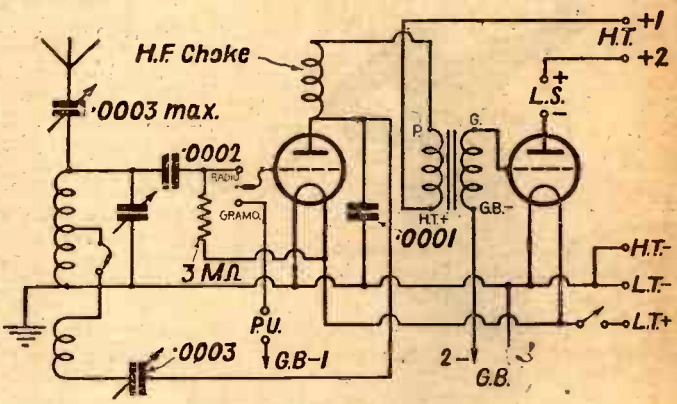
The switching is done, of course, with a plug and socket arrangement at the top of the coil.

The rest of the constructional workings are very straightforward as there is a three-ply panel and therefore no extensive ebonite work to be done. Even the terminal strip at the back is of wood. The wiring must, of course, be carried out in the ascending numerical order shown on the blueprint. Start off with wire No. 1, which connects the aerial terminal to the pre-set condenser. Check over all the wiring before you make a first test.

Note that at the front of the set the grid wire from the detector-valve holder is taken to a little wander plug which can be put in either the "gramo" or "radio" socket.

A medium-capacity H.T. battery or mains unit giving at least 120 volts at 15 milliamps is required to work this set to advantage. A 9-volt grid-bias battery is required.

The detector tapping H.T.+1 is taken to 80 or 100 volts on the battery or to a variable control on the mains unit. The H.T.+2 tapping is taken to the point of maximum voltage on either the battery or the eliminator. The tapping G.B.1 for the pick-up is taken to 1½ volts or 3 volts negative on the battery and the G.B.2 tapping to 7½ volts or 9 volts according to the valve manufacturers' recommendation for the maximum high-tension voltage available.



The circuit of the "25s. Two"

Valves Originally Specified for the "25s. Two"

Detector.—Mullard PM1HL, Mazda HL210, Marconi HL2, Osram HL2, Cossor 210HL, Six-Sixty 210HL, Lissen HL2, Fotos BC18, Tungsram H210, Dario HF, Eta BY2023, Triotron HD2.

Power.—Mullard PM2A, Mazda P220, Marconi LP2, Osram LP2, Cossor 220P, Six-Sixty 220P, Lissen LP2, Fotos BD9, Tungsram P215, Dario SP, Eta BW1304, Triotron ZD2.

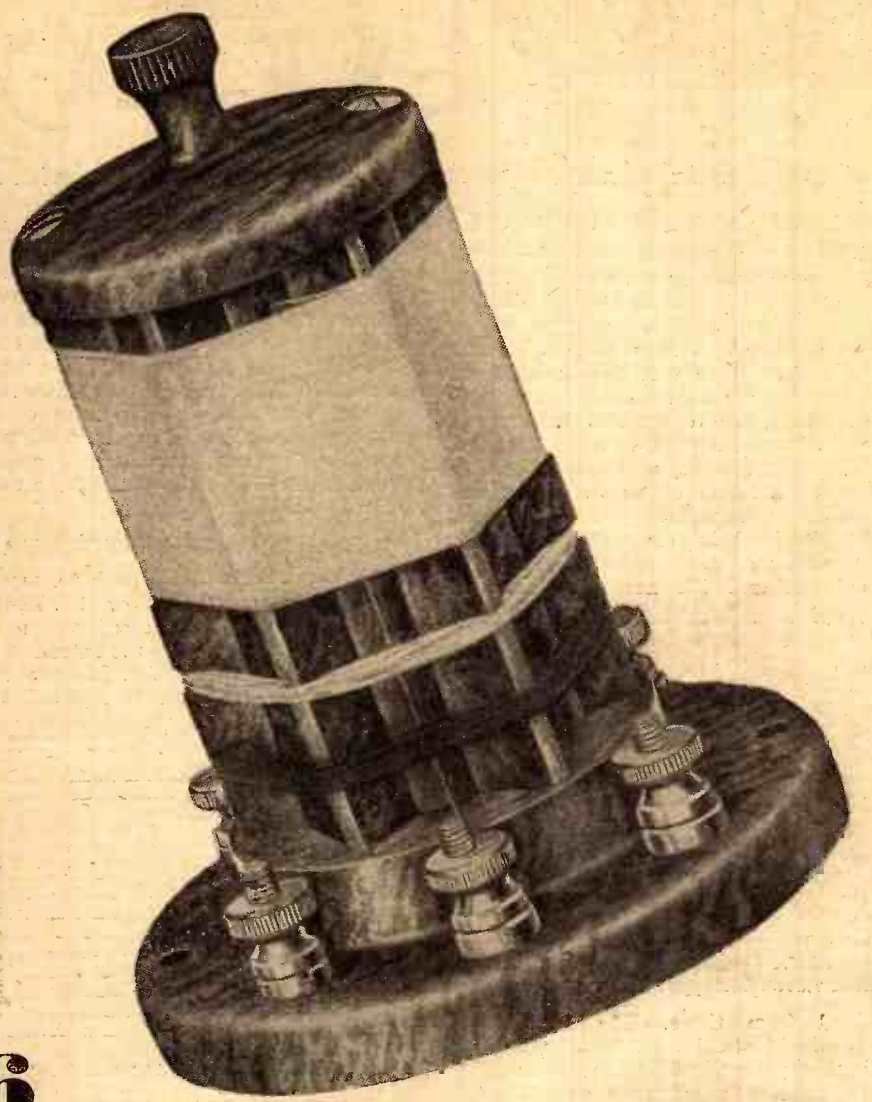
A full-size blueprint of this set and of others to be described in this series can be obtained from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, E.C.4. The print for this set costs 1s., post free.

A FULL-SIZE BLUEPRINT OF THIS POPULAR SET CAN BE SUPPLIED, PRICE 1s.—SEE LIST OF BLUEPRINTS ON PAGE 524

Two New LISSEN DUAL RANGE COILS

USED IN THE HOME-LOVER'S NEW ALL-ELECTRIC 3

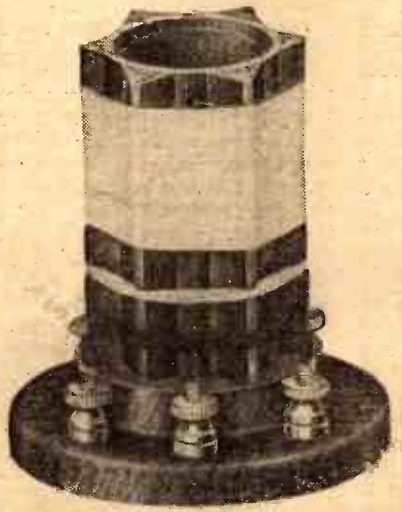
The designers of the 1933 Home-Lover's New All-electric Receiver have used and specified EXCLUSIVELY the new Lissen Unshielded Dual-range Coil, with inbuilt variable condenser for selectivity or volume control. The wave-band covered by these new Lissen Coils is 190 to 560 metres and 800 to 2,100 metres. Selectivity is of a very high order, and losses are exceptionally low. ***It can be said without fear of contradiction that these are the most efficient Unshielded Dual-range Coils available to home constructors to-day.*** **That is why "Amateur Wireless" have used them and why** ***YOU must specially insist upon them for the "Home-Lover's New All-electric 3."***



PRICE, complete with selectivity device **5/6**
(Anode Coil in this receiver)

PRICE, without selectivity device **4/6**
(Aerial Coil in this receiver)

LISSEN UNSHIELDED DUAL RANGE COILS



OTHER LISSEN PARTS

Also used in the "Home-Lover's New All-Electric 3"

Lissen Disc Type H.F. Choke **2/-**

Lissen Fixed Condensers:

.01 mfd., **1/-**

.002 mfd., .0005 mfd., **6d.**

Two .0001 mfd., **6d.** ea.

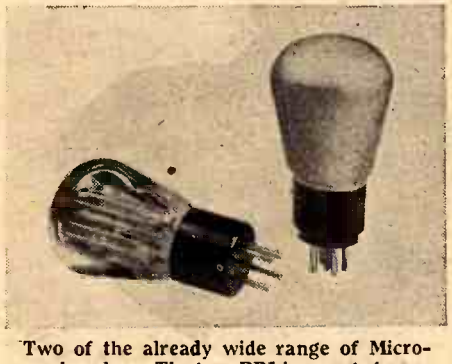
Lissen Grid Leak, with wire ends, 1 megohm, **1/-**

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

MICROMESH PB1 POWER VALVE

WE have recently tested one of the new Micromesh valves made by the Standard Telephones & Cables Ltd. This is a small power valve known as type P.B.1. The electrode system which is clearly visible through the very-lightly gettered bulb seems fairly conventional in arrangement. Very fine clearances have, been used between the grid and filament which probably accounts for the high amplification factor obtained. The valve is mounted on a normal type moulded base, split type pins being employed.

The static characteristics of the valve were taken and the normal parameters



Two of the already wide range of Micromesh valves. The type PB1 is reported upon

obtained from these. The figures are practically identical with those stated by the makers; the amplification factor being 16, the mutual conductance 4.2 milliamps per volt, and the impedance 3,800 ohms, these figures being obtained with 100 volts on the anode and zero grid volts. With 150 volts on the anode the maximum power output obtainable was of the order of 180 milliwatts.

The P.B.1 may also be used as an intermediate stage amplifier or in some cases as a power grid detector if a certain amount of power is required to drive the output stage.

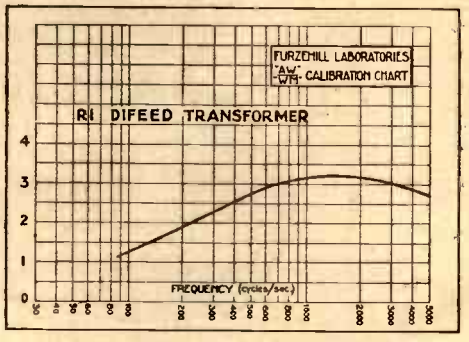
The valve retails at 8s. 9d.

SILTIT

WE have recently received particulars of a very interesting method of improving the earth connection. For this to be put into use it is not necessary to discard the present tube or plate, but only to ensure that the wire connection to such is in good condition. The method consists in burying close to the earth plate or tube a cartridge containing hygroscopic chemicals mixed with highly conductive metallic compounds. The action is, roughly, as follows: The hygroscopic chemicals attract the moisture to themselves and keep the earth surrounding the tube or plate in a permanently damp condition. The metal compounds are dissolved by the moisture, and thus a very low resistance connection is formed. These cartridges are sold under the name of Siltit, and anyone having any suspicion as to the performance of his earth connection should consider the purchase of one of these cartridges. The retail price is 1s. 6d., and the makers the Siltit Co., of Birkenhead, Cheshire.

R.I. DI-FEED TRANSFORMER

WE were very interested to receive recently one of the new R.I. Di-feed transformers for test. As is indicated by its name, this transformer is intended for use in direct-feed circuits, although, of course, it can be used in parallel feed circuit if required. A special nickel alloy iron is used for the core, and the primary



This curve for the R.I. Di-feed transformer shows the variation of effective ratio with frequency over the whole audio range

winding is rated to carry up to 4 milliamperes without undue saturation occurring. The transformer is housed in a small moulded bakelite case, which is extended at the bottom to form a base to facilitate mounting, and to carry the four terminals. These latter are provided with slots to enable tightening by means of a screwdriver.

The transformer was tested under actual working conditions, a 15,000-ohm valve being used on the primary side. The results of the test can be seen from the chart accompanying this report, the curve showing the variation of effective ratio with frequency over the whole audio range. During this test the steady anode current through the winding was 2.7 milliamperes.

The inductance of the primary winding with no direct current in circuit was approximately 26 henries, this dropping to about 8 henries at the rated 4 milliamperes. Our tests indicated, however, that it was preferable to limit the D.C. to about half the value, as otherwise distortion was liable to occur. Most detector valves fall within this limit, however.

The retail price is 7s., which is very reasonable in view of the performance.

A further edition of "Cue for Number —, Some Pages from Music Hall History," will be given on April 5, and the period to be covered will be the war years. These programmes are being prepared by Mr. L. E. Williams for broadcasting to the West Region.

The first of Mr. James Agate's talks on "Stars in Their Courses," for which distinguished actors and actresses are to play short scenes by way of illustration, is to be broadcast on April 8, the "stars" dealt with on this occasion being Lewis Waller, Sir Herbert Tree, Arthur Bourchier and Dame Ellen Terry. They will speak from gramophone records. On April 15 the artists are Sir Johnston Forbes-Robertson and Dame Sybil Thorndike. Sir Johnston will speak from a record and Dame Sybil is at present in Australia, but permission has been obtained to play a record by her. The rest of the famous artists represented in Mr. Agate's talks will visit Broadcasting House and record their voices by Blattnerphone (Stille Process), expressly for the series.

Readers who are building the Short-wave Adaptor (suitable for practically every battery-driven set) described last week, and wish to have a full-size blueprint, should note that the order number of the print is 382, and not 381 as stated last week. The print costs 1s., post free.

"Amateur Wireless and Radiovision." Price Threepence. Published on Wednesdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to "Bernard Jones Publications, Ltd."

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets. **Contributions** are always welcome, will be promptly considered, and if used will be paid for. **Communications** should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," 58-61 Fetter Lane, London, E.C.4.

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A permanent-magnet moving-coil unit. Extremely sensitive. Perfect quality. (Cash or C.O.D., Carriage Paid, 29/6.)

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ROLA PERMANENT MAGNET MOVING-COIL SPEAKER F.6. With Universal tapped input transformer. Cash Price £2/9/6. Carriage Paid. Balance in 11 monthly payments of 4/3. — Send **4/6** only

EPOCH "20 C" PERMANENT MAGNET MOVING COIL SPEAKER. With 3-ratio input transformer. Cash Price £1/15/0. Carriage Paid. Balance in 5 monthly payments of 6/9. — Send **6/6** only

BLUE SPOT UNIT AND CHASSIS. Type 99 P.M. Including matched transformer. Cash Price £2/19/6. Balance in 11 monthly payments of 5/6. — Send **5/6** only

CELESTION P.P.M. PERMANENT-MAGNET MOVING-COIL SPEAKER with impregnated diaphragm and dual-impedance input transformer. Cash Price £2/7/6. Carriage Paid. Balance in 11 monthly payments of 4/6. — Send **4/6** only

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FOR "A.W." READERS

BLUE SPOT 100U Speaker and Chassis. For high or low powered Sets. Original Price £1/12/6. Our Price (for a limited period only), CASH or C.O.D., Carriage Paid. **19/6**

S.G. BROWN ELECTRIC PICK-UP. Famous for Sensitivity. List Price £2/15/0. Our Price (while stocks last), CASH or C.O.D., Carriage Paid. **17/6**

R & A "CHALLENGER" PERMANENT-MAGNET MOVING-COIL SPEAKER. With special Ferranti multi-ratio input transformer. Cash Price, £1/15/-. Carriage Paid. Balance in 5 monthly payments of 6/3. — Send **6/6** only

ATLAS ELIMINATOR. Type A.C.244. Three tappings. S.G., Detector and Power. Output: 120 volts at 20 m/A. Cash Price £2/19/6. Carriage Paid. Balance in 11 monthly payments of 5/3. — Send **5/6** only

GARRARD INDUCTION GRAMOPHONE MOTOR. For A.C. Mains. Model 202. Mounted on 12-inch nickel motor plate with fully automatic electric starting and stopping switch. Cash Price, £2/10/0. Carriage Paid. Balance in 11 monthly payments of 4/7. — Send **4/7** only

GARRARD AUTOMATIC RECORD CHANGER for A.C. mains. Mounted on unit plate complete ready for fitting in position, including Garrard pick-up and tone-arm. Cash Price £10/0/0. Carriage Paid. Balance in 11 monthly payments of 18/6. — Send **18/6** only

HOME-LOVER'S NEW ALL-ELECTRIC THREE

These are the Parts the Author Used

SET PORTION

	s.	d.
1 PETO-SCOTT ready drilled ply-wood panel, 13 in. by 7 in.	2	6
1 Peto-Scott baseboard, 16 in by 10 in.	1	3
Aluminium foil, 16 in. by 10 in.	1	0
1 LISSEN "Disc" H.F. choke	2	0
1 SLEKTUN Standard H.F. choke	4	0
1 LISSEN dual-range unshielded aerial coil, type 5314	4	6
1 LISSEN dual-range unshielded coil with selectivity control, type 5180	5	6
3 LISSEN fixed condensers; 1 each, .01-mfd., .0005 mfd., .0001-mfd.	2	0
2 BRITISH RADIOPHONE 1-mfd. fixed condensers	4	8
2 POLAR No. 4 .0005-mfd. tuning condensers	8	0
2 POLAR plain black dials	2	0
2 GRAHAM FARISH .0003-mfd. bakelite di-electric variable condensers	4	0
2 W.B. rigid baseboard mounting valveholders, 5-pin	1	4
1 W.B. 5-pin horizontal-mounting valveholder	1	0
Erie fixed resistances—2, 20,000 ohms; 1 each, 25,000 ohms, 50,000 ohms, 350 ohms	5	0
1 LISSEN 1-meg grid leak	1	0
1 WEARITE combined 5-point shorting switch, mains on-off switch and 10,000-ohm potentiometer	9	0
1 R.I. Parafeed L.F. transformer, type DY23	8	6
1 Aluminium screen, 9½ in. by 6 in., with hole for S.G. valve	2	0
2 TELSEN terminal blocks	1	0
Aluminium strip, 7 in. by 1½ in., screws, connecting wire, sleeving, flex and short length of shielded wire	2	6
	£3	12	6

MAINS UNIT

	£	s.	d.
1 Peto-Scott Speaker Baffle and Mains Unit Baseboard		3	6
2 DUBILIER 4-mfd. electrolytic fixed condensers		9	0
1 DUBILIER .2-mfd. fixed condenser, type BE256, centre tapped		2	6
1 LISSEN .0001-mfd. fixed condenser			6
1 LISSEN .002-mfd. fixed condenser		1	0
1 BULGIN type F.15 combined twin fuseholder and mains connector		3	6
1 W.B. 4-pin valveholder			6
1 ROLA type F3-2,000 mains-energised loud-speaker	1	7	6
1 HEAYBERD mains transformer, type H.L.3, as specified	1	2	0

KIT "A"

Author's Kit of First Specified Parts for SET PORTION only, excluding Valves, Cabinet. Cash or C.O.D., Carriage Paid.

Power Unit and Speaker.

£3 12 6

Or 12 monthly payments of 6/10.

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Or 12 monthly payments of 19/-.

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MELODY RANGER
BATTERY MODEL

KIT "A" Author's Kit, comprising all FIRST SPECIFIED components, including READY DRILLED engine-turned Aluminium Panel as listed, but less valves and cabinet. CASH or C.O.D. Carriage Paid. **£6:6:0**

Or 12 monthly payments of 11/6.

KIT "B" As Kit "A," but with Valves, less cabinet. Cash or C.O.D. Carriage Paid **£8 5 3**

Or 12 monthly payments of 15/3.

KIT "C" As Kit "A," complete with Valves and Peto-Scott American type Oak Cabinet, with lift-up lid. Cash or C.O.D. Carriage paid. **£9 0 0**

Or 12 monthly payments of 16/6.

TELSEN "325 STAR." Complete kit of parts in sealed carton, less valves. Cash or C.O.D., Carriage Paid, £1/19/6. Balance in 7 monthly payments of 5/6. (Set of valves, add 3/6 to each of 8 payments). — Send **5/6** only

TELSEN SUPER "SELECTIVE" 4. Complete kit of Telsen parts in sealed carton. Cash or C.O.D., Carriage Paid, £4/18/6. Balance in 11 monthly payments of 9/-. (Set of valves, add 5/3 to each of 12 payments). — Send **9/0** only

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CONTAINS 1 Q.P.P. Transformer, 1 Q.P.P. Output Choke, 4 Non-Inductive Resistances, 1 Potentiometer, 2 Mansbridge Condensers, 2 Valve Holders, 1 Tone-Compensating Condenser, 1 H.F. Choke, G.B. Plugs, Wires, Screws, Flex, etc.

CASH or C.O.D. Carriage Paid **42/6** or 8 monthly payments of 6/-

With FULL SIZE diagrams and constructional notes.

KIT "B" but with Valves, Cash or C.O.D., £3/17/6. Or 12 monthly payments of 7/-.

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TELSEN "ALL-MAINS S.G.3." Complete kit of Telsen parts in sealed carton. For A.C. mains only. Cash or C.O.D., Carriage Paid, £6/18/6. Balance in 11 monthly payments of 12/8. (Set of valves, add 5/7 to each of 12 payments). — Send **12/8** only

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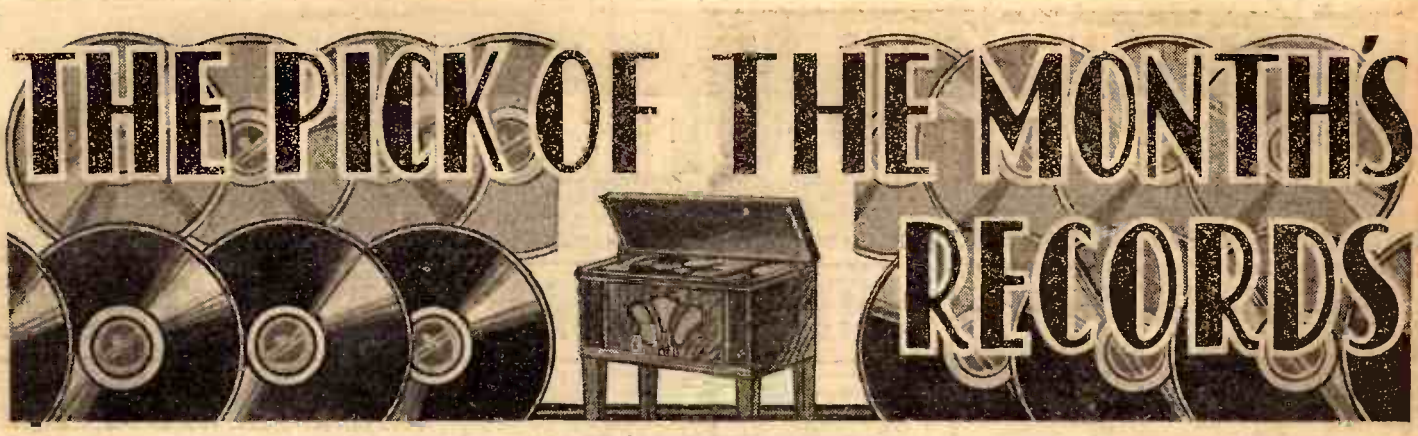
THE PICK OF THE MONTH'S RECORDS



The records reviewed below are a careful selection of the best of the recent issues. It will be noted that criticism is chiefly devoted to the treatment of the music and quality of recording rather than the actual composition

ORCHESTRAL RECORDS

Morning Papers and **Du und Du**, 2s. 6d. **H.M.V. B3898**
Splendid! Two of the most popular of Strauss melodies. And how delightfully played by the Marek Weber's Orchestra!

Love Songs (J. Strauss), 4s. **H.M.V. C2339**
This performance may best be described as "rich." I should have preferred a little less opulence in such a theme than the Vienna Philharmonic bestow.

That Pair of Matchless Eyes and **I'll Give You Away to God**, 2s. 6d. **H.M.V. B4135**
This Hungarian Gypsy Band make their strings positively *sob!* Two very quaint pieces.

Passepied and Pavane, 2s. 6d. **H.M.V. B4237**
Most people know these—from Delibes' "Le Roi s'amuse." They are by the L.S.O., and the stately grace of (2) is really delightful.

Der Freischütz—Potpourri, 4s. **H.M.V. C2506**
Weber by Weber—Marek, that is. I'll pass this one, with pleasure.

Brandenburg Concerto No. 2 in F major, 7s. **DECCA POLYDOR LY6061-2**
This is not so well known as the popular No. 2. Here it is done by the Berlin Philharmonic Orchestra with fine balance throughout. The piece is for trumpet, oboe, flute and violin, each of which is well played. The slow movement in Side 3 is the gem really.

Mon Cabot and **Ce Sont Vos Jolis Yeux**, 2s. **DECCA F3310**
Two very neat and pleasant little numbers by Rene Presenti's Orchestra. There aren't half enough of these jolly teatime pieces and I am sure everybody will like these.

El Relicario and **The Golden Musical Box**, 1s. 6d. **BRDCST 3277**
The Commodore's latest contribution. The first well-known piece has the correct dash, whilst the second is well enough.

BAND RECORDS

El Abanico and **Under the Banner of Victory**, 1s. 6d. **REGAL ZONO MR749**
By massed brass bands. A really magnificent performance. Every phrase of it is a real thrill.

DANCE RECORDS

Roll Along, Kentucky Moon and **Ich Liebe Dich, My Dear**, 2s. 6d. **H.M.V. B6307**
By the new Mayfair Dance Orchestra. The first (waltz) is miles ahead of the other.

Mighty River and **One Little Word Led to Another**, 2s. 6d. **BRUNSWICK 1385**
The Casahoma Orchestra are pretty sound in these two fox-trots. The vocals, however, are poor.

Always in My Heart and **Strange Interlude**, 2s. 6d. **BRUNSWICK 1414**
These two fox-trots are splendidly done by Anson Week's Orchestra. They take no undue liberties and have a vocalist.

I Don't Want to Go to Bed, Lying in the Hay, Yes, Mr. Brown and **Dreaming**, 1s. 6d. **BRDCST FOURTUNE 501**
The first two are by the Rhythm Rascals, and the other two by the Blue Mountaineers. Without doubt, all are competent performances.

That's Certain, Let's Put Out the Lights, Don't Say Good-bye and **You, Just You** 4 in 1, No. 22
Pair (*a*) by Rudy Statria's Band, and (*b*) by The Fifteen Crimson Dominoes. All are first-rate in every way with good vocals.

Every Woman Thinks She Wants to Wander and **When Anybody Plays or Sings**, 2s. 6d. **COL CB550**
Here is dance music of the most brilliant kind and—the music is by Oscar Strauss. They are both from "Mother of Pearl."

Love is the Sweetest Thing and **You'll Always Be the Same Sweetheart** 1s. 6d. **REGAL ZONO MR787**
By the Midnight Minstrels. This is a competent band (leaning a bit heavily to brass for these two, perhaps) and they play well.

Poema and **Tahiti**, 1s. 6d. **REGAL ZONO MR808**
The performance of these tangos bears the stamp of the real import. The Orquesta Posenti are a capable little lot, and have a very atmospheric lady vocalist.

VOCAL RECORDS

Melodies of Robert Burns, 4s. **H.M.V. C2511**
A very pleasant, clean performance of some nine of the poet's best. The soloists of the Light Opera Company sing very well indeed.

The World Laughs On and **Red Lips Unkissed**, 2s. 6d. **H.M.V. B4335**
Eric Bertner (tenor) has *just* the voice for these two songs from "A Kiss in Spring." Quite a safe record.

By the Weser (Pressel) and **On the Water** (Schubert), 2s. 6d. **DECCA POLYDOR DE7020**
Two more delightful *lieder* by Scheusnus. The first has that typically German festive spirit; the second is, of course, one of Schubert's best-known songs. They are superbly sung and have an accompaniment by the Berlin State Opera Orchestra.

The Rose of Tralee and **The Snowy-Breasted Pearl**, 2s. **DECCA F3379**
By Titterton. His singing of the first is much the better, and so is his diction. This is not to decry the second: it is merely a matter of comparison.

I Want to Go to Idaho and **That's Just Like Heaven to Me**, 1s. **BRDCST 930**
By G. H. Elliott, of course. Anybody collecting coon songs of a generation ago can safely collect this one.

Sigh No More, Ladies and **Come Back to Erin**, 1s. 3d. **PANACHORD 25371**
I like the voice of William Watt (tenor). He has no tricks, and good diction.

INSTRUMENTAL RECORDS

Sicilian Mariners and **The Magic Harp**, 4s. **H.M.V. C2453**
This record has a melancholy interest—it is a posthumous issue of Arthur Meale's performance on the organ of the Central Hall, Westminster.

MISCELLANEOUS RECORDS

The Black-Hand Gang, 1s. **BRDCST 925**
Wee Georgie Wood in a good little sketch. The confession that he broke the police station window is really excellent.

Let's Have a Party and **Let's All Be Fairies**, 1s. 3d. **Imp 2812**
By the Leslies Holmes and Sarony respectively. Well done, both. I like the first better.

In a Shanty in Old Shanty Town and **While We Danced at the Mardi Gras**, 1s. 3d. **Imp 2808**
The guitar twangings of Roy Smeck's Vita Trio are languorously pleasing.

Songbird Yodel and **Happy Hawaiian Blues**, 1s. 3d. **PANACHORD 25393**
Some good guitar playing by the Hawaiian Song Birds.

Petite Mimi Waltz and **Valse La Reine**, 1s. 3d. **STERNO 1100**
Zigano's Accordeon Band play these splendidly. The tunes are quite good in their class.

Hawaiian Eyes and **Aloha, Sunset Land**, 1s. 6d. **REGAL-ZONO MR783**
An excellent eighteenpennyworth of Hawaiian atmosphere. By José Norman's Novelty Band.

HOW TO USE "EVERYBODY'S HOME RADIOGRAM"

Further details of the new radiogram described in the two preceding issues and designed by PERCY W. HARRIS, M.Inst., Rad.E.

LET us consider now what has to be done as soon as you have finished the simple constructional work on "Everybody's Home Radiogram," and how you can best adjust it to your particular conditions and requirements.

Before the set can be operated we must, of course, insert the valves, and here you have a wide choice among the good makes. The first valve must be a battery variable-mu screen-grid valve, and the set is *so* designed to take the ordinary non-variable-mu screen-grid valve. Suitable valves are given in the table. For the detector I strongly recommend one of the H.L. type.

So far as the output valve is concerned you have three different types to choose from, and which of them you use will depend on the facilities available. If, for example, you are running off dry batteries and high-tension economy is essential, then the valve for you is the economical type of output valve. If, however, you have a mains unit with an adequate high-tension supply then by all means use a super-power valve which will handle a much bigger grid swing without distortion. If the maximum L.F. gain is required, remember that a pentode can be used with only the slightest change of connection.

Using a Pentode

The alterations in connections when you desire to use a pentode are very simple and do not make for any increase of cost, as the set is already provided with an output choke.

As we have a variable-tone transformer and as a moving-coil loud-speaker is built into this set, it is quite unnecessary to have any tone-correcting circuit for the pentode. In case you do not know it, the tendency to shrillness which occurs with the pentode when used with the moving-iron type of loud-speaker is much reduced with the moving-coil type, and what little difference there is in high-note reproduction between the ordinary output valve and the pentode is adequately taken care of by the Multitone transformer.

Grid bias in this receiver is applied both to the variable-mu valve and the output valve. So far as this latter is concerned, the correct grid bias for the particular high-tension voltage you are using will be given you on the leaflet accompanying the valve (it varies with different types and makes). So far as grid bias for the variable-mu valve is concerned, you should place the plug at the maximum negative tapping of the battery and leave it there, the variation in grid bias being taken care of by the special volume control potentiometer.

With all the battery connections correctly made, the first adjustment is that of the variable condenser. First of all turn the selectivity control condenser as far as it will go to the right and insert the plug on the flexible connection coming from this condenser in the socket No. 1 of the first coil. The plug in the second coil should also go into socket No. 1, while the knob of the volume control potentiometer should be turned as far as possible in a clockwise direction. The reaction knob should be turned full off or as far as it will go in an *anti-clockwise* direction. Before switching on pull out the wavechange switch which will put the receiver into condition to operate on the medium band. Now switch on and turn the tuning knob and you will soon find the stations.

SUITABLE VALVES FOR "EVERYBODY'S HOME RADIOGRAM"

Make	*H.F.*	*Detector*	*Output*
Mullard ..	PM12V	PM1HL	PM2A
Mazda ..	SG215VM	HL2	P220
Marconi ..	VS2	HL2	LP2
Osram ..	VS2	HL2	LP2
Cossor ..	220VSG	210HL	220P
Six Sixty ..	SS215VSG	SS210HL	SS220P
Lissen ..	SG2V	HL210	220P
Eta ..		BY1814	BW1304
Triotron ..	S208	SD2	ZD2
Tungsram		H210	P215

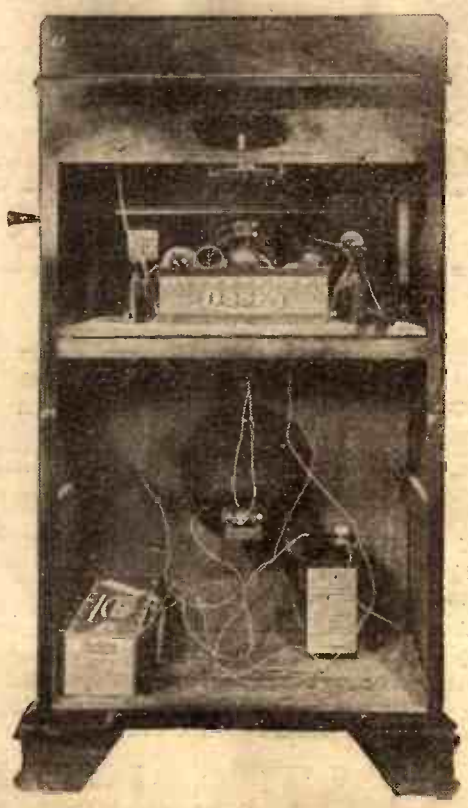
Tuning Adjustments

It so happens the scale is marked in wavelengths on this condenser, but you must not expect dead accurate wavelength readings over the whole scale. The best thing to do is to pick a station fairly low down the tuning scale (the London National will do) and tune it in. The central or trimmer knob on this tuning condenser can be rotated to half a turn; turn it as far as it will go in both directions so as to find its exact travel and stop half way between these extreme points. Now do not touch it again just yet, but tune the station in accurately on the main knob.

If the strength is too great, reduce it by means of the volume control until it is just reasonable and you can make sure of an accurate reading. If the reading of this station does not correspond with the wavelength marking, then take a screwdriver and turn the trimmer condenser on the second section of the condenser box slightly one way or the other and then re-tune. Screwing this condenser in will vary the tuning position on the scale so as to make it read lower, while unscrewing it his condenser will have the opposite effect.

When this is done the wavelength scale should be fairly accurate over the whole range, and you can then proceed to use the receiver in the ordinary way, only touching the smaller central knob for dead accurate tuning and for getting the maximum strength when you are using reaction. You will find the receiver delightfully simple to operate, and for all ordinary use the small central knob can be ignored.

Before making any other adjustments, try out the receiver thoroughly in its present state. In very many conditions its selectivity will be quite adequate and you will not desire to make it any sharper.



Motor, receiver, loud-speaker and batteries are clearly shown in this photograph, all taken with the back of the cabinet removed

Controlling Selectivity

If the selectivity is insufficient for your requirements then turn the selectivity control knob in an anti-clockwise direction and if necessary use a little reaction to make up for the slight loss of strength. An alternative method is to leave the selectivity control at its maximum setting (as far as it will go in a clockwise direction) and to move the plug from socket 1 to socket 2 on the first coil. Changes in selectivity can also be obtained by moving the plug on the second coil from socket 1 to socket 2; general selectivity changes will be made on the first coil.

At the other end of the scale and if you should be so placed that you have no powerful station very near to you and would like to have a little more strength at some sacrifice of the excellent selectivity possessed by this receiver, then you can take a lead from the selectivity condenser to terminal No. 6 (the grid terminal) on the coil in place of the lead to the wander plug which normally goes into socket 1, 2, 4 or 5.

With careful and critical adjustment of the selectivity condenser and reaction it is possible to isolate Königswusterhausen from both long-wave National and Radio Paris—no mean achievement for a set of this kind.

The change over to the gramophone side, of course, requires no explanation as it is only necessary to turn the switch, start the motor and place the pick-up in position.

Facts and Fallacies About "D.X."

THERE are probably more fallacies about long-distance reception than about any other subject connected with wireless communication.

"D.X.", by the way, is an amateur abbreviation for *long distance*.

Devotees of the art of long-distance reception, if you can call this pursuit of ether vibrations an art, are often referred to as "D.Xers"—in America they are often known as "D.X. hounds."

A fallacy we should like to talk about is the widely held theory *that range of reception depends entirely on the size of your set*. On this assumption it is only a question of power at the receiving end.

Transmitting Power

The fact is that really good reception from any distance more than a few miles depends just *as much on the power of the transmitter as on the amplifying properties of the set*.

It is not difficult to see how this fallacy has grown up. It is a fact that up to a point the more amplification you have in the set the better is your chance of getting in touch with very distant parts of the world.

"D.X." reception, as such, is not necessarily a question of finding programme alternatives to the local stations. If this were so many of the stations that are logged nightly by amateurs would have to be wiped out as useless. For they are useless, many of them, as programme alternatives to the locals.

The Biggest Fallacy

Which brings us to the very heart of the fallacy we are trying to show up. The fallacy is that amplification at the receiving end will make good the weakest of signals, enabling that signal, no matter how weak it may initially be on arrival at the aerial to be built up into a signal of full loud-speaker strength.

Where, you may ask, is the fallacy? It is not easy to see but very easy to *hear*! By which we mean that you can prove the fallacy for yourself simply by tuning in a weak signal on a powerful set.

What do you hear? A strong signal, certainly.

What else? *A great deal of noise*.

Indeed, if the signal is below a certain level of strength the noise developed by the great amount of amplification will make enjoyable reception impossible.

That is why stations have high power. Not to reach out to the ends of the earth. Oh, no! The idea is to provide listeners within the "service area" with a signal that *that does not need much amplification*.

A signal that can be brought up to loud-speaker strength with very little amplification has little or no background. *It is not only a signal—it is an enjoyable programme*.

Of course, as an incidental advantage, the modern high-power station does provide a very good field strength, especially after dark, far outside its service area simply because it is not possible to limit wireless waves to the area in which they are destined to be well received.

This means that after dark when you get waves coming along the ground and from the reflecting layers above the atmosphere, many foreign programmes have what is now called "entertainment value."

The ratio of the station's strength to the strength of all extraneous noises is sufficiently great to enable moderately "clean" reproduction to be obtained.

It is really one of the greatest imaginable fallacies to believe that foreign station reception is intentional.

When the B.B.C. put up its regional stations at Brookmans Park and Moorside Edge, for example, it intended to service London and the North of England with good signals of high programme value, that is, with signals free from background.

It certainly did not intend to supply Czechoslovakian listeners with alternative programmes any more than the Czechs intended to supply us with a strong signal when the Prague giant took the air!

That we all enjoy the more or less accidental advantages of the ether's funny little ways should not blind us to the fact that all this foreign station reception *is an accident*.

Still, within the past year or so set makers, in order to meet the needs of listeners with a taste for the joys of "D.X." have concentrated on the problem of turning the accident to good account. So that now, with a modern super-het *fitted with an automatic-volume-control valve*, it is possible to tune in many of the foreign stations with as much certainty as the local.

This automatic volume control valve is a coming thing. It is likely to revolutionise our ideas about "D.X."

Levelling Up Signals

Hitherto, even with the best of sets, you have usually been able to spot the difference between a nearby and a distant station by the periodical fading of the latter. Now, with such strong signals, whose intensity even at the minimum point of the fade is still above "static level," the use of automatic volume control has become worth while.

With this new device, which takes the form of an extra valve controlling the amplification of all the high-frequency valve, it is easy to level up a signal of varying intensity, so that unless the signal fades right out there is an automatic compensation of any temporary reduction in the strength.

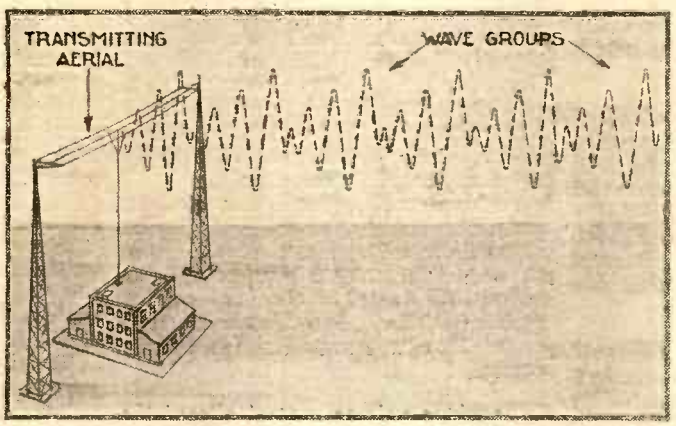
Big Sets and Small

It is often contended that a multi-valve set will provide you with many more signals of entertainment than say a modest three-valve set. That is dangerously near to being another fallacy. *What the little set can do the big set merely serves to emphasise*.

The well-designed three-valver of to-day has enough amplification to give you practically full loud-speaker strength from all the worth-while foreign stations. It will enable all signals that are initially above static level to be brought in at loud-speaker strength without much background.

The disadvantage of such a set is not limitation of amplification but lack of selectivity. With a larger set you can get probably more stations because there may be some worth-while stations masked by the locals on the small set.

This will not greatly add to the total log of stations, though. The real advantage of the bigger set lies in its easier control. To get the most from the three-valver you have to juggle to some extent with reaction and volume controls, whereas with the big set you just turn the knob and there you are.

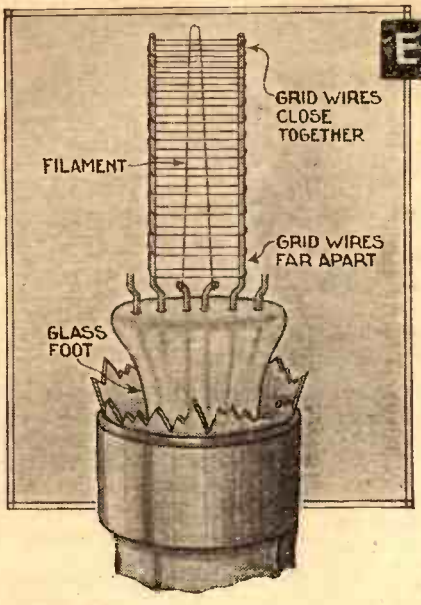


A diagrammatic idea of how a wireless station sends out waves in groups, that is low-frequency current from the microphone superimposed on the high-frequency current generated by the valves. Remember, as we say in this article, that a station really does not intend to send out its waves beyond the limits of its service area. It is an accident—a very happy one, of course—that enables us to log distant stations at entertainment strength

ELEMENTARY WIRELESS COURSE

ALL ABOUT THE "VARIABLE-MU"

This week J. H. REYNER and the "A.W." STAFF show how the variable-mu type of screen-grid valve provides us with a really effective control of the volume, by varying the amplifying property of the high-frequency valve or valves without in any way affecting the quality of the reproduction



Note that in the variable-mu type of screen-grid valve the grid is shaped so that at one end the turns are closer together than at the other. It is this construction that enables the amplification of the valve to be controlled by varying the grid bias

What is a variable-mu valve?

It is a special form of valve in which the amplification can be altered at the will of the user.

Is the amplification usually fixed, then?

Certainly. With a particular valve and a particular circuit connected to it, the amplification or step-up is more or less fixed. We can vary it slightly by altering the high-tension or the grid bias, but in general the value remains more or less constant unless we alter the circuit.

How is a variable-mu valve different?

In the variable-mu valve the actual amplification obtained depends upon the value of grid bias. If the bias is small the valve amplifies considerably. If we increase the bias, the amplification falls off, and if we make the bias quite large so that there is a voltage of 20 or more on the grid the amplification is so small that the valve hardly increases the strength of the signal at all.

What is the use of a valve like that?

It is particularly helpful in controlling the strength of the signals. When we are receiving distant stations, from which the wireless waves reaching the aerial are very feeble, we wish to develop the fullest possible amplification from the receiver and we therefore make our receiver capable of considerable magnification and often assist the process by the use of reaction, as I explained last week.

What will happen when we use a receiver having such an enormous amplification on a signal from a local station which by itself would be sufficient to operate the detector without any high-frequency amplification at all?

Wouldn't it produce a deafening noise?

It would, but for the fact that the valves in the ordinary receiver are not capable of handling more than a certain signal. The result is that they overload and, as you know, this introduces distortion. Practically every valve in the receiver would overload with the most horrible results, as far as the reproduction was concerned.

What is the remedy for this overloading?

The obvious solution is to remove the high-frequency amplification altogether. In the old days we used to do this by a switch which transferred the aerial from the beginning of the set to the detector stage, thereby leaving out the high-frequency amplifier completely.

Such an arrangement is rather crude, and although it works on local stations it has the disadvantage that it is either all or nothing. It is not possible to adjust the amplification to suit a medium station. In other words, it is essential to have some form of volume control.

I thought a volume control altered the strength?

So it does, but you will appreciate the difference between the two forms of volume control. We can allow the receiver to amplify to its fullest extent and only a small fraction would be useful in producing sound from the loud-speaker.

Surely we never do that?

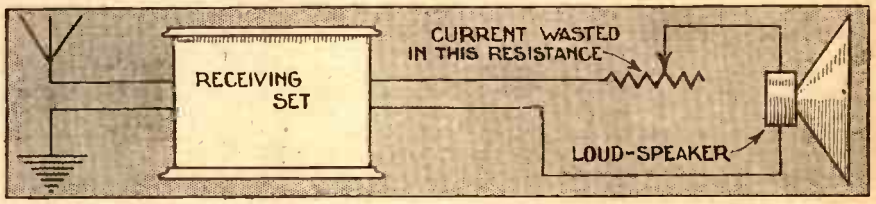
It is done more often than you think, and it is admittedly sometimes convenient to throw away some of the power in this manner. The fundamental snag in this system, however, is that the receiver will overload on a strong signal as I have just explained.

You will appreciate that it would be very much better if, instead of controlling the volume at the output end of the receiver, we controlled the amplification of the earlier stages in the set. We could then adjust the total magnification so that it was just sufficient to supply the power we want. This is the modern system of volume control, and is not only more scientific, but much more pleasing in operation.

Why did we not always use this system?

Because we were not able to vary the amplification satisfactorily. I have just told you that with the ordinary type of valve the amplification with a particular circuit is more or less fixed.

Various attempts were made with partial success to obtain a satisfactory volume control from the aerial circuit by cutting down the actual input to the receiver, but by far the most satisfactory system is that of controlling the actual amplification of the receiver to suit the particular station.



If the noise from the loud-speaker is too great it is possible to waste some of the current by means of a variable resistance in series with the loud-speaker and the loud-speaker terminals, as shown above. This is a very crude method and is seldom used

and then use just as much of the output as we want.

We might deliberately waste some of the power by putting a high resistance in series with the loud-speaker. Most of the energy in the output stage would then be wasted in heat in the resistance

Then has the variable-mu valve made real volume control possible?

You might almost say so. This form of valve is being developed to a surprising extent to-day, owing to the extreme flexibility which it gives the set designer.

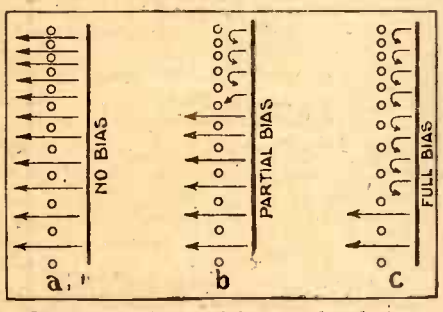
NEXT WEEK: HOW A "PORTABLE" WORKS

I don't quite understand the name "variable-mu."

Mu is the symbol which engineers use to indicate amplification, so that a variable-mu valve simply means a valve having a variable amplification.

How does it differ from an ordinary valve?

It is really made up of a number of valves, all rolled into one. I have told you that if we have a valve with a close grid winding in which the wires are relatively close together, the amplification factor of the valve is high. A small voltage on the grid produces a large change in anode current, and with a suitable circuit we can obtain a considerable step-up. If we use an open grid in which the wires are far apart, the amplification factor is quite small.



The three conditions of the control grid when the bias of a variable-mu valve is varied. At A you see that there is no bias, and so all the grid is in use. This gives the fullest possible control of the electrons passing from the filament to the anode and provides the highest sensitivity. At B there is partial bias and electrons at the close-mesh end of the grid cannot get through so sensitivity is reduced—so is volume. At C the full bias is applied and electrons can get through only at the open mesh end of the grid so sensitivity is very small

Now, a variable-mu valve is one in which the distance between the grid wires is not constant. At one end it is very little, so that the grid wires are close together. As we proceed towards the other end, the spacing between the wires gets larger and larger until at the other end we have an open-mesh grid.

Thus, you see, we have a valve composed of a number of individual pieces each of which has a different amplification factor, and by altering the bias on the valve we are able to choose which particular part of the valve we will work on.

Why should the grid bias control the amplification?

Look at it in this way. We have the filament emitting electrons which are being drawn across to the anode. In the electron stream is the grid.

With no bias on the grid it has little effect on the electron flow and if we place a small oscillating voltage on the grid it will control in the usual way, and we shall obtain the full effect of the close mesh giving us a high amplification.

As we place a negative voltage on the grid we tend to choke back the electrons into the filament, and this effect will obviously be stronger at the end where the grid wires are close together.

Thus the electrons at that end of the filament are rendered more or less useless, and it is only the electrons at the other end which are able to get through to the anode. At this point, however, the mesh of the grid is much wider, and the effective amplification will consequently be appreciably smaller.

This is a gradual process, and in effect you can consider that, as we place more and more negative voltage on the grid, we gradually force the electrons to the other end of the grid, where the amplification gets less and less until the valve is hardly amplifying at all.

That seems very ingenious to me?

It is a very neat arrangement and one which is very easy to use in practice. We do not alter the circuit at all, but simply vary the grid voltage on the valve. The amplification then gets less and less as we reduce the amplification factor of the valve.

Can any valve be made like this?

Yes, but in practice, the principle is usually applied only to screen-grid or pentode valves. The principal place where we wish to control is in the high-frequency stages, and, as you know, these are usually made to incorporate screen-grid valves, owing to the better performance and greater stability which these valves give.

Then the variable-mu valve is a screen-grid valve?

As a rule, yes. In appearance it is just like the ordinary screen-grid valve, the only difference being that it has what a valve designer once described as a "scientific hole" in the grid.

Is the variable-mu principle only applied to high-frequency valves?

There is no reason why it cannot be applied to low-frequency valves if suitable precautions are taken, but it must be remembered that with a low-frequency amplifier we have the question of distortion to consider. Our object is to produce a valve in which the characteristic is straight, so that the anode current variation is exactly the same as the voltage variation on the grid, and the variable-mu characteristic is *not* straight. As a general rule, therefore, we only use the valve in the high-frequency stages.

How much change in amplification can we obtain?

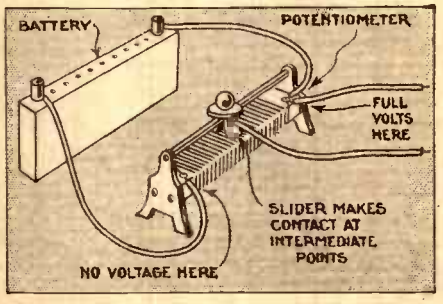
It is quite easy for the amplification to be reduced 30 or 40 times per valve with the ordinary variable-mu valve. Consequently, if we have a receiver with three variable-mu stages we can obtain a change of 50,000 or more in the amplification by merely altering the grid bias to the various valves.

How do you alter the grid bias?

By means of a potentiometer, which is usually mounted for convenience on the control panel of the set, so that the user can adjust the volume to his own requirements. Alternatively, the latest arrangement is to make the signal itself control the amplification, so that a strong signal reduces the amplification and a weak signal increases it. This is called automatic volume control.

What is a potentiometer?

It is a useful device for varying the voltage. If we have a battery, and we connect a resistance across it, then current will flow through the resistance. Consider the voltage at various points on this resistance. At the start the voltage is nothing. At the other end the voltage is the same as that of the battery.



A potentiometer connected across a battery, as in this diagram, will enable any voltage from the maximum down to zero to be obtained simply by adjusting the setting of slider along the resistance

At any intermediate point the voltage must be somewhere between these two extremes, and consequently, if we have some method of making contact to the resistance at various points, we are able to obtain any fraction we like of the full voltage.

This is what we use to control our grid voltage. We supply a voltage sufficient for our maximum requirements—about 30 to 40 volts, in most cases—and across this we connect a potentiometer.

The moving contact on this is able to slide from one end to the other, and the actual voltage applied to the grid thus varies from nothing to the full negative voltage.

Potentiometers are usually made circular for convenience, so that the control is obtained by rotating a knob instead of moving a slider. Also, it is interesting to note that a potentiometer can be used to control an oscillating or alternating voltage just as easily.

For example, if we connect a low-frequency signal across a potentiometer of this sort, then we can obtain any fraction we like of the signal by moving the slider up and down the potentiometer. This method is often used to control the output from the receiver, in addition to the use of variable-mu valves.

What Selectivity Really Means

Is it possible for the non-technical listener to understand the real meaning of selectivity?

We think so, if you care to think about the question. Let us see what we can make of this selectivity business. For a start we can take the obvious meaning of selectivity as being *an ability to select.*

What we equally obviously want to select with a wireless receiver is *one station to the exclusion of all others.* Never forget, when you are wondering about the reason for any of the processes of reception, that at any given time there are co-existing in the ether of space dozens, perhaps hundreds, or even thousands, of different wireless signals.

The job of tuning in a wireless set is to obtain order from this medley of signals. Without *tuning*, which is the key to selectivity, wireless reception would be impossible because we should not be able to get a wanted station clear of unwanted stations.

So that to understand the meaning of selectivity I must really understand tuning?

Yes, although it would be wrong to assume that when you know all there is to know about tuning you know all about selectivity.

In recent years we have come to realise that selectivity depends on other parts of the circuit, such as the high-frequency amplifiers and the detector.

For the moment, though, it will be enough to tell you the effect of tuning on this very important process of tuning. Tuning is done with a coil, which has the property of inductance, and a condenser, which has the property of capacity

A coil and a condenser, due to these two properties, together have what is known as a *natural wavelength.* This wavelength can be altered by altering one or other or both of the constituents.

For practical reasons we keep the inductance of the coil constant and vary the wavelength simply by varying the capacity of the condenser used with this constant inductance coil.

Every station has a wavelength assigned to it. To tune in that station you must adjust the wavelength of your tuning circuit to the same wavelength as that of the transmitter. In doing this you come immediately up against the problem of selectivity.

For you will find that, though you adjust your simple tuning circuit to exactly the wavelength of the wanted station you hear other stations as well. In other words your tuning circuit is not able to select the wanted station to the exclusion of all others.

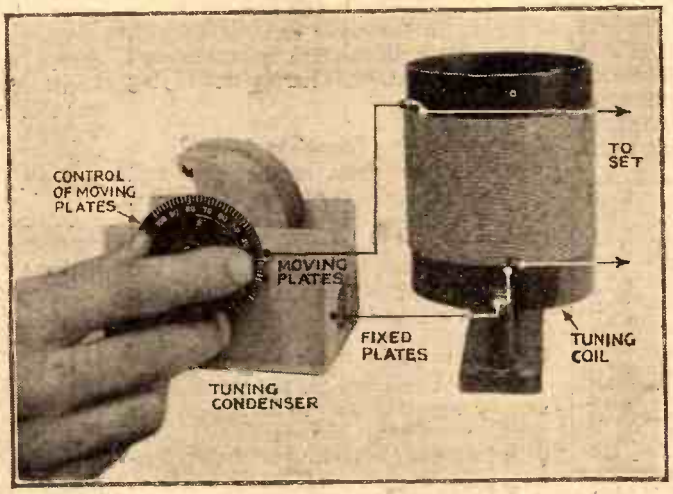
That, to-day, is the function of tuning—to select the wanted station to the exclusion of all others. This is not easy to do with a single tuning circuit.

It is true that you can, by suitable design, make one tuning circuit so selective that when it tunes in one signal's wavelength it does not appreciably respond to adjacent wavelengths, but in doing so you lose a great deal of energy. The signal you do get is very weak.

Moreover, it is mutilated, because in the highly selective process you will have lost not only the interference of adjacent stations but also the higher audible frequencies of the station you want.

We find in practice that it is very much simpler to use a chain of tuning circuits, each adjusted to the wavelength of the wanted station. This avoids the loss of the higher audible frequencies (loss of which, by the way, would mean very poor quality of reproduction), but it does not avoid loss of energy in the wanted signal.

To make up for this we put in a high-frequency-amplifying valve between successive tuning circuits, to boost up the signal as it passes on its way to the detector.



Most amateurs probably think that selectivity is wholly a question of tuning, as done by this variable condenser in parallel with the tuning coil. Actually, as we try to show in the article, selectivity depends on many things, among which is the distance apart in wavelength or frequency of the transmitting stations

So there is a connection between this business of selectivity and the quality of the reproduction?

A very important connection, as scientists are now beginning to tell us most emphatically.

For example, it has now been proved beyond reasonable doubt that *no matter how selective we may make our tuning circuits, whether by a single circuit or a chain of them, it is not possible to select a wanted station without any background from adjacent stations unless those stations are in the first place sufficiently widely separated.*

To-day, owing to the demands on the ether, there are not enough wavelengths to go round and the result is that many stations are too close together in wavelength.

The real problem of selectivity to-day is not merely to get one station clear of another, but to get that station clear of interference *without loss of quality.*

It is becoming increasingly clear that unless stations are more widely separated than they are to-day we shall have to endure a certain amount of loss in the quality of the loud-speaker reproduction.

In what way shall we lose?

We shall lose the high audible frequencies, those frequencies that go to make up the characteristic timbre of certain musical instruments.

Isn't there some system of overcoming this loss?

Yes, you are probably thinking now of *tone correction.* This idea is very good for certain forms of interference. By its aid we can cut down the high-note response of the tuning circuits so that this type of interference is eliminated and then we can make good the quality by tone correction after the detector.

Unfortunately, all interference cannot be so combated. It has been recently shown that such interference as heterodyne whistles and some of what we call "side-band splash" cannot be cut out by first sharpening tuning and then tone-correcting for the loss of high notes.

You say that all the problem of interference is not due to the tuning circuits. What else is important, then?

Quite apart from the design of the detector circuit and the type of valves used for the high-frequency stages, quite apart, that is to say, from all receiver design, there is the highly important question of the wavelength separation of the stations.

Unless by international agreement we can obtain more breathing space between the high-powered stations there is no known technique for overcoming *all* forms of interference. There *is* a way—but it means loss of quality carried to a point the musically educated listener would find intolerable.

A. H.

KNOB TWIDDLING *for* NOVICES

IF you are new to wireless you must treat the knobs on your set with respect. On how you operate them largely depends your success in reception.

Tuning: there is a right and a wrong way of doing this. The great point is the speed with which you turn the knob.

Turn it quickly backwards and forwards about any given station's approximate setting. This will make it easier to "settle down" on the right spot.

It is wrong to turn the knob very slowly backwards and forwards—you will never get an accurate setting that way.

What's it matter if you don't? For one thing, you will not get maximum signal strength. For another thing you will get background noises from adjacent wavelength foreigners.

About reaction: when searching keep the reaction just below the point of oscillation. The set is then in its most sensitive condition.

Reduce reaction unless you need its maximum setting for extra volume. Or unless you need the selectivity reaction imparts to the tuning of the wanted station.

Why reduce? Because when reaction is near the oscillation point there is "high-note cutting" which means that you are losing some of the quality of the reproduction of which the rest of the set is, or should be, capable of giving. *Never over-do reaction. It does not pay.*

SHORT-WAVE NOTES

BY 'SHORT-WAVER'

WHILE very few like turning out at 6 a.m., it is certainly worth while to hear some of the East Coast "W" stations, which are coming over very well at the moment. Using only 50 or 100 watts, at that time of the morning on the 80-metre band, the signal strength is enormous, and reception is infinitely better than on 20 metres between 5 and 7 in the evening. You have to be fairly wide awake, as some of the amateur transmitters are rather prone to "gabble" the all-important call-sign.

A refinement that is not often found in a short-wave receiver is a milliammeter in the anode circuit of the detector valve—I find it an invaluable help. My short-waver started to play tricks on Sunday morning, while I was listening to some of the amateurs, so I started to explore.

With all my valves out, my meter was hard over at 5 milliamperes! This was traced to a decoupling condenser having developed a leak; so far so good. On testing the set again, I noticed that while it was more or less satisfactory, when I increased the reaction, instead of the meter reading decreasing, there was, if anything, a slight increase, which pointed to the detector valve anode-bending. I immediately replaced the grid condenser and everything was then quite normal. The whole of my test took less than a quarter of an hour and I had to do hardly any thinking at all, thanks for the milliammeter.

There has been a distinct improvement in conditions during March, particularly with the daylight stations. W8XK, on 13.93 metres, 21,540 kilocycles, being R7/8 during the early part of Saturday afternoon, W3XAL also made a very welcome reappearance on Sunday afternoon for the first time for quite a while. Incidentally, Sunday appeared to be a very remarkable day. 2FC Sydney was R4/5 at 7.30 a.m. and a little after 9.30, when he started up again, had increased to R6. What is even more interesting is that at 6.30 in the evening he had still further increased to R7! It is very unusual to hear Sydney throughout the day in this way and as the static was on its best behaviour the programme of records was quite entertaining.

THE MAINS SET FOR YOU—THE "HOME-LOVER'S NEW ALL-ELECTRIC THREE."

During the latter part of the afternoon, W8XK on 15,210 kilocycles was between R5/8 and altogether was a really good station, although slightly spoilt by slow fading. To overcome this, I coupled up my receiver to include automatic volume control and there was certainly a great improvement.

Although this refinement does not altogether overcome fading, on those stations where the signal strength is reasonably good it certainly keeps it very constant as the slow fade and dither is taken up.

I find the English News Bulletin from Radio Colonale, on Sunday afternoons at 1.45, quite interesting; it helps to break up the day instead of waiting for the English news during the evening. The wavelength used is 15,243 kilocycles, 19.68 metres.

If you listen regularly, as I do, you become quite accustomed to the programmes from the American studios and can follow their unusual phraseology quite easily. Very few short-wave fans do not know of "Little Orphan Annie" and her adventures, from KDKA studios, and the intimate asides of the "News Reeler" who comments on the day's news from the same station.

How many of you listen to the "Breakfast Club Orchestra" from W3XAL, at 1.30 p.m., 8.30 a.m. Eastern Standard Time? Listen next Saturday afternoon to the excellent dance band and orchestral programme put over—I mention Saturday because the majority of readers will find this most convenient. At the time of writing the ARRL are holding their annual test between amateurs in all countries; that is why the 20-, 40- and 80-metre bands seem so full up at the moment.

The VE stations, that is those of Canadian origin, are coming over very well at the moment between 5 and 6 p.m., particularly on Sunday afternoons.

I heard VE2BG and VE2CX discussing our G5BY and I could follow their whole conversation without missing a word for nearly a quarter of an hour. Signal strength was about R5, which is some signal, when you consider that the output is only 50 watts or so.

The earthquake presented an opportunity for "W" amateurs to be of service. I heard W6EPE of Los Angeles giving details of the disaster to a friend of his in New Jersey, mentioning that he was "just round the block" from the 'quake, so he could give first-hand details.

A REVOLUTIONARY VALVE DEVELOPMENT

(*Continued from page* 497).

several possibilities arising from it, and the first to be put to practical use in this country is what is known as the Class B valve. In this arrangement we not only obtain the increased power output, but we do so at the expense of a relatively small current drain from the H.T. battery.

The basic principle of push-push amplification has already been described in these columns. Briefly it consists in using two valves operating at a point on their characteristic where the anode current is practically zero. The two valves are connected end-to-end to a special centre-tapped transformer so that when one valve is positive the other is negative. On the arrival of a signal which supplies voltage to the grid, each valve supplies its quota of current alternately. The anode currents are combined in a special output transformer and a continuous supply of power is obtained.

Exactly the same thing is done with the Class B valves, the only difference being that they are designed to work with *no grid bias*. Since they have to work on the positive side of the characteristic anyhow, they are designed to operate entirely in that region, and they are so designed that with no bias on, the anode current is only 1 to 2 milliamps. Two such valves arranged in push-push as shown in Fig. 2 will then handle the power alternately. When the top valve is positive it will supply anode current while the bottom valve will be idle, since the only effect of a negative voltage is to reduce the anode current to zero and keep it there.

The next half wave, the bottom valve is positive, and therefore anode current flows in this valve, while the top valve is now doing nothing. Thus each valve in turn supplies the necessary anode current which passes through the appropriate winding on the output transformer and delivers a complete oscillation in the secondary winding to which the loud-speaker is connected.

Thus when no signal is applied, the anode current is simply the small anode current flowing with zero voltage on the grid. When a signal arrives the anode current increases to just the extent required to supply the power output in the same way as with the quiescent push-pull system. There is thus the great advantage of economy of H.T. consumption arising from the use of the push-push system, coupled with the remarkable output obtainable through the increased anode current swing.

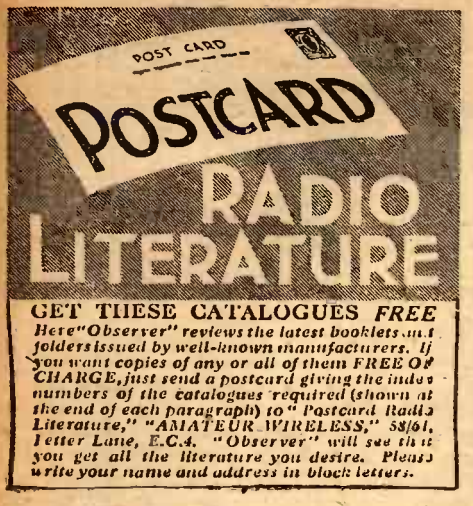
The Class B valves are ordinary triodes and are therefore quite simple to construct and to match. Actually the two Class B valves are being put out in one bulb, and the two together cost less than an ordinary pentode. Added to this, of course, is the cost of the driver, but many people already possess a valve suitable for this purpose, it being the method of connection rather than the valve itself, which is novel as far as the driver stage is concerned.

Both the power and the quality obtainable from the advance samples of these valves are encouraging, to say the least. There are so many possibilities that it will be necessary to discuss the various aspects of this new system week by week, rather than make any attempt to crowd all the information into one long article. Next week, therefore, I hope to give further information on the system, with details of some of the valves available.

DRILLING THE PANEL

When you drill holes in an ebonite panel, keep the drill vertical in order to get the

holes true. Do not bear too heavily on the top of the drill or the bit may be broken and the panel cracked.



Grampian Speakers

IN case you are interested in getting a new speaker, I want to bring to your attention the new Grampian folder. This describes permanent-magnet, energised and differential armature speakers, both in cabinet and chassis forms. A special type of magnet system is used in the permanent job and all the moving-coil speakers (even the new low-priced "Nipper") are fitted with moulded cones and tapped transformers. **965**

Quixsol Soldering

When you start soldering the wires in your set you will find how essential it is to have a good solder. Quixsol is a metallic paste solder which cleans and solders in one operation. No other solder or flux is required and it is therefore very quick and easy to use. It is quite cheap, a 1s. 6d. tin containing sufficient for about 200 electrical joints of average size. A descriptive pamphlet is available. **966**

Clang

Small electrical fittings, plugs, adaptors and so forth, made by Clang, Ltd., are described in leaflets, copies of which have just been sent me. These fittings are extremely well made and will interest mains users. **967**

Wearite Chokes

A useful loose-leaf folder of Wearite chokes has just been sent me. These H.F. chokes cover every set need, and some of the types incorporate a laminated iron core. Special short-wave chokes are also available, and also tone corrector chokes. The loose-leaf folder gives very explicit technical details of each choke. **968**

A Cossor Speaker

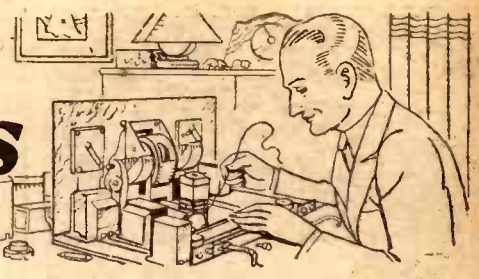
Have you yet heard the Cossor 495 permanent-magnet moving-coil speaker. This is fitted in an attractive walnut cabinet, and is tapped for use with power, super-power or pentode valves. The price is only 49s. 6d., and it is described in a folder, a copy of which has just been sent me. **969**

Six Sixty Sets

A new A.C. mains set, the Super Five, has just been brought out by the Six Sixty Radio Co. This is an attractive table-model receiver, having two screened grid stages and super-power pentode output. The price is only fourteen guineas. **970**

OBSERVER.

In My Wireless Den



Weekly Notes: Theoretical and Practical

WHEN GRID CURRENT STARTS

WHEN reckoning the amount of the signal which can be applied to an amplifying or power valve it is necessary to consider the point at which grid current starts.

Some battery valves start passing grid current when the grid is taken to the negative side of the filament. Others again do not commence to pass grid current until the grid is made a little more positive than when the grid is joined to the negative side.

In this case there is no need to apply bias when the valve has to deal with weak signals. Mains valves usually pass grid current when the grid is negative by about three-qnarters of a volt with respect to the cathode.

It is, therefore, necessary to provide bias of at least about one volt in order that grid current shall not flow with weak signals.

In the case of a power valve, if the correct bias is, say, negative nine volts, the input must be restricted to about a volt less than this in order to avoid grid current which would normally cause distortion.

REACTION "PLOPS"

PLOPPY reaction is not only a nuisance, but its presence definitely means that the best results cannot be obtained from the set.

Reaction is of such value in many sets that it pays to make adjustments which have the effect of allowing critical reaction to be applied. It must be remembered that the reaction circuit itself may not be wholly to blame.

When there is a screen-grid stage, for example, and reaction is applied to the anode circuit or its equivalent, it may turn out that the screen-grid stage itself is rather unstable. The result is that when a little reaction is applied, the screen-grid stage oscillates.

To avoid this the coils must be carefully screened, if necessary, and also the tuning condensers. Go over the wiring with the object of reducing the stray capacitative couplings, using a shielded covering for the grid and anode leads if necessary.

A reduction in the voltage of the screen will usually help matters as well. Then see to the reaction circuit itself.

If it is impossible to make the circuit oscillate gently, the trouble may be that the screen-grid stage is already providing considerable amplification and the addition of reaction causes it to oscillate.

The addition of a little grid bias to the screen-grid valve will usually reduce the effectiveness of the valve and stabilise the circuit. So far as the reaction circuit itself is concerned, the addition of a condenser of about .0002 microfarad between the anode of the detector and the filament may help.

It is better to avoid dropping the voltage of the detector, if this is at all possible, and to try adjusting the reaction circuit. The by-pass condenser usually helps matters and a different value of grid leak may be found necessary.

GETTING MORE POWER

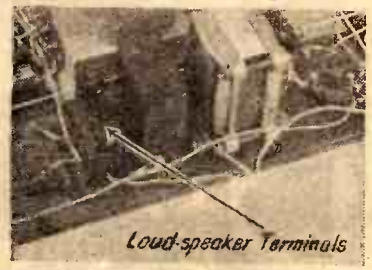
A GOOD way of increasing the power capacity of the last stage of a set is to put up the high-tension volts. The bias must also be increased in proportion and the anode current will also go up.

It is difficult, I know, to convince a user of batteries to put up the high-tension, but it is worth doing this in many cases where the battery set is a really good one.

If further expense is not objected to the quiescent push-pull system may be adopted with either pentodes or triodes. There is no need to restrict the high-tension to 120 volts when this method is used, and provided the valves will take a greater voltage. In fact, I strongly recommend the use of, say, 160 volts when the output valves are small triodes.

The power output will be increased by increasing the voltage and the current will still be within the economical range of standard batteries. Naturally, it will be necessary to get more out of the detector in order fully to load the power stage, but this is usually easily managed.

If the set shows signs of overloading, then the voltage applied to the detector should be increased and probably a coupling transformer between the detector and power valves of greater ratio will remedy matters.



This photograph shows only the output end of a well-arranged set. The loud-speaker terminals are on a separate block close to the output choke and condenser, so there are no straggling wires. If the output connections are always tidily arranged, you will never have any signs of instability in the output stage

OUR LISTENING POST

By JAY COOTE

SINCE the General Elections took place in Germany, you may have noticed a considerable alteration in the character of the programmes broadcast by the studios. Not only have military marches become a prominent feature, but dance music, as you will have observed, has been drastically cut down. In addition, I do not know whether you will hear any more syncopated numbers from German stations, as I understand that the Hitler Government has definitely banned jazz. Not only will this kind of music not be permitted in the studios, but it is also vetoed in the cabarets and night clubs, and consequently Germany must now fall back on the older waltz and other dance steps hitherto more frequently heard from Scandinavian countries.

If you now want syncopated numbers outside those offered to you in the British Isles, you must turn to Copenhagen, Paris, Brussels, Prague, or Warsaw.

Stand by for the initial tests of the new Vienna Bisamberg high-power station; you may pick them up on any evening, as all efforts are being made to have the station ready by the beginning of April. Its ultimate power will be 120 kilowatts, but at the outset we may not secure the full benefit of this energy, as the station will work with a temporary aerial.

The Power of Toulouse

Have you noticed the power of Radio Toulouse after midnight? The new transmitter is almost regularly brought into operation for roughly half-an-hour at the end of the day's programme. It has been ready to work for some time, but no permit is forthcoming from the State. In the same way, Luxembourg may still be heard from time to time reeling out one gramophone record after another. The wavelength is still 1,191 metres—namely, in a prohibited area—and consequently no date has yet been fixed for the formal opening of the station.

Austria has suddenly developed a spasm of patriotism and the Vienna announcer adds to his nightly call: *"Wir Schliessen jetzt mit der oesterreichischen Bundeshymne"* ("We now close with Austria's anthem"), following which we regularly hear that familiar melody, "Deutschland über Alles," which, in reality, was written by Haydn as a hymn to the Emperor (of Austria). It is the same anthem as now used by all German transmitters.

Prague, a station which is now within the reach of most listeners, will be worth tuning in on May 1, when the station celebrates the tenth anniversary of the Czech broadcasting network. I am informed that the programme will be worthy of the occasion and may be relayed not only by such stations as Brno, Bratislava, etc., but also by a number of European transmitters.

On the "long" waves you may come across two newcomers, but they will not provide very strong signals. Craciunelu, a 1-kilowatter on 2,000 metres, relays the Budapest programmes and Blaj, an even smaller station, which at first operated on 1,986 metres, has now reduced its wave-length to 1,920 metres. On two occasions I have picked it up faintly just below Kaunas. It can, however, be identified by the fact that it is the Bucarest call with two words added: *"Se Blaj."*

You would do well to make a note that on Friday, March 31, the Hilversum and Huizen studios will again exchange wave-lengths and transmitters. On April 1, therefore, you will tune in to the A.V.R.O. programmes on 296.1 metres, and to K.R.O. on 1,875 metres. I wonder how long this game is going to last; the Dutch are already tired of it.

BROADCASTING STATIONS

Broadcasting Stations classified in order of wavelengths. For the purpose of better comparison, the power indicated is that of the carrier wave.

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
13.97	21,470	Daventry (G5H)	15.0
16.88	17,770	Daventry (GSG)	15.0
19.73	15,200	Zeesen (DJB) ...	8.0
19.82	15,140	Daventry (GSF)	15.0
25.28	11,865	Daventry (GSE)	20.0
25.4	11,810	Rome (2RO) ...	15.0
25.53	11,750	Daventry (GSD)	20.0
31.25	9,598	Lisbon (CTIAA)	2.0
31.3	9,585	Daventry (GSC)	20.0
31.31	9,580	Radio Nations ...	20.0
31.38	9,560	Zeesen (DJA) ...	8.0
31.55	9,510	Daventry (GSB)	20.0
32.26	9,300	Rabat	0.5
40.3	7,464	Radio Nations ...	20.0
43.75	6,865	Vitus/Paris	0.3
45.38	6,611	Moscow	12.0
46.6	6,438	Moscow	12.0
48.2	6,220	Rome (2RO) ...	9.0
49.4	6,073	Skamleback	0.5
49.5	6,060	Vienna (UOR2)	2.0
49.59	6,050	Daventry (GSA)	20.0
49.83	6,020	Zeesen (DJC) ...	10.0
50.0	6,000	Moscow	20.0
52	5,769	Prague	0.5
158	1,900	Odessa	3.0
203.5	1,474	Seraing	0.2
206.9	1,450	Miskolcz	1.0
209.7	1,430.4	Magyarovar	3.0
210	1,429	Pecs	1.25
211.3	1,420	Newcastle	1.0
211.3	1,420	Antwerp	0.4
214.3	1,400	Aberdeen	1.0
214.3	1,400	Warsaw (2)	1.9
215.3	1,393.4	Chatelineau (EL)	2.0
217.1	1,382	Konigsberg	0.9
217.1	1,382	Brussels (Conf.)	0.25
218	1,373	Salzburg.....	0.5
218.5	1,373	Plymouth	0.2
219.6	1,366	Binche	0.3
219.5	1,367	Beziers	0.5
223.2	1,344	Swedish Relays...	—
224.4	1,337	Cork (6CK)	1.2
225.9	1,328	Fecamp	10.0
227.4	1,319	Flensburg	0.5
230.6	1,301	Malmo	1.2
232	1,294	Kiel	0.25
232.9	1,289	Liege (Wallonie)	0.3
233.4	1,285	Lodz	2.2
236	1,270.9	Kristianssand ...	0.5
236.4	1,269	Bordeaux (S.O.)	3.0
237.2	1,265	Nimes	1.0
238.9	1,256	Nurnberg	2.0
240.7	1,246	Stavanger	0.5
241.3	1,243	Llego	0.3
242	1,238	Belfast	1.0
244.1	1,229	Basle	0.5
245.9	1,220	Berne	0.5
245.9	1,220	Cassel.....	0.25
245.9	1,220	Linz	0.5
245.9	1,220	Swansea	0.12
247.7	1,211	Trieste	10.0
249.5	1,202.4	Juan-les-Pins ...	1.0
250	1,200	Prague (Strasnice)	5.0
250	1,200	Radio Schaerbeek	0.3
250.9	1,195.8	Barcelona (EAJ15)	6.0
253.4	1,184	Gleiwitz	5.0
255.1	1,176	Toulouse (PTT)	0.7
256.7	1,168	Horby	10.0
259.3	1,157	Frankfurt-a-M. ...	17.0
259.3	1,157	Treves	2.0
261.6	1,147	London National	50.0
263.8	1,137	Moravska-Ostrava	11.0
265.7	1,129	Lille (PTT).....	1.3
267.1	1,123	Valencia	8.0
267.4	1,222	Nyiregyhaza	6.0
267.7	1,120.8	Bremen	0.3
269.4	1,112	Bari	20.0
271	1,107	Cointe-Liege.....	0.3
271.5	1,105	Rennes	1.3
273.7	1,096	Turin (Torino)	7.0
276.5	1,085	Hellsberg	60.0
279.9	1,071.8	Bratislava	14.0
281	1,067	Copenhagen	0.75
282.1	1,064	Lisbon (CTIAA)	2.0
283	1,058	Innsbruck	0.5
283	1,058	Berlin (E)	0.5
283	1,058	Magdeburg	0.5
283	1,058	Stettin	0.5
284.7	1,053.5	Radio Lyons	1.0
286	1,049	Montpellier	0.8
288.5	1,040	Bournemouth ...	1.0
288.5	1,040	Scottish National	50.0
291	1,031	Viipurl	13.0
293	1,022	Kosice	2.5
293.7	1,021.5	Limoges (PTT)	0.7
296.1	1,013	Huizen	20.0
298.8	1,004	Tallin	11.0
301.5	995	North National...	50.0
304.3	986	Bordeaux (PTT)	13.0
306.8	978	Zagreb	0.75
307.5	975.8	Falun	0.5
309.9	968	Vitus (Paris) ...	1.0
309.9	968	Cardiff	1.0
212.8	959	Cracow	1.5
313.9	955.6	Genoa (Genova)	10.0
315.8	950	Marseilles	1.6
318.8	941	Naples (Napoli)	1.5
318.8	941	Sofia (RodnoRadio)	1.0
319.7	936	Dresden.....	0.25
321.9	932	Goteborg	10.0
325	923	Breslau	60.0
328.2	914	Poste Parisien ...	60.0
331.6	904	Milan Siziano	50.0
332.2	902.9	Poznan	1.9
338.2	887	Brussels (No. 2)	15.0
341.7	878	Brunn (Brno) ...	35.0
345.2	869	Strasbourg (PTT)	11.5
348.6	860.5	Barcelona (EAJI)	8.0
351	854.7	Leningrad (RV7O)	10.0
352.1	852	Graz	7.0
355.8	843	London Regional	50.0
358	838	Tiraspol.....	5.0
360.5	832	Muhlacker.....	60.0
363.6	825	Algiers (PTT) ...	16.0
365.5	820.7	Bergen	1.0
367.2	817	Fredriksstad	0.7
368	815	Kharkov	10.0
368.1	815	Bolzano	1.0
368.1	815	Helsinki.....	13.2
369	813	Seville (EAJ5) ...	1.5
370.1	810	Radio LL (Paris)	0.8
372.2	806	Hamburg	1.5
376.4	797	Scottish Regional	50.0
381.7	788	Lvov	16.0
385	779	Radio Toulouse	60.0
385	779	Stalino (RV26)...	10.0
388.5	772	Archangel	10.0
389.6	770	Leipzig	75.0
394	761	Bucharest	12.0
398.9	752	Midland Regional	25.0
399	752	Vladikavkas	10 0
403.8	743	Sottens	25.0
408.7	734	Katowice	12.0
413.8	725	Athlone.....	60
416.4	720.5	Radio Maroc (Rabat)	6.0
419.5	715	Berlin.....	1.5
421	712.6	Milan Vigentino	7.0
424.2	709	Madrid (Espan.)	2.0
424.2	709	Madrid (EAJ7)...	3.0
424.3	707	Moscow (RV39)	100.0
430.4	697	Belgrade	2.8
431	696	Parede (CTIGL)	1.5
435.4	689	Makhatch-Kala ...	100.0
435.4	689	Stockholm.....	55.0
441.2	680	Rome (Roma) ...	60.0
447.1	671	Paris (PTT)	7.0
447.1	671	Danzig	0.5
450	666.5	Odessa (RW37)	20.0
452	664	Madona.....	25.0
453.2	662	Klagenfurt.....	0.5
453.2	662	Odessa.....	10-0
455.9	658	San Sebastian (EAJ9)	3.0
456.7	657	Agen	0.5
459	653	Beromuenster ...	60.0
465.8	644	Lyons (PTT)	1.6
472.4	635	Langenberg	60.0
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501.7	598	Niini Novgorod	10.0
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509.3	589	Brussels (No. 1)	15.0
518.5	578.5	Vienna	15.0
525.4	571	Riga	15.0
532.9	563	Munich	60.0
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540	5,555	Prague (tests) ...	10.0
541.5	554	Sundsvall	10.0
550.5	545	Budapest (1)	18.5
555.5	542	Tampere	1.0
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559.7	536	Augsburg	0.3
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566	530	Hanover.....	0.3
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824	304	Sverdlovsk.....	60.0
833	360.1	Heston Airport...	5.0
845	355	Budapest (2)	3.0
848.7	353.4	Rostov (RV12) ...	20.0
857.1	350	Leningrad	100.0
882	340	Saratov (RV3) ...	20.0
937.5	320	Kharkov (RV4)...	20.0
967.7	310	Alma Ata (RV60)	10.0
1,000	300	Moscow	100.0
1,034.5	290	Kiev (RV9)	100.0
1,060	283	Scheveningen-Haven	10.0
1,071	280	Tiflis (RV7)	100.0
1,073.5	279.4	Oslo	60.0
1,107	271	Minsk (RV10) ...	35.0
1,117.4	268.5	Moscow	40.0
1,153.8	260	Kalundborg	7.5
1,171.5	256	Taschkent (RV11)	25.0
1,190.5	252	Luxemburg	140.0
1,200	250	Istanbul	5.0
1,200	250	Reykjavik	16.0
1,240	242	Boden.....	0.6
1,254	239.2	Vienna Exp.....	3.0
1,260.5	238	Bakou	35.0
1,304	230	Moscow (T.U.)...	100.0
1,354.4	221.5	Motala	30.0
1,380	217.4	Novosibirsk (RV6)	100.0
1,411.8	212.5	Warsaw.....	120.0
1,445.7	207.5	Eiffel Tower	13.5
1,481	202.5	Moscow (RV1)...	500.0
1,538	195	Ankara	7.0
1,554.4	193	Daventry (Nat.)	30.0
1,600	187.5	Irkutsk	10.0
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1,685.3	178	Kharkov.....	25.0
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1,796	167	Lahti	54.0
1,860	161.3	Sverdlovsk.....	50.0
1,875	160	Hilversum	8.5
1,920	156	Blaj.....	0.75
1,935	155	Kaunas	7.0
2,000	150	Craciunelu	1.0
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Mr. Wallace Harland, who is one of the best-known authorities on the game of rugby football in Northern Ireland, will give an eye-witness account of the Northern Ireland Senior Cup Final on March 25. This is one of the most important rugby matches in the Six Counties during the year.

INFORMATION BUREAU

Will every querist please observe the following revised rules.

Please write concisely, giving essential particulars.

A fee of one shilling postal order (not stamps), a stamped, addressed envelope and the coupon on the last page must accompany all queries.

Not more than two questions should be sent at any time.

The designing of apparatus or receivers cannot be undertaken.

Slight modifications of a straightforward nature only can be made to blueprints. For more serious alterations the minimum charge is 2/6.

Blueprints supplied by us will be charged for in addition, but of course, readers may send their own blueprints for alteration.

Modifications to proprietary receivers and designs published by contemporary journals cannot be undertaken. Readers sets and components cannot be tested by us. Queries cannot be answered by telephone or personally. Readers ordering blueprints and requiring technical information in addition should address a separate letter to the Query Department and should see that their remittance covers the price of the Blueprint and the amount of the Query fee.

We do not answer queries in cases where the fee is omitted.

Queries should be addressed to the Query Department, "Amateur Wireless," 58/61, Fetter Lane, London, E.C.4.

THE PILOT Q.P.P. CONVERSION KIT

THIS kit, just produced by the Peto Scott Co., Ltd., converts any battery receiver to quiescent push-pull.

In view of the present popularity of Q.P.P., its big advantage is in a battery set, where one must cut down H.T. consumption to the minimum, and the fact that the Peto Scott kit can be added easily to any battery-driven receiver, readers will be interested to have details.

A complete kit is supplied which replaces the existing power output arrangements of your set. The kit includes all the necessary components including a special Q.P.P. input transformer and output choke. The necessary wiring is very easily carried out, and full instructions are given with a blueprint which shows the Q.P.P. conversion. This gives a suggested layout which is suitable for most receivers and shows the wiring alterations that have to be made. Five-pin valve holders are provided for the special low-consumption pentodes (Mazda Pen 220A) used, and detailed instructions are given with the kit for setting up the

The chief components in the Pilot Q.P.P. conversion kit described here. All the necessary parts for the conversion of a battery-driven set are included

Q.P.P. stage to work with the greatest economy. A milliammeter is an advantage in setting up the Q.P.P. stage, and if the instructions given are closely followed the steady D.C. taken by the two valves in the quiescent stage, will be only 4 milliamperes. This is a remarkable figure considering the power output given by a set with a Q.P.P. stage.

Many popular "A.W." sets can be converted to Q.P.P. output by means of the pilot kit, and the blueprint provided makes it an easy job to fit the new parts and carry out the small amount of wiring.

Full details of the kit and of the way in which it is used to convert an existing receiver can be obtained on mention of "A.W." from Peto Scott Co., Ltd., 77 City Road, E.C.1. The prices of the kits are very reasonable, so that you will not find it an expensive matter to change over to Q.P.P.

It should be noted that the Pilot Q.P.P. kit can be used to convert the ever-popular "Ether Searcher" to Q.P.P. output, as is described on another page this week. The kit includes all the necessary components for the "Ether Searcher" conversion.

The kit costs 42/- or eight monthly payments of 6/-. The kit B, which includes the valves, costs £3 17s. 6d., or twelve monthly payments of 7/-.

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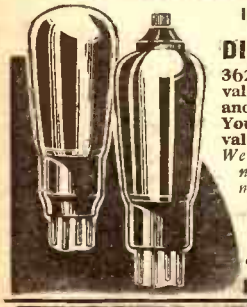

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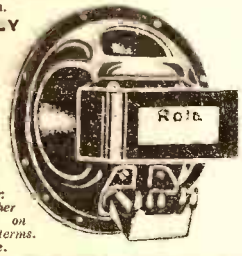

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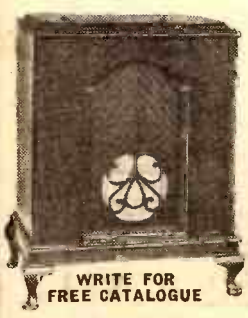

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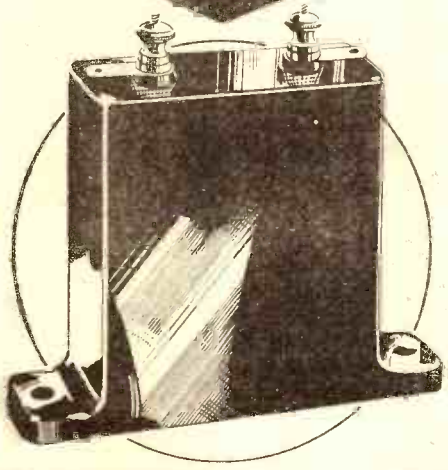

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