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Amateur Wireless

and Radiovision

Every Thursday 3d.

Vol. XV. No. 382 Saturday, October 5, 1929

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The Music-lover's Gramo-Radio :: "Thermion" Looks Back at the Show

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The Receiver for the new B.B.C. Regional Scheme . . . which will put old Sets out-of-date

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OCT. 7—12.

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OCTOBER 5, 1929 No. 382 Vol. XV

Amateur Wireless and Radiovision

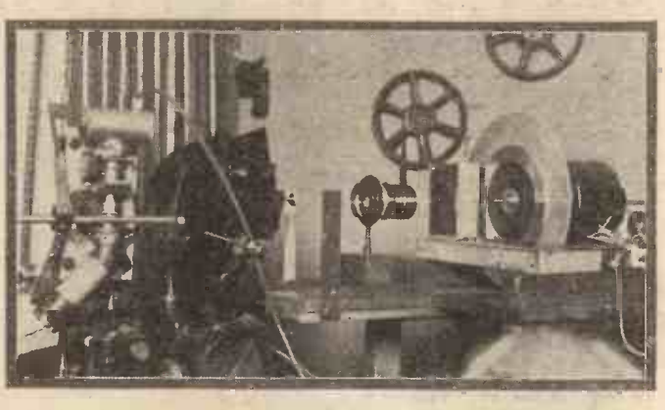
The Leading Radio Weekly for the Constructor, Listener and Experimenter

Editor: BERNARD E. JONES

Technical Editor: J. H. REYNER, B.Sc., A.M.I.E.E. :: Research Consultant: W. JAMES :: Assistant Editor: H. CORBISHLEY

The Show, and After—The Lay Press—Short-wave Radio Pictures—Listening to Law Courts—Commerce by "Mike"—The B.B.C.'s New Musical Director

The Show, and After—The end of the Show; and it is to be hoped that all who were able to go to Olympia took the opportunity to do so. And, of course, you didn't miss the AMATEUR WIRELESS stands. The Show was even better than ever this year. We were confident that this would be so, and this fact is proved by the conversation of everyone who went. For those who live too distant from Kensington we hope that our special show numbers gave the second best thing and enabled them to make an "arm-chair" tour of the Exhibition. When television is really here there will be no need to go at all! Well, hardly!



Behind the scenes at the Baird Laboratory—a transmitter for broadcasts of talking films. The film strip passes through the apparatus on the left, and the scanning disc is on the right

The Lay Press—As is the case with Motor-Show reports, some of the things said by the lay Press in connection with the Show were very amusing. One "daily" heralded the general use of a "two-in-one amplifier valve" which, after reading through the pseudo-technical description, seems to be no more or less than our friend the pentode!

Short-wave Radio Pictures—Vienna has started sending out Fultograph pictures on a wavelength of 41-42 metres, and this should be a good trial of skill for all short-waveites. Telegraphy and telephony tests are being given as well. The tests will be made twice daily, from 10.10 till 10.45 a.m., and from 3.10 till 3.45 p.m. The Fultograph transmissions will occupy the last ten minutes of each programme. If you manage to pick up the transmissions successfully, then oblige our Continental friends by dropping a card to Fultograph Gesellschaft, N.B.H, Austria, IV, Prinze Eugenstrasse 10, Vienna.

Listening to Law Courts—And while talking of Continental matters the Berlin Broadcasting Co. are doing a novel thing in rigging up a "mike" in the Law Courts, so that broadcasts can be made. A big trial of thirty anti-Republican Fascists is shortly down for hearing, and it is hoped to make this the first broadcast.

Commerce by "Mike"—A trade dinner was recently given at Frascati's in London and speeches given by the chairman were relayed to Manchester, Birmingham, Leeds, Glasgow, Newcastle, and Bristol. By means of this land-line "broadcasting" over G.P.O. lines, the enterprising company was able to outline its trade policy for 1930 to provincial members. An AMATEUR WIRELESS representative was able to see the apparatus and a more detailed technical description is given on another page in this issue.

Invading the "Castle"—When a lady was summoned at Watford for using a set without a licence, a protest was made against the high-handed method of two Post Office officials. It was alleged that the officials who called "browbeat" her and, after taking a statement, threatened penalties and imprisonment. A trivial fine was imposed, which rather indicates that the Bench felt that an Englishman's home is still his castle, no matter what the P.M.G. may think.

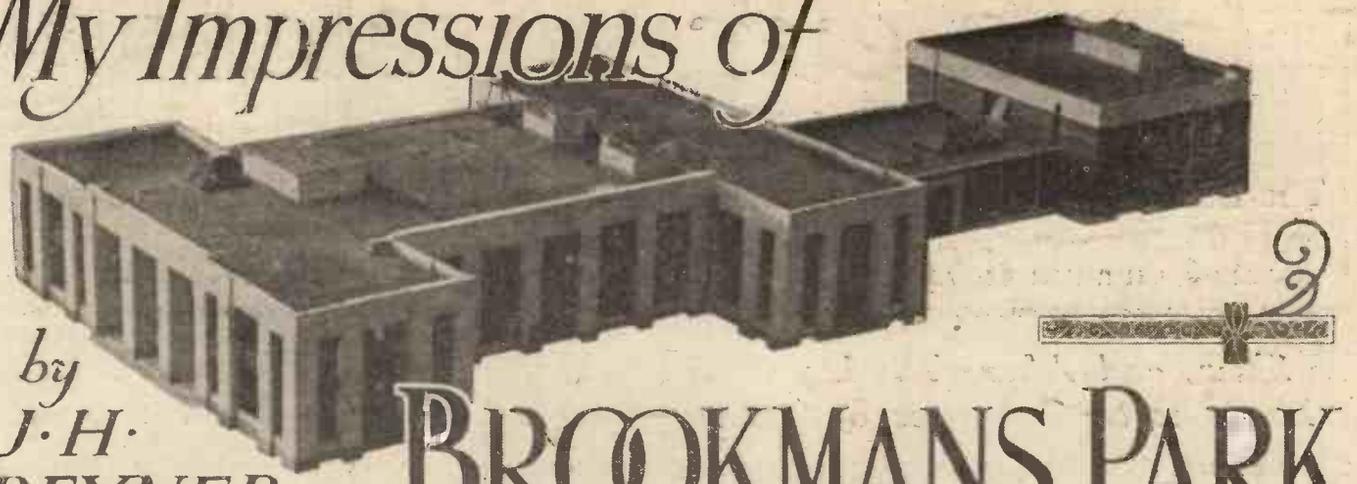
The B.B.C.'s New Musical Director—So Mr. Adrian Boult has taken over the baton of the B.B.C.'s musical directorship. We believe his duties commence with the new year, but it is interesting to note that he is conducting the City of Birmingham Orchestra in a broadcast from 5GB on October 10.

Radio Drama—Those who hold that only the play which has been specially written for broadcasting can be successful on the microphone should listen on October 12 to 5GB's transmission of *The Test*, by H. Simonis and K. J. Thomas. It has been written for the B.B.C. and is in the nature of a problem play.

Next Week—Of course, when you went to the Exhibition, you didn't miss seeing the original "Music-lover's Gramo-radio" on the AMATEUR WIRELESS stands. The special receiver-cum-electric gramophone has been designed by the Technical Staff and is being described on page 459 this week. In next week's issue will be described the construction of the linen-diaphragm loudspeaker (a new model) which is incorporated in the Music-lover's Gramo-radio instrument.

PRINCIPAL CONTENTS

My Impressions of BROOKMANS PARK



by J. H. REYNER

I REMEMBER once going over a hydro-electric power station at Berne, in Switzerland. We saw how the power was generated and taken to a distributing room from which feeders went in various directions. Each of these feeders had its own control panel and was marked at the top with the name of the place or district to which the power was being transmitted. One of the feeders was marked "Alsace Loraine"! This was my first experience of exported power, and I could not help feeling impressed at the idea that this unassuming distribution board was handling power quietly flowing across from Switzerland into France.

One of the impressions I received at the Brookmans Park station was of a similar nature, only even more impressive. We saw how the power was generated and converted and passed into a distributing room, from which it was distributed by two feeders, one on each side of the building. The feeders were not marked with the name of any particular country, but, nevertheless, the power flowed away from these feeders to supply an aerial system a hundred odd yards away, whence it was radiated for the benefit of a vast number of listeners.

The impression, indeed, from start to finish was one of the simple generation and distribution of power; in a slightly different form from the usual, I grant you, but otherwise treated in much the same manner. It is indeed no longer a case of "What's all them wires—them wires is wireless." Radio engineering has become merely a somewhat specialised branch of ordinary alternating-current theory, and appears to be as well ordered and dignified as any central station.

The power house at Brookmans Park

12,000 Volts D.C.

Now perhaps a few particular impressions will be of interest. I think everyone must have been impressed with the beautiful six-cylinder Diesel engines started off compressed air in less than half a minute. I remembered the troubles we used to have in the old days starting this class of prime-mover.

Next, the 12,000-volt D.C. generators for the main amplifiers were interesting to me, largely because of the technical difficulties in making such machines which were unheard of quite a short time ago. There is quite a snappy fault-locating device on these generators, too. The machines are arranged to run with an artificial fault—that is, a connection through a high-resistance from the armature to the frame. If, however, an actual fault develops on the machine, the current flowing through the artificial fault is upset, a relay operates and rings a bell, at the same time automatically disconnecting the artificial fault.

The machine therefore continues to run exactly as if nothing had happened. There is still a connection to the frame of the machine, but the engineers now know that it ought not to be there, and when opportunity offers the machine can be shut down and overhauled. Unless another fault develops in the meantime, however, the machine can continue to run in this manner for weeks on end.

Cooling Arrangements

Silly points, of course, impress one. When one sees filament leads nearly 2 in. thick, one is amused. The cooling system for the valves also is good. Water-cooled valves are used, and in order to preserve the water, the cooling system is entirely self-contained. The water is pumped away from the valves to external radiators, where further water is sprayed on the pipes to dissipate the heat. The actual cooling water, however, never leaves the pipe, and is thus kept as free as possible from impurities. This method enables distilled water to be used, but I was told that the first sample of distilled water was obtained from a battery maker and was found to be slightly acid. This, of course, does not matter in a battery, but it actually meant that the alleged distilled water had a greater conductivity than tap water. As the cooling water is in contact with the anodes of the valves, which are at a potential of over 10,000 volts, it is desirable to reduce the conductivity of the water, as far as possible, and the leads to the individual valves are in the form of a large rubber spiral; so that there is a very large column of water between the anodes of the valves and the earth, thereby minimising the leak to the greatest possible extent.

There are, of course, hosts of points which I should like to mention. The system whereby any valve may be changed at a moment's notice is extremely good. There are two valves, one in use and the other spare, and a simple operation of the push-rod changes from one to the other. Mr. Kirke demonstrated this to a number of us, and Captain Eckersley, who happened to be

(*Continued at foot of page* 460)

The MUSIC-LOVER'S GRAMO-RADIO

"All 'Amateur Wireless' readers who visited the Radio Exhibition at Olympia had the opportunity of seeing the 'Music-Lover's Gramo-Radio' receiver. . . . This electric gramophone-cum-receiver is indeed well worthy of comparing with the best that manufacturers have to offer, and, as is always the case with home-constructed instruments, the price is even more within the reach of the average man's pocket." Preliminary constructional details of the receiver unit, a four-valver, were given last week. Here are final constructional notes and operating instructions.

ALL AMATEUR WIRELESS readers who visited the Radio Exhibition at Olympia had the opportunity of seeing the "Music Lover's Gramo-Radio" receiver, and doubtless as a result of seeing the instrument actually "in the flesh," many were persuaded to make it up.

This electric gramophone-cum-receiver is indeed well worthy of comparing with the best that manufacturers have to offer, and, as is always the case with home-constructed instruments, the price is even more within the reach of the average man's pocket.

A Complete Receiver!

Yet the performance is in no way inferior. The receiver side includes a high-quality four-valve circuit, giving great selectivity on the H.F. side and ample power from the power amplifier. The electric gramophone section includes a good-quality clockwork turntable drive, a pick-up, volume control and, finally, a linen-diaphragm loud-speaker of special design.

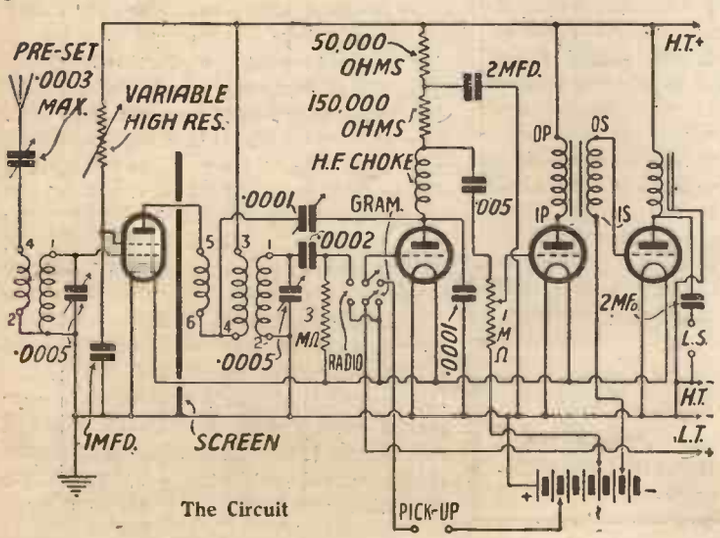
The preliminary part of the receiver construction was described last week, and the construction of every detail of the loud-speaker and gramophone will be explained in due course. Further details will here be given of the receiver.

It is first necessary to explain that the receiver unit is complete in itself. It may be made up without any intention to use it in conjunction with the gramophone, and by itself will prove to be a most useful distance-getter and local-station receiver. If desired, it may be used in conjunction with any electric pick-up attached to an ordinary gramophone. There is no need to build the complete instrument unless this is particularly desired, but the final result is a handsome piece of furniture and the most up-to-date electric gramo-radio outfit that one could wish for!

For the benefit of those who have not yet started construction, a list of components is given on the next page. These components are for the receiver unit only.

The receiver includes a screen-grid H.F. stage, with binocular transformers, both for the aerial and H.F. tuning, a leaky-grid detector, an R.C. stage, and a final power stage with a choke-output circuit.

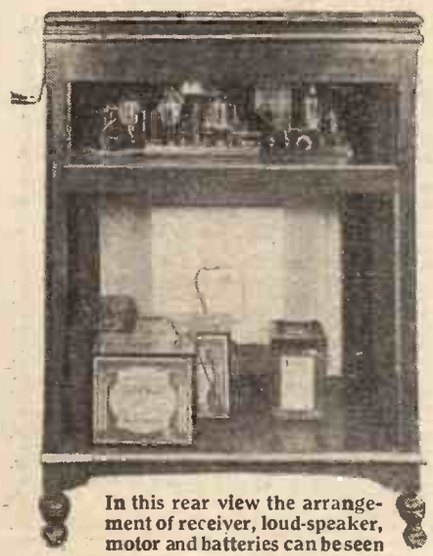
Special points to note are the following: The aerial is coupled via a pre-set condenser with a maximum of .0003 microfarad, and through a loose-coupled binocular transformer. This arrangement results in the very best selectivity to commence with, and is a great improvement on the more conventional method of coupling the aerial almost direct to the H.F. stage grid: the H.F coupling is a second binocular transformer (resulting, again, in a high selectivity factor) and reaction is obtained by making a connection to a mid-point formed by placing the primary and reaction windings in series; the secondary of the transformer is tuned by a .0005 condenser; in the grid circuit of the detector is incorporated a switch to change from "radio" to "gramophone"; in its mid-position this switch cuts off the L.T. supply; it is not recommended that this switch be omitted from the receiver, even if the unit is not to be used with a pick-up.



The Circuit

Assembly

Last week a useful hint was given in connection with mounting the components. It is suggested that in a fairly large receiver such as this the components should first be placed out on the baseboard, when the panel has been drilled and the panel components mounted, and pencil marks made around the base of each part, so that they may then all be removed and subsequently screwed in place as the wiring progresses. There is really no need to delay mounting all the panel components.



In this rear view the arrangement of receiver, loud-speaker, motor and batteries can be seen

A small reproduction of the blueprint was given in last week's issue, but it is strongly recommended that all who want to make up this receiver should obtain the full-size

"THE MUSIC-LOVER'S GRAMO-RADIO" (*Continued from preceding page*)

blueprint, which can be had from the Blueprint Dept. of AMATEUR WIRELESS, 58-61 Fetter Lane, E.C.4, price 1s. 6d. The blueprint number is AW202a, and a special note should be made of the fact that two other blueprints 202b and 202c have been prepared for the loud-speaker and gramophone sections respectively. Print 202b costs 1s., and 202c, 9d. Provided all three are ordered at one time, however, *they will be supplied at an inclusive price of 2s. 6d.*

Wiring

There is no special constructional feature which merits mention, the assembly is quite straightforward. A small drawing on the blueprint gives the shape and dimensions of the screen which passes between the two coils. Note the small slot which is cut to allow of the passage of the coil switching arm.

Wiring should be carried out with rigid insulated wire, such as Glazite, for this minimises the possibility of short circuits. Battery connections are made by means of lengths of flex, to the ends of which are attached wander plugs, marked for convenience. It is intended that the H.T. and L.T. batteries should be placed in the compartment below the receiver, if it is used with the special Clarion cabinet, and if the arrangements are made as shown in one of the accompanying photographs. The grid-bias battery is held in clips on the receiver baseboard.

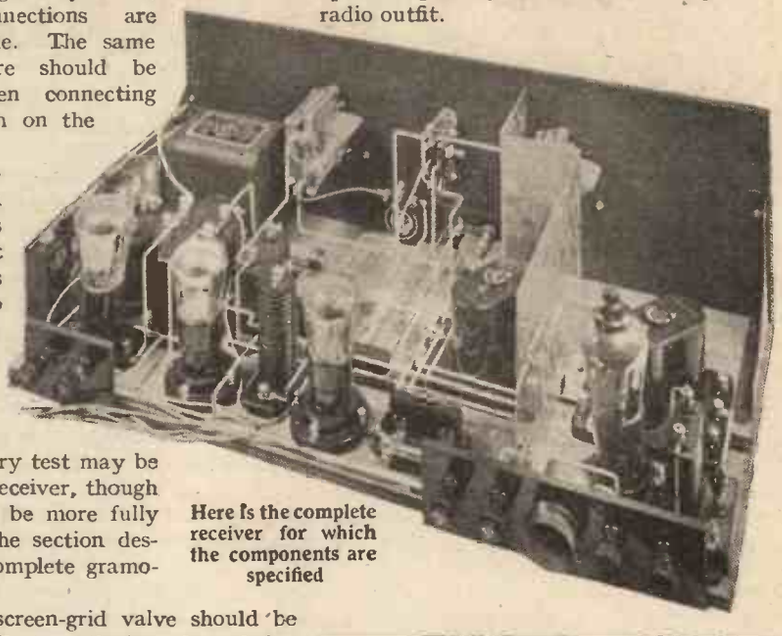
Components for the Receiver

Ebonite panel, 21 in. by 7 in., and two strips, one 7 in. by 2 in., and one 3 in. by 2 in. (Becol, Raymond).
Two .0005-mfd. variable condensers (Cyldon, "Junilog," Lotus, Lissen, Ormond).
.0001-mfd. reaction condenser (Peto-Scott, Bulgin, Polar, Dubilier, Lissen).
1-megohm volume control (Igranic, "Megostat," Gambrell).
Two slow-motion dials (Bowyer-Lowe, Lissen, Brownie, Lotus, Burndept).
Panel brackets (Ready-Radio, Bulgin, Raymond).
Double-pole double-throw switch (Utility, Lotus, Lissen).
Four valve holders (W.B., Lotus, Wearite, Benjamin, Igranic).
Dual-wave aerial coil (Lewcos, D.B.A.).
Dual-wave screened-grid transformer (Lewcos, D.B.G.).
Ganging switch for coils (Lewcos).
Screen (Parex, Ready Radio).
.0002-mfd. fixed condenser (Lissen, Dubilier, T.C.C., Graham-Farish).
.0001-mfd. fixed condenser (Lissen, Dubilier, T.C.C., Graham-Farish).
.005-mfd. fixed condenser (Lissen, Dubilier, T.C.C., Graham-Farish).
1-mfd. fixed condenser (Lissen, Dubilier, T.C.C.).
Two 2-mfd. fixed condensers (Lissen, Dubilier, T.C.C.).
Pre-set aerial condenser (Formodenser type J, Igranic).
Grid leak holder (Lissen, Ediswan, Dubilier).
3-megohm grid leak (Dubilier, Lissen, Ediswan, Graham-Farish).
H.F. choke (Lewcos, Lissen, Tunewell, Ready-Radio).
150,000-ohm anode resistance with holder (Ready-Radio, Ferranti, Lissen).
50,000-ohm anode resistance with holder (Ready-Radio, Lissen, Ferranti).
L.F. transformer, ratio 4 to 1 (Marconiphone "Ideal," Ferranti, Lissen, Varley, Igranic).
L.F. choke (R.I., Ferranti, Igranic, Varley).
Variable resistance 250 ohms to 4 megohms (Regenstat, Clarostat, Volustat).
Six terminals marked, Aerial, Earth, Pick-up (2), L.S. (2), Belling-Lee, Eastick).
Baseboard, 21 in. by 10 in. (Clarion, Raymond).
Seven yards of thin flex (Lewcoflex).
Six wander plugs, marked, H.T.—, H.T.+, G.B.+, G.B.—1, G.B.—2, G.B.—3 (Belling-Lee, Eastick).
Spade terminals (Clix).
Connecting wire (Glazite).

If the blueprint is followed, no difficulty at all should be experienced in making all connections. Note particularly that the coils are the right way round, and that the terminal connections are correctly made. The same particular care should be exercised when connecting up the switch on the panel.

Make a careful check when all connections have been put in place. It is always wiser to find out any little mistakes *before* the "juice" is turned on!

A preliminary test may be made of the receiver, though operation will be more fully gone into in the section describing the complete gramo-radio outfit.



Here is the complete receiver for which the components are specified

Any good screen-grid valve should be used in the H.F. stage, the impedance being of about 150,000 to 200,000 ohms. The detector should be a general-purpose valve of the HL type, the first L.F. valve a DEL-type valve of about 10,000 ohms impedance and the final valve a power job, preferably of the "super" class, having an impedance of the order of 2,000 ohms. At least 120 volts H.T. should be used for good results, while the grid bias on the final stage will depend entirely on the type of valve used. About 3 volts will be right for the R.C. stage.

Next week will be described the construction of the linen-diaphragm loud-speaker specially matched for this gramo-radio outfit.

BLUEPRINTS

For the complete Gramo-Radio instrument three blueprints have been prepared:—Blueprint for four-valve set (A.W. 202a) 1s. 6d. Blueprint for linen-diaphragm loud-speaker (A.W. 202b) 1s. Blueprint for motor board (A.W. 202c) 9d. Total 3s. 3d.

Provided all three are ordered at one time they will be sold at an inclusive price of 2s. 6d.

"MY IMPRESSIONS OF BROOKMANS PARK"

(*Continued from page* 458)

behind, remarked in a loud aside: "He's done it, Ashbridge, and it's worked!"

The feeders taking the power out to the aerial have already been referred to. This system bristles with points, and I shall possibly discuss this question in a separate article on some future occasion. When we actually get the power to the aerial, however, a further point of considerable interest arises in the arrangement of the aerial. With a normal aerial the current gradually diminishes as we go up the aerial. The aerial is acting as a capacity, and current is leaking away through this capacity the whole time. Consequently, in making any calculations as to the effectiveness of the radiation, one must replace the actual aerial with an effective aerial in which the current is uniform all the way up, and the height of such an aerial would obviously be distinctly less than the actual height. The effective height of an ordinary aerial is something of the order of one-half the actual height.

If we can increase the effective height of an aerial, then for a given height of mast we obtain a greatly improved radiation. By arranging to work the aerial at Brookmans Park below the natural wavelength, it is possible to arrange that the current at the top of the aerial is greater than the current at the bottom. By this means the radiation efficiency goes up enormously, and, indeed, I was told that the effective height of the Brookmans Park aerial was in the neighbourhood of 90 per cent. of the total height—an astonishingly high figure.

To sum up, I came away from the new station with the impression of a sound engineering job well conceived and admirably executed—in fact, a worthy example of British engineering.

NEXT WEEK!

THE LINEN-DIAPHRAGM SPEAKER FOR THE GRAMO-RADIO SET

Loud-Speakers on the Dirt Track

By a Special Correspondent

YOU can't help being interested in the loud-speakers at the dirt tracks. They add to the thrills and it would be impossible to follow the racing without them. They have a radio interest, too, for the announcing is being done with the aid of an ordinary microphone and L.F. amplifier. And, when the announcer has finished giving out the results of the racing he turns on a "super" electric gramophone and the music passes away the time until the next race is due to start.

Different Systems

How is it done? Well, it should first be explained that the equipment is not standard, for on some tracks they have Marconi plant, and on others Siemens-Halske, and in the north the Philips travelling van has had a large share in entertaining the crowds. In all cases, however, the arrangements, so far as the dirt-track people are concerned, are the same, and it is only on the electrical side that there is any difference For instance, Marconi's always use the well-known trumpet-type moving-coil loud-speakers, such as you might have seen at the Hendon Air Force Pageant. Siemens-Halske use the flat honeycomb-type Blathaller loud-speakers, which are really a kind of moving-coil job on a large scale.

And now to take a peep behind the scenes, as an AMATEUR WIRELESS Special Correspondent did recently, accompanied by that familiar personality of the dirt tracks, Mr. R. J. Samuel, publicity director of International Speedways. Let us start at the tail end first and go to the little control room, generally situated right away from the track and under one of the grand stands. Here, all the time the racing is in progress you will find a man in his shirt sleeves, wearing phones and closely following the programme with one eye while he keeps the other on the amplifier panel!

A buzzer "bzzz-z-z-z's" once, and he flicks a switch which puts the announcer's microphone into circuit.

The Amplifier

The Siemens apparatus is typical of most, and the L.F. amplifier is arranged in the following manner. First, there are four stages of R.C. amplification, with H.T. supply by dry batteries in order to prevent the possibility of ripple. Then follows another R.C. stage incorporating a valve of the LS5 class. This valve has its anode "juice," 750 volts, supplied by one section of an H.T. generator. The 15-volts grid bias is supplied by a dry battery, again to prevent the possibility of ripple or H.T. hum. The next stage is a super-power one, with a valve driving both H.T and L.T. from the generator. The H.T. voltage is 1,500 volts. This is transformer-coupled to two valves in parallel, the H.T. again being 1,500 volts and the filaments consuming the somewhat startling figure of 9 amps. each

With the Marconi plant a carbon microphone is used, though a magnetic type has been tried, but the Siemens people use a German strip microphone bearing a faint resemblance to the condenser microphones which the B.B.C. engineers are now trying out.

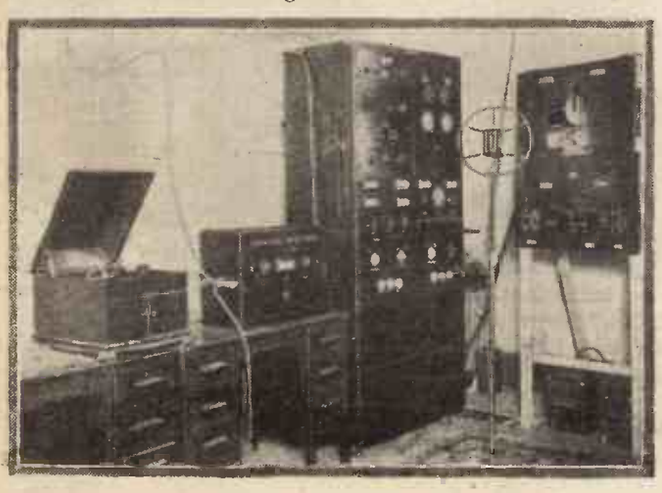
So far as the gramophone music is concerned, there is an electrically-driven record turntable mounted in a case somewhat similar to an ordinary table grand gramophone. The turntable spins continuously during the whole of most of an evening's programme. In this way records can be changed with only a moment's delay. This is important, because none of the equipment has a dual turntable gramophone. Marconi's use a magnetic pick-up like a balanced-armature loud-speaker unit, with a needle carrier in place of the diaphragm drive, but Philips and Siemens have pick-ups of their own design.

H.T. Supply

In all cases the H.T. supply for the amplifier is derived from the mains. A simple little motor generator gives two or three values of H.T., and one fixed L.T. voltage. Marconi's sometimes use an Exide accumulator bank, which is charged from the mains.

At the White City track only will you see the Blathaller loud-speakers, which are most interesting instruments. Each one is a rectangular frame clamping firmly a sheet of aluminium. On the surface of this is bolted (but insulated from the aluminium diaphragm) a zig-zag-shaped conductor,

(*Continued at foot of next page*)



(Left). A peep behind the scenes at the Siemens-Halske apparatus as at the White City Track. Gramophone, amplifier and power bank are all in the one little control room. (Right). Giving out the results. The "mike" is on the right, and the signal button on the left.

For the Newcomer to Wireless: CRYSTAL TO VALVE

LIKE so many people, I bought a crystal set some time ago, and I am wondering whether I ought to make a change and install a valve receiver.

I don't think that there can be any question about that!

How do you mean?

Well, there are many excellent points about the crystal set. . . .

It costs little to install and practically nothing to run, for instance.

Agreed. But isn't it worth while to obtain enormously increased pleasure from broadcasting by spending just a little more?

Please explain how the valve set increases one's pleasure.

I am taking it that you will want to have a loud-speaker?

Yes, of course.

Well, that means that you are going to hear the real richness and tone of music as you never could with telephones.

Why exactly?

It is physically impossible for ordinary telephones to reproduce properly anything but the middle of the musical scale. A good loud-speaker, on the other hand, enables one to hear not only this, but also the very high and very low notes. And there is a further point.

What is that?

Wearing telephones, however light and well designed they may be, for any length of time is always rather an uncomfortable business.

That is true, now you come to mention it.

Again, you will not be tied down to just one station.

That's certainly a big advantage, for I often see items in other programmes that I would like to hear. Can one really bring in other transmissions so that they are worth hearing?

If you install a good three-valve set with one high-frequency stage, a detector, and a note-magnifier you should have something like a dozen alternative programmes available, and they will be really worth hearing.

What sort of stations should I be able to receive?

On the medium band you ought to obtain splendid reception from Nuremberg, Cologne, Turin, Barcelona, Hamburg, Toulouse, Frankfurt, Berlin, and probably Brussels, Vienna, and Budapest. These stations you will hear best after dark.

What about the daytime?

You will find the long waves best for daylight reception. Here you should have a choice of Hilversum, Radio-Paris, Kalundborg, and Motala. In addition to these, you will also, of course, have 5XX, 5GB, as well as the local station.

Does a valve set cost much to run?

Very little indeed. First of all, modern valves require only a tiny filament current; your accumulator, therefore, will require recharging only at long intervals.

What about high-tension?

A high-tension battery of a capacity to suit your set should last you at least a year.

But can't I run directly off the mains?

Yes, of course, you can—I didn't know that you had them in your house.

Will that be economical?

Distinctly so. Your set will draw so little current from the mains that you probably won't notice the slight increase in your electric-light bills at the end of any quarter.

"LOUD-SPEAKERS ON THE DIRT TRACK"

(*Continued from preceding page*)

along the length of which are placed a number of powerful magnets. The output from the amplifier is taken to a step-down transformer, the secondary of which is connected to the conductor strip. The strip thus acts as the coil of a moving-coil loud-speaker, although it is not in coil shape, and it moves the diaphragm.

The Marconi speakers are also somewhat similar to moving-coil jobs. They have small round diaphragms carrying on the surface cone-shaped wooden pieces which fit into the throats of the horns. The horns are of the exponential type, and it is found that the presence of the wooden pieces in the throat gives a better sound reproduction.

And now to see how the whole scheme works.

A race has just come to a conclusion. Immediately the winner passes the line a gun goes off and all lights come on. The announcer pushes his little button three times, and the man under the grandstand puts the pick-up needle on to a record. Jazz then keeps the interest alive until the results and times have been worked out. The button is pushed once. The announcer breathes into the "mike" to see if the switch has been thrown over. A faint rustle can be heard if the microphone circuit is "live."

Then: "Hello everybody. The winner of that heat was Flying Jim Somebody; time, eighty-three seconds dead. Second, So-and-so. Third, So-and-so. The next event will be . . ."

The button is then pushed again to tell the control man to "put over" some more music.

Immediately the machines are ready to be pushed off for the next event the announcer touches his button and the loud-speakers are switched off.

Then the thrills begin; but the control man has to have a record handy in case one of the riders crashes and the race has to be stopped. Music always comes on immediately in such an event. The control man hasn't a very enviable job, for in most cases he can neither hear nor see the racing and has to go entirely by the buzzer indications.

Considering the difficulties under which the giant loud-speaking installations are worked it is surprising that there are not more breakdowns. The only trouble which is ever experienced is interference with the microphone lines.

The microphone is always situated on the grass in the centre of the track, and the lines have to pass up standards, over the track, and down to the back of the grandstand. They are likely to come in contact with electric light and telephone wires, and it is easy to get pick-up from these sources. On one occasion the White City engineer reports having faintly picked up part of a very private telephone conversation. And that may explain why the loud-speakers were suddenly switched off for a few moments on one occasion!

Marconi apparatus in use at Harringay

VARLEY

FOR PUSH PULL TRANSFORMERS

HEAVY DUTY PUSH-PULL INPUT TRANSFORMER

Here is a problem which is totally different from that of other Transformers and which our Research Department has tackled thoroughly and efficiently, enabling us to market two up-to-date models designed on sane, sound, scientific lines.

In our **Heavy Duty Push-Pull Input Transformer** the primary winding will carry the Anode current of a small power valve without saturation thus ensuring that overloading does not take place in the early stages and giving pure undistorted input to the output valves. The secret of successful push-pull design lies largely in arranging the winding symmetrically in the electrical sense. This feature has received very close attention in all our Push-pull Transformers. The secondary of the Heavy Duty Push-pull Input Transformer is wound in two sections, so that different Grid Bias Values to each Push-pull Valve can be applied as may be necessary, when the valve characteristics differ.

Further, when two valves are employed with their outputs in parallel, each can have its grid circuit connected to its own input winding. Alternatively the valve output circuits may be connected to different loads when it is desired to operate two widely differing Loud-speakers from the same receiver. Ratio, 2.5-1.

Price, £1 : 3 : 6
Royalty 1/6 extra

Our Double Ratio Push-pull Output Transformer can be used after the largest super power valves and is tapped to give two ratios for high and low resistance speakers.

Ratio 1-1 and 20-1. Maximum current per pair of valves—120 m.a.

Price, £1 : 2 : 6
Royalty 1/6 extra

For RADIO
OLIVER PELL MANUFACTURE
Varley

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

On Your Wavelength!

An American View

DR. C. F. BURGESS, head of the big Burgess Battery Company in America, whom I saw at the exhibition, told me that he was very favourably impressed with the quality of the exhibits and the attractive way in which they were displayed. One thing, he told me, struck him particularly. Wireless exhibitions are held at many big centres in the United States, and he said that at these you would find the stands in the charge, as a rule, of quite junior salesmen. "Your people," he said, "give their products a much better chance, for they don't leave the showing in the hands of juniors. I've found at stand after stand that one or more of the big men in the firm was in charge." And that, when you come to think of it, shows the keen way in which our manufacturers conduct their business. You could hardly go to a stand without finding that the managing director, the sales manager, or even the proprietor of the business was there himself, not only supervising the work of his assistants, but also ready at any moment to interview prospective buyers or to explain his wares to those who had questions to ask. Dr. Burgess was very much impressed with the state of our radio industry and with the high efficiency to which we have brought our apparatus. "You don't see," he said, "so many highly ornamented and expensive cabinets as you might at an American show, but beauty may be only skin deep, and your sets certainly have the right stuff inside them."

The One Fly

I have only one adverse criticism of any moment to make about the exhibition itself, but the sole fly in the ointment was, to my mind, rather a fat one. Though twenty-five sound-proof demonstration rooms were provided so that those interested could hear loud-speakers performing, the management for some reason or other permitted loud-speakers to be operated at intervals on many of the stands. Though there is nothing that I like better than a good loud-speaker well operated, there are few things that I hate worse than a bad one run absolutely all out. Also, by the way, even the best of loud-speakers can be made to sound utterly loathsome if it is overloaded, and many of the loud-speakers that were being allowed to raise the roof were receiving vastly more juice than they could possibly deal with. The result was at times a horrid din. This may, of course, have resulted in the sale of a few instruments to those who don't particularly care what sort of a noise it is so long as it is a noisy one; but I am quite sure that the general influence upon business was distinctly bad.

A musical person hearing some of these horrible things perform might well say to himself: "Well, if that's 1929 wireless, I am not having any." And the pity of it is that most of the instruments that were being worked at far too big volume and hopelessly overloaded were capable of quite pleasant reproduction if only they had been given a chance. I do hope in future years either that loud-speaker demonstrations will be confined to sound-proof rooms or Herculean fellows with sledge hammers will go round and pulverise any instrument that is an example of blaring beastliness.

Brookmans Park

I have just been listening to Brookmans Park, which, by the way, is on the air most days now between 11.30 a.m. and noon, besides coming into action after the London programme. It is borne in upon me that though my present receiving set was in the past selective enough for all ordinary purposes, it will have to be revised to some extent to meet new requirements. It was not designed as a super-selective receiver. Actually, it enables either Seville or Barcelona to be tuned in comfortably without interference when 2LO is working. The wipe-out from the Oxford Street station thus extends over about twelve or fourteen metres on either side of his wavelength.

A Coming Problem

But with Brookmans Park with more power at shorter range it is a very different pair of shoes. With the circuit as it stands I should be able to receive nothing between Cardiff and Frankfurt, owing to the vast wipe-out of the new super-power station. This would mean that when simultaneous 30-kilowatt transmissions take place on 356 and 479 metres I should hear nothing much between Budapest at the upper end of the scale and Madrid, and then between Frankfurt and Cardiff. I live about forty-five miles from 5GB and fifteen from Brookmans Park. Owners of some of the older sets in the locality tell me that when Brookmans Park is working on 356 metres they will find it impossible with present apparatus to separate him from 5GB.

Great Stuff!

Passing down Kingsway the other day I noticed quite a crowd assembled outside a shop window. All seemed rather amused and some were rocking with laughter. Naturally, I joined to see what the fun was. At the back of the window was a very large poster of the Wireless Exhibition, and pasted across it was a wide strip bearing the words "Great Stuff This Bass." In the middle of the window was the familiar little bill-sticker, striding away after his fell work, complete with ladder, brush, paste-pot, and smile. The rest of the window was occupied by various wireless components, and notices informed the public that these brought out not only the *bass*, but also all other parts of the musical scale. It was one of the most effective bits of wireless advertising that I have seen, and I would like to congratulate whatever member of the Varley people's staff who was responsible for it.

Have We All Gone Mad?

Speaking of bass, though (I am referring, mind you, to the stuff that goes in at the *ear*), prompts me to ask quite seriously whether we have all gone mad on a certain point at the present time. Early wireless receivers produced nothing whatever of the lower tones, the result being that it was difficult to tell a clarinet from a penny whistle or a harp from a piano until the announcer told us what we had just heard. Then, as transmission became better, it was borne in upon us that we ought to hear a good deal more of the middle and lower parts of the scale. "Does your set bring out the bass?" was the question that everybody began to ask everybody else. The moving-coil loud-speaker showed us that there was plenty of bass if we could only deal with it.

First Attempts

And then I think the first symptoms of bass insanity began to manifest themselves. Those who couldn't design loud-speakers to bring out the bass that really was there made instruments which, by means of various resonances and sometimes with the help of fat condensers, brought out quite a lot of what wasn't really there at all. The high notes, like silver and gold in Solomon's time, were nothing accounted so long as plenty of booms and grunts came through. And I am afraid, reader, that many of us are still suffering from this peculiar form of madness. When a friend takes me in to hear his latest set or loud-speaker I very often find that the pride of his heart gives reproduction that I should describe as "tubby," or "drummy."

Curiously enough, the fever has spread to the talkies, all of whose heroines appear to have single-bass voices, whilst those of the heroes are double-bass. I heard a story the other day which I believe is literally true. The maker of a piece of apparatus which provides really natural reproduction of sound films gave a demonstration to members of the talkie trade. They turned

On Your Wavelength! (continued)

the thing down at once, saying that the public would not have it because it did not sound a bit like what they expected from the talkies!

An Interesting Device

I have been trying out recently a very interesting gadget which hails from America. This is the Cockaday Tone-Tilter invented by a wireless expert whose name is almost a household word on the other side of the Herring Pond. You connect it up between the receiving set and the loud-speaker, which having been done, you proceed to do things with the two knobs with which it is provided. The one on the left is labelled "High" and that on the right "Low.' Turning the left-hand knob has a surprising effect. The higher tones are more and more strongly brought out as it is rotated, and if you go a step further and at the same time move the right-hand knob towards its minimum position, you can almost entirely suppress the lower tones. A deep male voice becomes like a squeaky schoolboy's, whilst a full orchestra sounds like a hurdy-gurdy with half its strings missing.

An Accommodating System

Then, if you reverse the action you get just the opposite effect. The higher pitches are eliminated almost entirely and the lower ones are brought out at full strength. I think that there is a great future for a device of this kind, for by the careful manipulation of the knobs you can arrive at a setting that very much improves the reproduction of a loud-speaker which by itself is not quite perfect. If it is "woomphy" (is not that a beautiful and highly descriptive word?) you can raise its voice, so to speak, from its boots to the place where it ought to be; and if it does not have quite enough to say about the bass in the ordinary way you can greatly improve its performances. The tone-tilter has not yet come to this country in quantities—I believe that mine is the only one over here—and I don't think that any of our manufacturers are turning out a similar device. I believe, however, that there should be a great future for such an instrument, not only in our homes, but also in talkie theatres. Tastes in loud-speakers are notoriously different, and a tone-tilter would enable anyone to adjust his own loud-speaker exactly to suit his requirements.

Radio Gramophones

The fact that there were so many radio gramophones on view at Olympia has prompted several people to remark, rather unkindly, I think, that such a development is the natural outcome of unsatisfactory B.B.C. programmes. Throwing bricks at the B.B.C. programme builders has become a national pastime, but it is quite a new move on the part of the critics to put the "blame" for a normal scientific development of receiver design on these much maligned folk. Advanced amateurs and set constructors have used gramophone pick-ups in connection with the low-frequency side of their receivers for a long time, and the non-set-constructing public is now demanding the same facilities. The electric gramophone record reproducer is, on the whole, better than the mechanical gramophone, especially in the matter of quality and the ease with which one can adjust the volume of sound.

Mechanical Gramophones

Mechanical gramophones have progressed, too. During the last few months I have heard several mechanical machines which have reproduced with amazing quality, but they have all been large both in bulk and price. A curious fact emerges in connection with the design of these super-mechanical gramophones. The whole process of picking up the sound and reproducing it by mechanical means has been worked out with formulæ used in similar electric circuits. From the mechanical soundbox to the aperture of the long logarithmic horn the transmission and attenuation of the musical frequencies has been traced out in equivalent network diagrams of resistances, condensers, and inductances. The even reproduction of the whole range of sound frequencies depends on the correct matching of impedances, whether the chain of "circuits" be mechanical or electrical. The needle arm in a mechanical soundbox, for instance, is the equivalent of a transformer, the ratio of which is equal to the relative length of the arms on each side of the pivot.

Colour Frequencies

This question of even reproduction of a range of frequencies or vibrations has not been the exclusive possession of sound-research engineers. Light, for instance, is apparently a close relation of sound; the difference is merely a matter of frequency. I mean that, while "Middle C" of the piano has a fundamental frequency of 256 cycles per second, "Middle Green" of the spectrum has a frequency of 600×10^{12} cycles per second. Thus, we find the photographic research man working out frequency response curves for the emulsions of plates and films in much the same way as the L.F. transformer manufacturer does. In photographic work the curves are plotted on a wavelength basis of Angstrom units, the special range being from 3,000 to 7,000. The Angstrom unit is equal to a ten-millionth of a millimeter, and therefore rather lower than the range of your radio set! The "bass notes" of the photographic man's curves are the red tones of light; green come in the centre, while blue-violet tones constitute his "treble." And it is the correct rendering of the "bass notes," otherwise red tones, which gives him the most trouble.

Photographic Bass

In the old days, photographic plates were like the early L.F. transformers: the lower frequencies were not responded to at all. Thus, pillar boxes, the red uniforms of soldiers, and ginger hair all "came out" black. With the development of research on photographic emulsions came (as with L.F. transformers) improved rendering of the middle and low frequencies, and the modern panchromatic plate will do the same work in the correct grading of colour values in shades of black, white, and grey as the modern L.F. transformer does for bass and treble notes. Colour photography is but a step further from the correct rendering of colour values in monochrome, and the latest colour moving pictures, especially the film *On With the Show*, demonstrate how much progress has been made in this particular "range of frequencies."

A Novel Tele-cinema Scheme

I was rather intrigued when delving into some literature the other day by a special television transmission arrangement which appears to have been tried out on the Continent, where they are so keen on televising cinema films. Readers will call to mind that in the normal spotlight arrangement the transmitting disc, which serves the purpose of allowing an elemental light area to traverse the whole of the scene or object, is perforated with a series of thirty holes, so that they form a complete spiral. Thus, when one spot has moved across or down the object, another spot performs a similar function through the medium of the next hole, and so on. This produces thirty adjacent light strips which together cover the scene.

Now, in this other scheme the disc is made with a circle of holes near the periphery instead of a spiral. When the disc is rotating these would only produce light strips over the same portion of the picture, and in order to change this to a series of strips it is suggested that the object to be scanned should be moved a strip distance just before each hole performs its function.

With human subjects it is obvious that such a scheme is wholly impracticable, but with films a mechanism could be devised which would keep each picture of the film moving its requisite distance so as to be completely scanned. The film wheel could be geared to the rotating disc, and I understand that tests with a mechanism designed in this fashion have shown that the idea is quite practicable for film work. The construction of the scanning disc is, of course, simplified, but I am sceptical whether this saving is advisable in view of the added complication which is required in the film-projector mechanism.

THERMION.

INTRODUCING THE NEW "Q" COIL

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

The new "Q" Coil

THIS is an age of progress, and although the original "Q" coil supplied the need when it was first introduced, a number of points have arisen as a result of the extensive practical use of these components which have made it desirable to bring out an improved type. In addition, certain problems which were difficult of solution when the "Q" coil was first invented have, as a result of persistent investigations, been satisfactorily overcome. A particular example of this is the new QAT (aerial) coil, as will be seen.

It should perhaps be emphasised at the outset that the new form of "Q" coil does not depart in any radical particular from the principles which were laid down as necessary when the coil was first designed. Eighteen months ago, I felt the need for some improved method of obtaining two ranges of wavelength within the one coil and did not feel at all satisfied with the system then in use, that of short-circuiting the long-wave winding. A number of tests showed that the extra resistance introduced on the short-wave band by this practice was considerable and after some research, the expedient of paralleling the coils in the short-wave position was adopted.

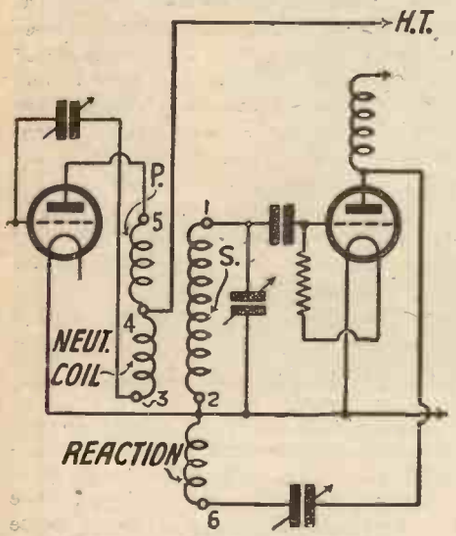


Fig. 1. Connections of QSP Coil

Experiments had been under way at the same time with a view to the production of a new form of astatic coil, and it was decided to combine the two effects. The coils, therefore, were placed in opposition when paralleled, while for the long-wave band the two sections of the coil were placed in series. By arranging the two sections concentrically, it was then found that a suitably placed primary winding could be made to operate equally successfully on both wave bands. This made it possible to construct dual-range H.F. transformers having a performance on each wave-band equal to that obtainable with a specially-constructed transformer made for either wave-band alone.

Improved Construction

None of these important advantages has been sacrificed in the new version of the coil. The improvements which have been made are in the nature of improving the ease with which the coil can be employed. In the first place, the switching has been greatly simplified. Despite all efforts to the contrary, cases did occur where trouble was experienced due to imperfect switching and numerous somewhat curious effects would result if one of the switch contacts was not properly home. The problem of simplifying the switching was therefore tackled, and it was finally found possible, without losing any of the valuable properties of the coil, to reduce the switching to a simple push-pull arrangement. To do this, the original idea of utilising the two coils in series on the long waves had to be abandoned, only one coil being employed, the other section being made to exert a self-screening action.

This alteration brought in its train advantages and disappointments. In the first place, it was found that the secondary could be made distinctly more efficient—indeed the mean short-wave resistance of the present type of "Q" coil is in the neighbourhood of 7 ohms, less than half the figure with the older form. On the other hand, the H.F. transformer features were distinctly more difficult to obtain and, for some time, it appeared doubtful as to whether the new system could be successfully employed.

After a while, however, it was found that by resorting to very careful methods in manufacture the desired results could be produced and the final coil, owing to the reduced secondary resistance, showed a marked improvement on every previous type.

The H.F. transformers were otherwise unaltered. We have the two types, the QSP and the QSG, suitable for ordinary and screen-grid valves respectively, the connections of these coils being as shown in Figs. 1 and 2. It will be seen that, as before, they conform to the standard 6-pin convention.

The Aerial Coil

The aerial coil, however, received more attention. Hitherto, there had been three different types of aerial coil. One, the simple QA type, utilised an aerial coupled through a .0001 fixed condenser. The other two types utilised a coupled aerial coil, but certain difficulties were experienced due to the tuning of the aerial winding by the aerial capacity itself. This is one of the greatest difficulties in a dual-range aerial coil, for it is very hard to obtain one aerial coupling winding which serves equally well on both wave bands. Fortunately, however, as a result of a careful investigation of the underlying principles, it has now been found possible to achieve the desired results to a quite unexpected degree.

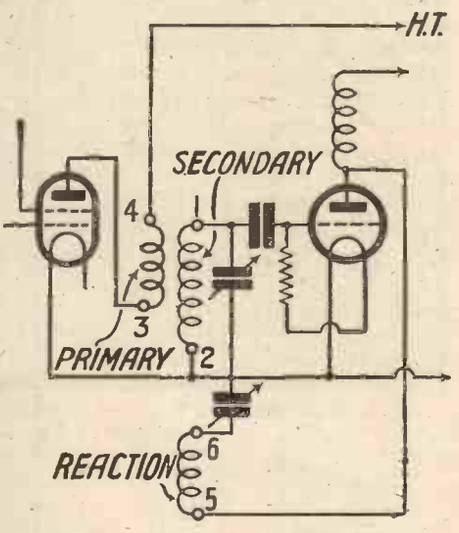
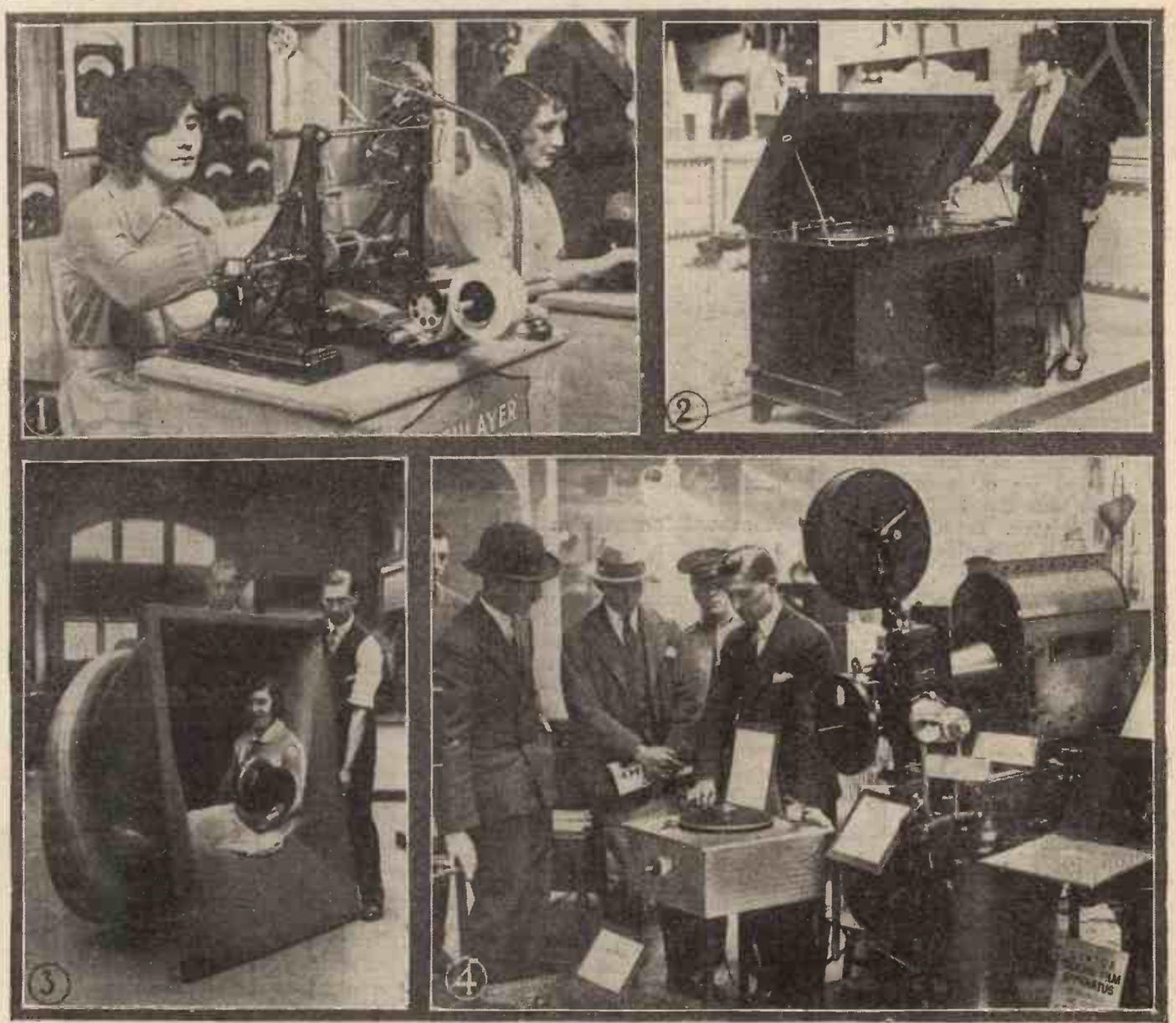


Fig. 2. Connections of QSG Coil

The three types of aerial coil hitherto marketed have therefore been replaced with one coil only. This coil is known as the QAT coil in order to distinguish it from the others, and is provided with a coupled aerial winding which serves equally well on both wave bands. It is quite free from the troubles, so often experienced, of interference from the local station towards the bottom half of the long-wave scale, while its selectivity is better than anything previously devised in the way of dual-range coils. The connections of this coil are shown in Fig. 3 and it will be noticed that a separate

(*Continued at foot of next page*)

TYPICAL SCENES AT THE SHOW



Watching others work ! (1) Girls busy winding coils at a demonstration. (2) A really "super" gramo-radio set. (3) The great and the small of it ! (4) A talkie film projector in which all sound-film "fans" were interested.

"INTRODUCING THE NEW 'Q' COIL"

(*Continued from preceding page*)

reaction winding is provided so that the reaction condenser may be arranged with its moving plates at earth potential.

A further improvement which applies to all the coils and which will be welcome to set constructors, is that the size of the coil has been reduced. The diameter of the coil is now 2⅛ in. and the base has been reduced to 3 in. by 3¾ in. It has been found necessary to increase the height of the coils slightly, but this is not a troublesome feature in the modern set where there is always plenty of head room in order to house the valves. The actual overall height is about 3½ in. from the bottom of the base to the top of the coil, this figure varying slightly with different manufacturers. The switch is of the push-pull variety instead of the rotary type and this has a number of advantages.

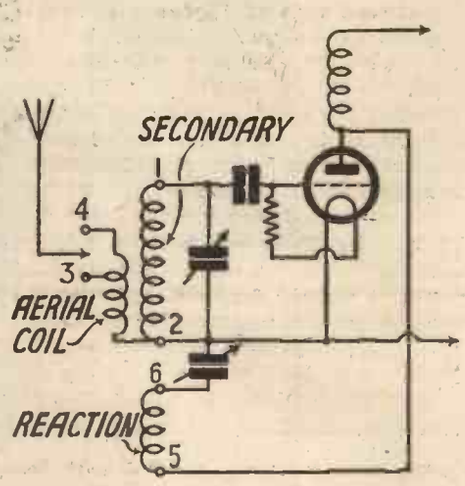
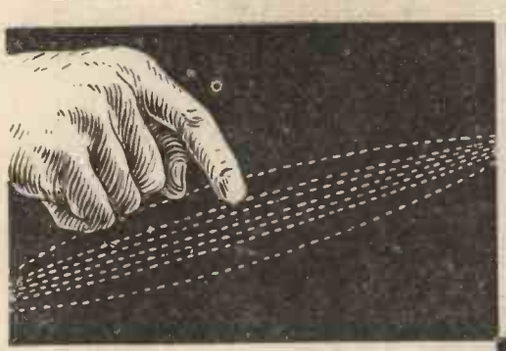


Fig. 3. QAT aerial coil connections

An innovation is the introduction of 6-pin "Q" coils. The standard type of "Q" coil is mounted on a rectangular base, having 6 terminals, this being done in order to conform as far as possible with what has become conventional. Many readers, however, have sets incorporating 6-pin plug-in coils and they would welcome the opportunity of changing to a dual-range type of coil which could be done without any alteration to the wiring. The three types of "Q" coils already outlined are therefore marketed in the form of a 6-pin coil, suitable for plugging into any standard 6-pin base. The connections remain exactly the same as before, while the switch now becomes a small push-pull switch or link, fitted on top of the coil.

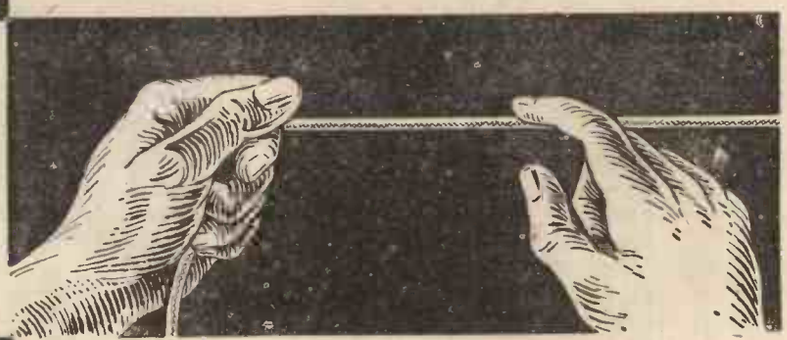
The coils are manufactured by Messrs. Lewcos and Wright and Weaire and will shortly be marketed by Messrs. Ready Radio Supply Co.

"TWANG" A TAUT WIRE



— THEN TRY TO "TWANG" A RUBBER COVERED CABLE

—YOU CAN'T!



MICROPHONIC NOISES ARE LARGELY DUE TO FILAMENT VIBRATION

On the right you see how the new Cossor filament would appear if viewed through a powerful micro scope. Note the tungsten core and the thick coating which definitely damps out vibration. This wonderful new filament is tougher than steel yet as pliable as whipcord.

NEW COSSOR FILAMENT CAN'T VIBRATE——ITS COATING IS TOO THICK

Because of their wonderful tungsten core filament and their rigid construction, the NEW Cossor Valves are definitely non-microphonic—they give you 100% pure music. And because this new Cossor filament has a 28% greater emission the NEW Cossor Valves give greater volume, longer range and sweeter tone. No other filament has such enormous emission. Put new life into your Receiver—use the NEW Cossor—they make old Sets like new—they improve even the most up-to-date Receivers. Your dealer sells them.

NO NOISE 100% PURE MUSIC WITH THE NEW COSSOR

The NEW Cossor is available in a complete range of types, including Screened Grid, H.F., Detector, L.F., R.C., Power, Super Power and Pentodes. Your Wireless dealer stocks them.

The NEW Cossor

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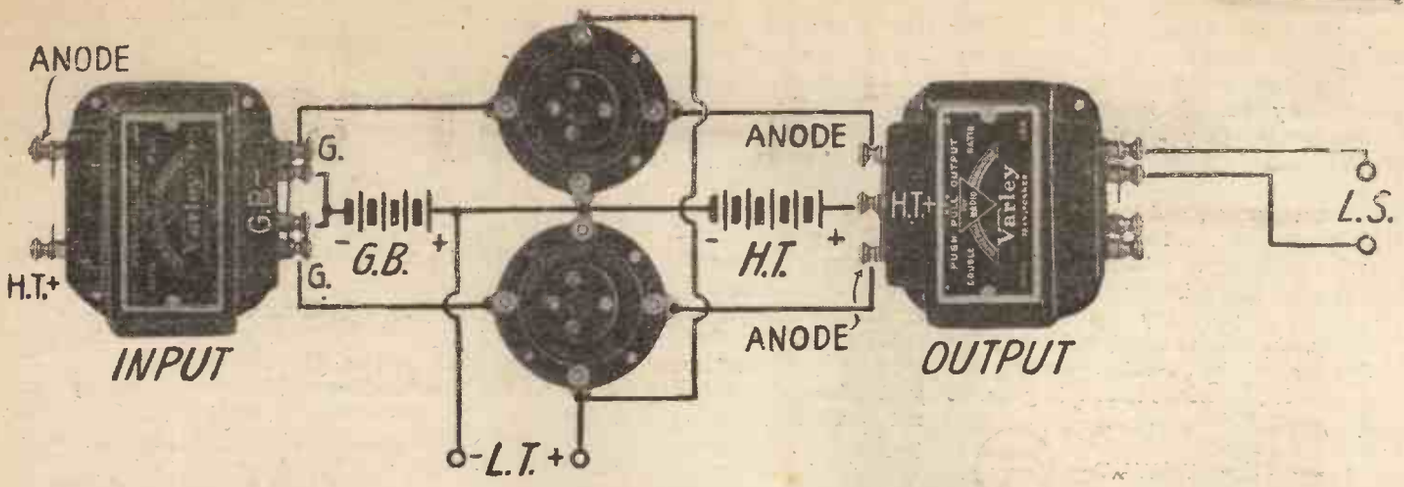


PUSH-PULL SIMPLY EXPLAINED

By W. JAMES

THE amount of the volume to be obtained from a receiver without overloading is dependent amongst other factors upon the size of the output valve and its high-tension supply.

Thus, we might obtain 1 unit of strength when the output valve has a high-tension of 120 and a suitable grid bias. By increasing the high-tension to 200 volts and adjusting the grid bias to suit, we should, however, be able to deal with a strength of say, 4 units.

Now, the particular output valve being used might be of a type which would not stand a high-tension of more than 200 volts, with the result that if we wanted still more volume we should have to employ either a bigger power valve and give it more high-tension, or else employ a second valve of the same type.

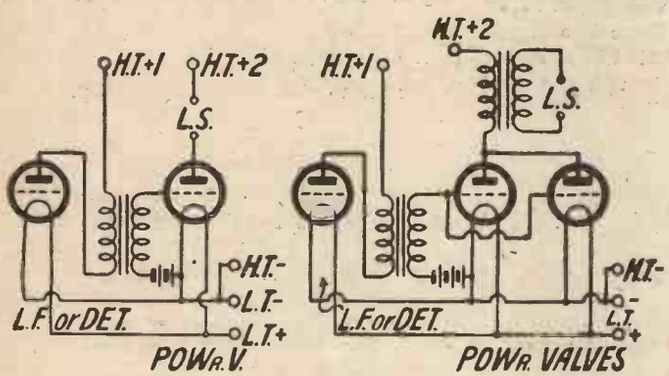
This second valve might be connected in parallel with the first one as indicated in Fig. 1B. Then, with 200 volts high-tension as before, the anode current will be double, and therefore the amount of power supplied to the valves is doubled. These two valves may be considered as one having exactly half the impedance of one of the valves and the same value of amplification factor.

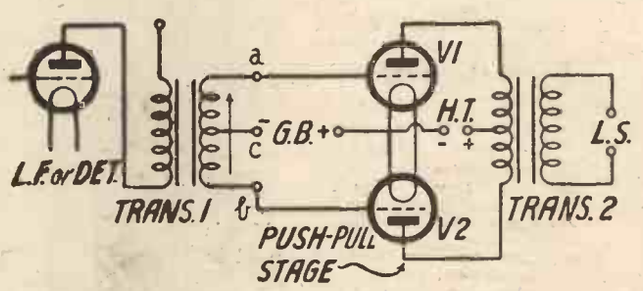
In order to obtain the increased output which we are entitled to expect from the two valves, we must alter the anode circuit. If we use the same anode circuit as before, we might be disappointed with the volume, but by fitting a transformer of the correct ratio, a suitable increase in the volume will be obtained.

We cannot apply stronger signals to the grids of the valves as the grid bias for the two valves in parallel is exactly the same as for one valve, and increased volume is only secured because the anode impedance is halved by joining the two valves in this way, which in turn enables one to employ a transformer of different ratio.

The primary winding of this transformer has to carry the current flowing through both valves. This is a disadvantage, as when the current is heavy, a transformer having a large iron core and windings of thick wire, must be used in order to avoid distortion. This disadvantage is avoided altogether and other benefits are obtained by connecting the two valves in push-pull instead of in parallel.

Fig. 2 shows how the two valves are connected for push-pull working with transformers. Notice that transformer T1 has an ordinary primary winding and a





Left : Fig. 1. Single output valve and a pair in parallel.
Above : Fig. 2. Connections of a push-pull stage

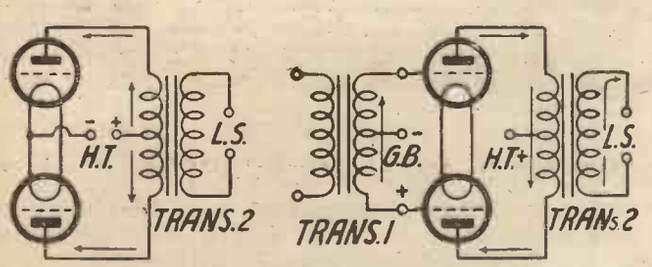


Fig. 3, A and B. Showing flow of steady current

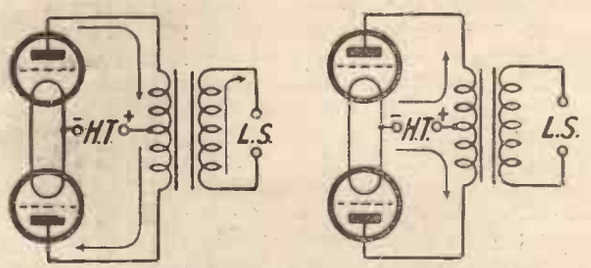


Fig. 4A. Speech currents do not pass through H.T. Fig. 4B. If a ripple is present in the H.T. it passes through each half as shown

secondary winding which is tapped exactly at its centre. The output transformer T2, is arranged in exactly the opposite way, as its primary winding has a centre tap, whilst its secondary winding is joined to the loud-speaker.

Transformer 1 is known as a push-pull input transformer, and T2 as an output transformer. A usual ratio for the input transformer is 3.5 to 1, including the whole of the secondary winding. But it will be clear that if we apply one volt to the primary, the voltage developed across the two halves of the secondary winding will be 1.75 volts, whilst the total voltage across

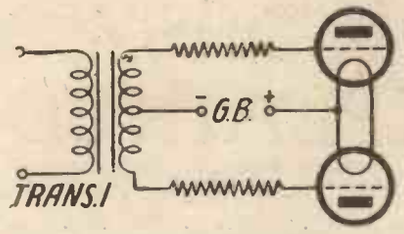


Fig. 5. Resistances for preventing spurious oscillations

the secondary is 3.5. This is the first point to notice in connection with a push-pull circuit.

The second point is this. Only one-half of the full voltage is applied to valve V1, and one-half to valve V2. We may therefore use more amplification in the receiver in order to apply the full input voltages to the valves.

Now, the grid bias of the two valves is just the same as when they were used in parallel, or for that matter when one of them was used by itself. It therefore follows that we may usefully employ exactly twice the amplification in the receiver, because the two valves are capable of dealing with a total of twice the input.

An Interesting Point

An interesting point to observe is that when one grid is made positive by the incoming signal, the other grid is made negative by an equal amount. Thus, if the voltage in the secondary winding of transformer 1 is as indicated by the arrow, end *b* is positive and end *a* is negative, whilst the voltage of C is exactly half that of B. If, therefore, at a given instant the total secondary voltages is 10, end *a* will be negative 5 volts and end *b* positive 5 volts, with respect to the centre point C. The voltages have the effect of increasing the anode current through valve V2, and of reducing the current through valve V1.

Now let us examine the anode circuits to learn the effect of the currents. The primary winding of T2 is tapped at its centre and joined to the positive side of the high-tension. Therefore, as the anode current of the two valves is equal when not receiving, the current flowing through one half of the primary exactly balances out the magnetic effect of the current passing through the other half (Fig. 3A).

This is a most important effect as it means that so long as the wire employed will carry the necessary current, a component of small size may be used, as the iron is not magnetized by the steady anode current. There are also several other most important points to note, which I will mention presently. What I want to explain now is how the output from the two valves is combined to provide a strong signal.

We have seen that when the current through valve V2 increases, that through V1 decreases, and of course, vice versa. The net result is therefore, that the current produced by the incoming signal passes through the primary winding in one direction only, and it sets up a current in the secondary winding to which the loud-speaker is joined. This is indicated in Fig. 3B.

None of the varying current passes through the power supply, and at the same time if the power supply should be varying in any way (through improper filtering in a mains unit for example) no effect will be produced. The diagram Fig. 4 will make these points clear. If there is a ripple in the high-tension supply it will cause an equal current to pass through the two halves of the primary winding, as indicated by the arrows in Fig. 4B. These two currents being in opposite directions tend to set up magnetic fields which cancel

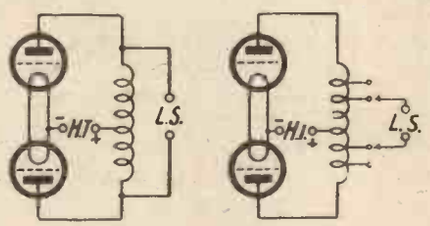


Fig. 7, A and B. Choke-output circuits

out, with the result that no hum will be produced.

In this description, I have assumed first, that the input transformer T1 is tapped at its exact centre, secondly that the two valves are identical and thirdly, that the output transformer is tapped at its exact mid point, and has a ratio which suits the valves and the loud-speaker.

Ratios

This ratio will be quite different from that when valves in parallel are used, for the reason that the effective anode impedance of two valves in push-pull is twice that of a single valve. A suitable transformer must always be used, and the pair must be of good construction or the circuit will be out of balance.

The valves, too, should be reasonably alike, although there is no need as a rule to have them specially matched. In practice the parts may not be so correctly proportioned and so perfect electrically that the above description is exact. Sometimes, for example, it is necessary to connect a resistance of the order of 100,000 ohms in each grid wire as indicated in Fig. 5 for the purpose of preventing spurious oscillations which might, were they allowed to flow, spoil the quality and heat the valves.

Using Grid Leaks

It is not essential to employ a special input transformer having a centre tap. An ordinary transformer may be used with a pair of grid leaks, as in Fig. 6. The grid leaks R1 R2 should be alike, and may have resistances of 100,000 ohms each, or a little more. Two resistances are used in order that the equivalent of a centre tap may be available for the grid bias, and whilst

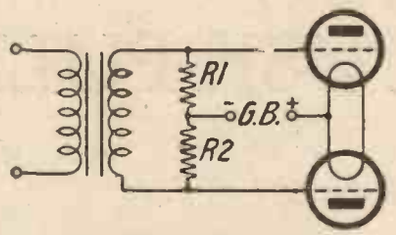


Fig. 6. Use of ordinary transformer and two grid leaks

they load the transformer, they improve rather than detract from the quality.

From the description of Figs. 4A and 4B it will be clear first, that the push-pull stage will not tend to produce "motor-boating" in association with the other stages of the set. In this respect it resembles a power stage fitted with a choke-condenser filter circuit which also tends to prevent the passage of speech currents through the H.T. supply.

Eliminating Hum

The second point is that if the filaments of the valve are heated with alternating current, no hum will be set up. From Fig. 4B it follows that if the anode current of both valves varies according to the alternations of the filament current, the two anode currents produce effects which cancel.

Instead of an output transformer a tapped choke may be used as shown in Fig. 7. The choke must be centre-tapped for the high-tension feed, as indicated. But there is a further point to watch here. If the impedance of the speaker is not suited to that of the valves, there will be a loss of power. The choke may therefore have to be tapped about its mid-point in order to enable a favourable connection to be made.

Choke output circuits have the disadvantage that the loud-speaker is not isolated from the H.T. supply and it so happens that the saving effected is very little.

Push-pull amplification is greatly used when considerable volume with good quality of reproduction is needed, and the high-tension voltage is limited either by its cost or by the construction of the valves. I, personally, have used it for years, with good results.

THERMION Looks Back At The Show

WELL, the 1929 exhibition has come, and by the time that these notes get into print it will have gone. On the whole I think it was by far the best wireless show that we have yet had. Of course, there were grousers. One fellow whom I met in the afternoon of the opening day shook his head sadly and said there weren't nearly so many people present as there had been on the corresponding day last year. I pointed out that there wasn't a corresponding day, and when he asked what I meant I said that in 1928 and in previous years the exhibition had opened on a Saturday, when all the world and his wife and family were free to attend.

Grouser number two said that he had seen nothing especially attractive; so I said: "Well, what about the Mullard Girls?"—just to cheer him up. He explained that he meant that there was nothing what he called especially striking in the strictly wireless exhibits. And this, dear reader, was, in my humble view, one of the very best features of 1929 Olympia. What grouser number two meant, as I dragged out of him by questioning, was that there was nothing startling, such as a five-valve set in a cigar box, a set tuned by pedals in order to eliminate hand capacity, or anything of that kind. He had come, in fact, expecting stunts, and he had not found them.

The interest taken in the construction of kit sets was very noticeable

Then and Now

Though they may attract a certain amount of passing attention, stunts are not serious wireless and they don't do any real good. A distinguished American wireless man who was there told me that in comparison with our exhibition of 1927 this one struck him as being immeasurably superior owing to the almost entire absence of "junk." By "junk" he meant flashy but almost useless components and sets, of which we saw far too many when wireless was in its infancy—probably, I suppose, because infants must always have toys. This year one noticed everywhere sound engineering electrical and constructional jobs. You don't find freak coils, tinpot slow-motion dials that freewheel or advance in jerks and valve holders constructed of that queer black compound which is known to the trade as "mud."

Coils

Everywhere one noticed a return to the solenoid coil in one form or another; in fact, I only remember seeing a few odd specimens of other types. I am perhaps using the term "solenoid" rather widely, but I mean it to include anything that consists of single-layer helical windings. Binoculars and cylindrical coils, wound half right-handed and half left-handed, thus fall into this category. And what beautiful pieces of work these coils are. One has only to visit the stands of such firms as Wright & Weaire or Lewcos (to mention but a couple) in order to see to what a high pitch the art of coil-making has been brought.

Batteries or Mains?

We were told that this was going to be an all-from-the-mains year, and many visitors went expecting to find hardly a battery-operated set in the place. There were plenty of mains-driven receivers, it was true, and I will turn to them in a moment; but there were also any amount of battery sets, and when you come to think of it this is likely to be the case for many a long year. Only a small proportion of our houses have electric light, so that for some time to come large numbers of wireless enthusiasts will rely largely upon batteries. Long-distance men, too, and particularly short-waveites, like batteries; for, good as mains units are, it is an astonishingly difficult task to entirely suppress hum when a set with a great deal of amplification is brought into the sensitive condition necessary for long-range working.

The Most Popular Set

The typical set this year is a three-valver of very high efficiency. In a large number (perhaps the majority) of cases the combination consists of a screen-grid H.F. amplifier, a triode detector, and a pentode. Many firms, such as McMichael, Marconiphone, Burndept, and others, are turning out alternative models for mains and battery operation. Some of these can be converted from one method to the other, supposing that the purchaser subsequently installs electric light, by the simple process of removing the batteries and placing an eliminator in their compartment. There are portables galore, and very much better portables they are than those that came on to the market when this type of set first made its appearance. Some of the earlier models tried to ask a standard capacity battery to deliver anything up to 28 milliamperes with the net result that, the poor thing lay down and died very quickly. Makers have now realised that current can be cut down considerably without any loss in quality and provision is made for H.T. batteries of larger cell size. But one of the most interesting developments in the complete receiver is the,

"THERMION LOOKS BACK AT THE SHOW"

(Continued from preceding page)

transportable, which is shown by many firms. This is a completely self-contained set intended for indoor use. It is light enough to be carried from room to room, but since weight does not matter very much it contains either good-sized batteries or an efficient eliminator.

Batteries of All Types

Amongst the dry batteries I noticed a promising newcomer in the Dubilier, whilst both Ever Ready and Siemens were showing very attractive new models incorporating many improvements. One dry cell may look very like another, but the work which the research chemist does on its inside makes all the difference to its performances. Accumulators shown by Exide, Oldhams, Peto-Radford, and C.A.V. were extremely pleasing. Oldhams showed very neat power units for both H.T. and L.T., each containing in one and the same case an accumulator battery and a trickle charger, connections being made automatically by the insertion or the withdrawal of a plug.

Valve Progress

Valves this year are better than ever. Our old friend the S.G. has been developed in a wonderful way. In the earliest models, which provided the sensation of the 1927 show, inter-electrode capacity was cut down by the screen, but there was still so much of it there that it was impossible to use highly efficient circuits for both plate and grid tuning. Careful design has now cut down this capacity to but a fraction of what it was; modern screen-grid valves remain perfectly stable and provide enormous amplification with tuned circuits that come quite into the low-loss class. The pentode has ceased to be the fragile contraption that it was last year. In the triodes we have now a splendid range for all purposes, including some excellent detectors (in which high mag. and low impedance are combined) and the best collection of output valves that any country in the world can show. A newcomer into the valve world this year is Lissen, who exhibited a comprehensive series of good-looking valves. Mullard and Cossor vied with one another in the good looks not only of their valves, but also of their highly attractive mantraps!

What of the Crystal Set?

I hope that the B.B.C., which is still suffering from a crystal complex, carefully noted the number of crystal receiving sets on show. There *may* have been more than one; but one, at any rate, was all that I saw. It doesn't look, somehow, as if they needed to bother quite so much about providing big crystal-service areas.

Variable condensers are always a joy to me—good ones, I mean, of course. At the exhibition I simply revelled in the new models shown by Ormond, Formo, G.E.C., J.B., and other makers. Some are particularly interesting for the small space that they occupy, some for their excellent slow-motion arrangements, some for their ingenious methods of securing positive contact with the moving vanes; but all are things of beauty and sound mechanical jobs. Considering the work put into them, the lowness of prices is simply astonishing; you can buy a first-rate condenser to-day for half the price demanded two or three years ago for something quite crude and wobbly.

Better Transformers

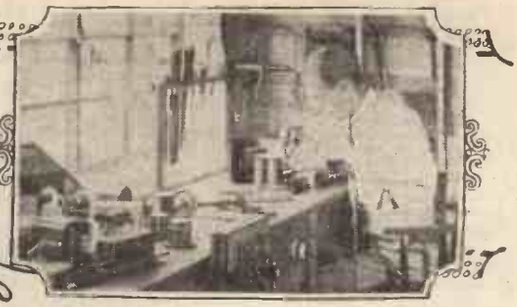
Some people thought last year that we had reached the high-water mark in the matter of low-frequency transformers. We hadn't, for 1929 showed that designers could go still one better. There were many intervalve transformers well worth attention; the new Varley, for example, when used in the resistance-capacity-cum-transformer circuit, of which I am very fond, shows an absolutely straight-line curve under N.P.L. tests. More and more people are realising the importance of having an output transformer with a low-impedance valve in the last holder *and* of having a transformer with a ratio that enables valve impedance and loud-speaker impedance to be matched. Manufacturing firms are to be congratulated on the way in which they came forward to meet the demand for these components. With the pentode valve having the right output transformer makes all the difference between thoroughly good and thoroughly bad results. R.I., Igranic, Varley, and Marconiphone are all making transformers that enable this fine valve to do its best.

Well, that's how "Thermion" looks back at the 1929 Wireless Exhibition—and he is already looking forward to that of 1930.

MR. FLEX THINKS THE OLD JOKE ABOUT GETTING CHILI—

—ISN'T A PATCH ON THIS ONE.

My Wireless Den



Weekly Tips—Constructional and Theoretical by W. JAMES

Cores Which Change

LOW-FREQUENCY transformers having cores made up from stampings from sheets of one of the new steels may change their characteristics if by accident a relatively heavy current is passed through the primary winding or if the component is dropped. It is usual to heat treat the core stampings after they have been punched from the sheet in order to improve their magnetic properties, but it would seem that a user must exercise a certain amount of care, or the special properties will be destroyed. The manufacturers themselves handle the stampings with care during assembly, as it is known that even bending will impair the magnetic properties of the steel.

Choosing H.F. Valves

So large an amount of magnification is to be obtained from a well-designed high-frequency stage having a shielded valve that it is a pity the results are so often spoiled because the valve used is not according to specification. I have found that when self-oscillation occurs the valve is often of too low an impedance. If the anode current of such a valve is measured it will often be found to be rather more than that indicated in the instruction slip.

Some valves that I have tried have passed an anode current of as much as 7 milliamperes instead of the 2 or 3 milliamperes of a normal valve. When unsatisfactory results are being obtained, therefore, I would recommend that the anode current be measured, and if it is found to be much higher than normal for that type, it should be returned.

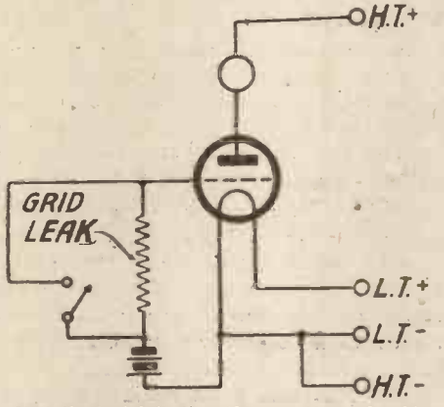
Shielded valves having 2-volt filaments usually have an impedance of 200,000 ohms, and coils and other parts are naturally adjusted to suit a valve of this impedance. A fair proportion of the valves issued have, however, according to my tests, an impedance of as little as 100,000 ohms, with the result that selectivity is poor and self-oscillation occurs.

Measuring Grid Current

The average amateur does not include a micro-ammeter in his equipment, and is therefore unable to measure very small currents. Fortunately, however, it is not always necessary to measure a current so long as one is able to detect its presence.

As an example I would refer to amplifying or power valves which, as everyone knows, should have so good a vacuum that no current flows through the grid circuit under normal conditions when a negative value of grid bias is used. Ill-treatment may result in the valve becoming soft, however, or a faulty valve may have slipped through the valve manufacturer's test-room, and one may desire to test whether grid current is actually flowing.

I have found that if a milliameter be connected in the anode circuit of the valve being tested, and a grid leak of, say, 2 megohms is joined in the grid circuit as



A method of detecting the presence of grid current without the need for a micro-ammeter. An ordinary plate-current milliameter is connected as shown.

indicated in the diagram, there will be a difference in the anode current when the grid leak is in circuit and when it is short circuited. This test is easily made, and it is not hard to see why the presence of grid current is so easily detected. If the current is very small, such as .1 micro-ampere, for instance, it will, as it passes through a grid leak of 2 megohms, alter the grid bias by .2 volt, and will therefore change the anode current.

A grid leak of as much as 10 megohms may be used in this test. One could, of course, estimate the amount of the grid current by noting the equivalent voltage needed to change the anode current, and then find from Ohm's law the current flowing through the grid leak; but this i not always necessary.

Frame or Indoor Aerial?

The assumption is generally made that even a small indoor aerial is better than a frame aerial, but I recently met with an instance where a frame aerial was much better than a well-constructed indoor aerial over 30 ft. in length. The difference in the volume was most marked, and I therefore endeavoured to find whether the frame used was a particularly good one.

I soon found that any ordinary frame aerial was better than the indoor aerial, and it seemed that no matter how it was arranged the results obtained were always better when a frame was joined to the set. This in spite of the fact that the set was not designed for a frame aerial.

The set was installed in a flat not far from the London station and the signals were rather weak, partly because of the construction of the building and partly, no doubt, because of its situation with respect to other large buildings in the neighbourhood.

Tests showed that the frame had to be pointed in one direction, and that by moving it more than a few degrees the station could not be heard. Evidently this is a rather special instance, but tests in another district have shown me that a good frame aerial collects as strong a signal as a poorly constructed indoor one. In the interests of neatness, an indoor aerial is often fastened to a picture rail or is concealed in another way, with the result it is not a very good collector.

NEXT WEEK!

W. JAMES on

MAKING THE MOST OF THE POWER STAGE

In Lettland, travellers with motor-cars touring the country are allowed to bring in their wireless set free of charge, providing they can show a broadcasting licence from their country of origin.

The new 75-kilowatt Moscow high-power station, which for two years has been under construction, is now completed. Tests are being carried out daily during the midday hour on a wavelength of 950 metres.

PIEZO-ELECTRIC CRYSTALS

An Account of Some Recent Developments

By MORTON BARR

THE piezo-electric action of quartz and certain other crystals is finding a steadily increasing field of useful application in modern wireless practice. This curious crystalline property, by which mechanical pressure is converted into electricity, was first discovered by the brothers Curie in 1880.

For many years after that date it was regarded as an interesting scientific curiosity, with little if any practical application. Some early attempts were made to use it in connection with gramophone reproduction, and also as a substitute for the ordinary microphone, but they did not prove successful from the commercial point of view.

However, in 1922 Professor Cady, of

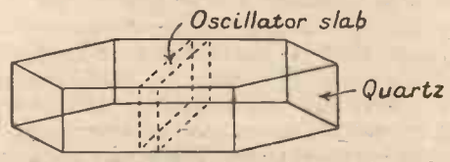


Fig. 1. The crystal is cut from a piece of natural quartz

Connecticut, U.S.A., discovered that by applying a high-frequency voltage, a piezo-electric crystal could be made to vibrate mechanically at an amazing rate—in fact at more than a million oscillations a second if necessary. At that time such a rate of mechanical or bodily vibration was absolutely unique. It was generally believed that such frequencies were only to be found in the realm of electricity.

Crystal Resonators

Not only does a quartz crystal behave in this unique manner, but each crystal, according to its particular dimensions, has a definite fundamental frequency which it will maintain at a perfectly constant rate.

Professor Cady's discovery at once led to the idea of using the crystal "resonator" as an independent master control for high-frequency electrical circuits. For instance, a piece of quartz crystal, cut to have a fundamental frequency of, say, one million a second, can now be employed to control or "anchor-down" a broadcast transmitting station to an allotted wavelength of 300 metres.

Fig. 1 illustrates the manner in which a crystal oscillator is cut out from a block of natural quartz, whilst Fig. 2 shows the crystal operating as a master control in the grid circuit of a back-coupled valve oscillator, used, for instance, to feed the power amplifiers of a transmitting station.

By so stabilising the transmitter, all fluctuations in wavelength due to variations in the power supply to the broadcasting equipment, or to other causes, can be prevented. This in turn avoids mutual interference and heterodyning, and so makes it possible to increase the number of broadcasting stations working within any given wavelength band in the ether.

Selective Reception

More recently the use of piezo-electric crystals has also been applied to selective reception. Utilising the tendency of each crystal to favour one definite frequency, a series of crystals, which have been cut to "accept" a given wavelength and its side bands, can be arranged either in the input or in the intervalve coupling circuits so as to cut out powerful interference from a nearby station.

Although the crystal-controlled selective receiver has not yet reached the stage of commercial exploitation, it is probable that we shall hear more of it in the near future, particularly when the new high-powered broadcasting stations come into operation.

Crystal Pick-ups

Now that the development of the thermionic amplifier has made it possible both to manufacture and reproduce gramophone records by electrical methods, the original suggestion to use the piezo-electric crystal as a convenient means for converting sound waves into corresponding voltage variations and *vice versa* has been revived. With modern methods it is likely that piezo-controlled reproduction will prove more successful, the crystal acting as a substitute for the ordinary pick-up.

A type of crystal possessing piezo-electric properties to a marked degree is made from Rochelle salt. The crystals are

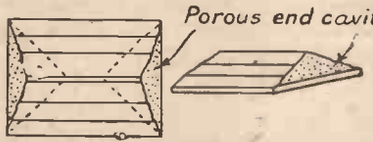


Fig. 3. Diagrams explaining how occluded water is removed

deposited when a saturation solution of the salt is rapidly cooled.

Rochelle-salt Crystals

If the deposition is carried out fairly rapidly, as is desirable in practice, it is found that a concave portion is formed at the end of each crystal, as shown in Fig. 3,

W. JAMES ON "MAKING THE MOST OF THE POWER STAGE" IN NEXT WEEK'S ISSUE

containing part of the mother liquor of the original solution. These portions are opaque and porous, and are extremely troublesome to dry cut.

Unless they are treated in some suitable manner to drive off the occluded liquor before the electrodes are fitted, subsequent trouble is likely to arise. For instance, after the crystal has been in operation for some time the water tends to dry up by spontaneous evaporation, and this de-

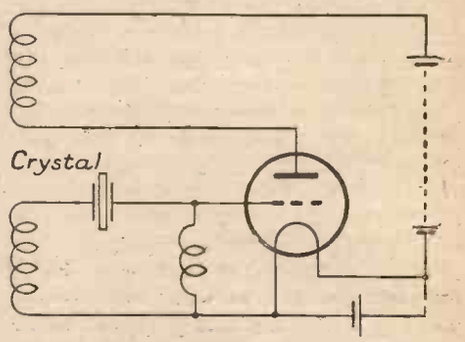


Fig. 2. How the crystal is used as a control

creases the electrical contact between the crystal and the end electrodes.

Usually one electrode consists of a metal-foil band lapped around the body of the crystal. The other contact is shared between two metal caps pressed into close contact with the porous ends. It may happen that after the crystal has been suitably mounted the water contained in the porous ends will suddenly leak out and creep around the outside, beneath the foil band or the varnishing or other insulating coating.

A "Contact" Problem

In order to avoid this source of trouble an ingenious method has recently been protected for clearing-out the occluded crystal water under air pressure. Drain holes are bored into the end portions from underneath, and the crystal is mounted in an airtight chamber and subjected to heavy air pressure. The bore holes are mounted so as to fit over exit holes, and the undesirable water content is in this way forced out of the crystal.

When the crystal has been treated in this way it is found necessary to restore its electrical conductivity by first boring-out the desiccated end portions as indicated in the dotted lines (Fig. 3) and then applying a solution of silver nitrate to the new surface. As the solution dries off it deposits a thin coating of metallic silver on the surface of the crystal, and the end terminals are then fitted tightly against this film so as to make perfect electrical contact.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

I THINK it was nearly a year ago when we had that interesting controversy in AMATEUR WIRELESS regarding the respective merits of the dance bands.

The time has come to review the position because the situation has changed so much since then. As my jazz correspondent writes: "Now that there are new dance bands broadcasting, I wonder which of them is the most popular? It is now some time since we thrashed out the Jack Payne-Padbury controversy."

◆ ◆ ◆

"Harold" encloses for my perusal a list of current broadcasting bands *arranged in order of merit* according to his judgment. Here they are:—

1. Ambrose's May Fair Hotel Band.
2. Billy Francis' Band.
3. Jack Payne's B.B.C. Orchestra.
4. Bertini's Orchestra.
5. Ambassador Club Band.
6. Café de Paris Blue Lyres.
7. Teddy Brown's Orchestra.
8. Piccadilly Players.
9. Piccadilly Grill Band.

◆ ◆ ◆

Let us see how this accords with the views of other listeners. So far as I am concerned—but let's hear what my readers have to say. By the way, do *any* of these bands come up to the standard of the Savoy Orpheans or Elizalde's Band? I will ask Sir Henry Wood.

◆ ◆ ◆

One of the prettiest pieces which we hear only too rarely is "An Album Leaf" by Wagner. I was glad to hear the Wireless Orchestra play it the other night, but I should like to hear it more often.

◆ ◆ ◆

The B.B.C. has certainly had everything to do with the revival of part singing, but I doubt whether it has hit upon a really well-balanced combination. In some cases the singing is good, but the selection of music is bad. In other instances it is the reverse.

For example, the Tudor Singers relayed from Manchester *sang thirteen songs*, and frankly one tired. The band, composed of goodness knows how many instrumentalists, played only five pieces. This, I venture to say, is a badly balanced programme. By the way, we still get "by request" items. One always wants to know by whose request. The conductor, of course, is justified in including a piece of his own composition, if it is popular enough.

But why "by request"? Even if it is by his own request!

◆ ◆ ◆

Nina Doria, like most of these Continental singers, sang Neapolitan songs charmingly. At least, I took her to be a Continental singer. I wager she *is*, judging from her voice.

◆ ◆ ◆

The artiste (I have forgotten his name) whom I asked to repeat his clever imitation of a quarrel between five French people, obliged. Many thanks!

◆ ◆ ◆

D.L.S., of Neath, wants my opinion on the pronunciations of the following words by one of the London announcers:—

Fire	- -	Far.
Ireland	- -	Arland.
Showers	- -	Shars.
Wireless	- -	Warless.
Modern	- -	Moddne
Hours	- -	Ars.
Flowers	- -	Flars.
Power	- -	Par.
Britain	- -	Brittne.
Deliberately	-	Deliberatler.
Australia	- -	Australiah.
Clear	- -	Cleah.
County	- -	Carnty.
Europe	- -	Yorrop.

My opinion would be unprintable.

◆ ◆ ◆

There may be different views about these national programmes; but not for me, thanks. Like having a dinner of all soup or, as in the case of Spanish programmes, all onions. Spain is my spiritual home, or a place somewhere near there. But a whole evening—for that is what an hour amounts to—was too much at one gulp.

◆ ◆ ◆

People still ask me when the dance titles are to be announced again. Personally, I would just as soon do without them. Particularly in view of the fact that the announcing led to a good deal of abuse. It may be annoying, as one of my correspondents puts it, to hear a catchy tune and to be unable to refer to it by name when buying a record. Also, it might well have been "a blow to musical publishers and record manufacturers." Since, however, a good many of these people are to blame for the ban, the best thing they can do is to go out in the garden and kick themselves.

Lissenden's idea of Frank Braidwood

An Impression of Lou Abelardo

The TALISM

A Two or Three at Will

HERE is a receiver which is really adaptable. Not many people need less than two valves nowadays, for it is usually barely possible to operate a loud-speaker unless one L.F. stage is used. So two valves are the minimum for good working from the local stations.

But something more is sometimes needed; it is tantalising, to say the least, to be able to receive stations faintly on a two-valver, knowing that were another stage available it would be possible to bring them out at full strength on the loud-speaker. It is not always necessary for this that the additional stage should be an H.F. one. Provided that the low-frequency amplification is carefully carried out, there is much to be gained by the addition of an L.F. stage to boost up distant signals. No amount of low-frequency amplification will make up for signals which are too weak to be detected, but provided that the weak input is just sufficient to operate the detector, then the detected signals can be brought up to generous strength by reason of the added L.F. stage.

Two or Three at Will

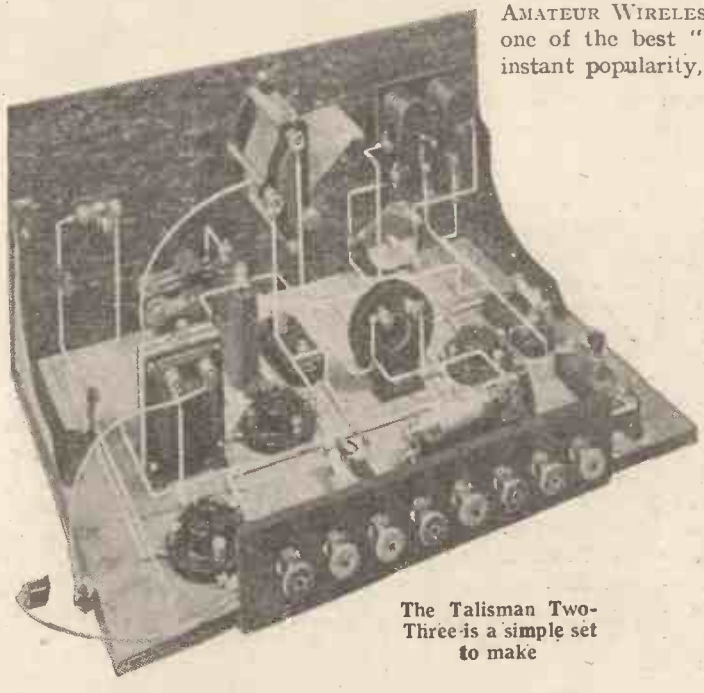
The result of this is that there are a good many folk who find a two-valver ample enough for their needs when the local programme is pleasing, but badly want a "three" when the foreigners are being brought in only faintly on the "two."

The "Talisman Two," described in AMATEUR WIRELESS No. 373, is certainly one of the best "two's" yet. It gained instant popularity, firstly, because it was so compact, simple to build, and inexpensive, yet made of good parts; secondly, because this set included the Talisman dual-range coil, a most compact panel-mounting tuner covering both the medium and long wavebands at the touch of a switch.

Cutting out a Valve

Very many readers who made up the "Talisman Two" were so satisfied with its performance that they said: "Why not design three- and four-valve editions of the 'Talisman'? Not everyone is satisfied with a 'two.'" A three-valve "Talisman" receiver, however, would not differ fundamentally from many other excellent "threes" which have been given in AMATEUR WIRELESS from time to time. It was felt that in the basic "Talisman" was the opportunity to produce a "three" along different lines—to produce a "three" which could be "economised," as it were, when only local-station working was desired, and yet which would give the advantage of the added low-frequency stage when the maximum performance is needed.

What is the saving? Not in initial cost, true. The "Talisman Two-Three" necessitates the same number of components as if it were a full "three." The real saving is in running costs. The method of switching will be dealt with later, but it may be mentioned at this stage that the valve cut out by the switch is the "middle" or first L.F. valve. When it is switched off



The Talisman Two-Three is a simple set to make

COMPONENTS REQUIRED

Ebonite panel, 14 in. by 7 in. and strip, 9 in. by 2 in. (Becol, Ebonart, Raymond, Peto-Scott).

.0005-mfd. variable condenser (Burton, J.B., Polar, Igranic, Formo).

Talisman coil (Wearite).

.0002-mfd. reaction condenser (Lotus, Peto-Scott, Igranic, J.B., Burton).

Double-pole change-over switch (Wearite, Utility).

Push-pull filament switch (Bulgin, Benjamin, Lissen, Trix, Wearite).

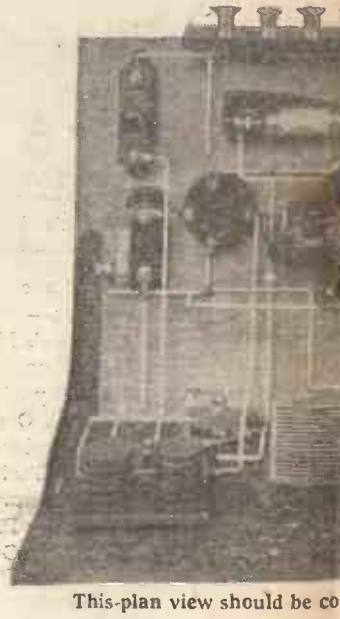
Panel brackets (Ready-Radio, Bulgin)

Cabinet, 14 in. by 7 in. with a 9-in. baseboard (Clarion, Cameo, Pickett).

Three valve holders (W.B., Lotus, Benjamin, Lissen, Wearite).

.0002-mfd. fixed condenser with series clips (Dubilier, Lissen, T.C.C., Graham-Farish).

.005-mfd. fixed condenser (Dubilier, Lissen, T.C.C., Graham-Farish).



This plan view should be co

MAN TWO-THREE

both filament and H.T. current are saved. The saving in filament current will, of course, not be very noticeable to the pocket, for accumulator charging is inexpensive. The advantage is just that the accumulator will last a few hours longer at each charge and that the expenditure in valve replacements over a number of years will be lower than if all three were constantly in use.

To very many people the H.T. saving will be considerable. If an eliminator is employed, then the number of milliamps used is not of great importance. But if a dry battery is the source of H.T., then it is essential for economy that the drain on the cells should be reduced to the minimum.

With the "Talisman Two-Three" the average man will be running for the greater part of the time on two valves only; here is the H.T. saving. Only when the best reception from distant stations is desired is the full load placed on the battery, and the length of time for which this is done is extremely short in comparison with the whole time during which the receiver will be worked.

A Simple System

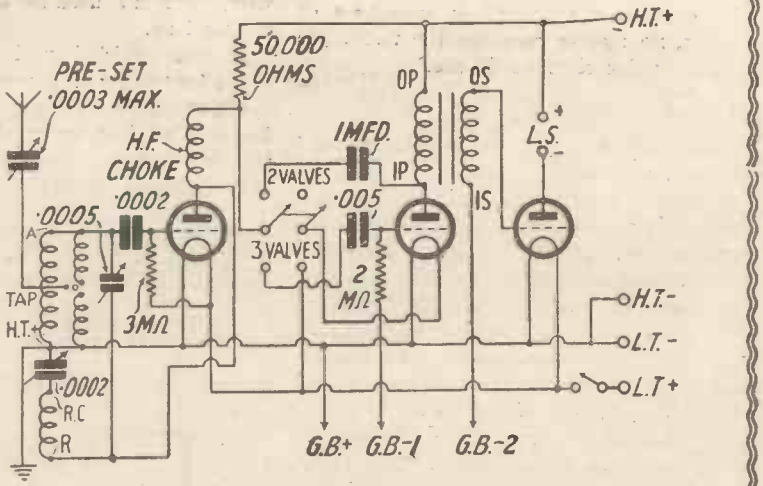
It certainly sounds a simple proposition to design a straightforward "three" with a switch to cut out one valve. The question is "which" valve. The detector is best left alone, because complicated switching would be needed to transfer grid condenser and leak, and so on, to the grid circuit of the L.F. valve. If the first L.F. valve is cut out in the obvious manner, by connecting the detector anode through a coupler to the last valve grid, then the operating conditions of the detector are upset.

In this particular receiver, for example, if the middle valve were cut out in this manner, then the H.T. current to the detector valve would have to pass through the loud-speaker only, instead of through the primary of the L.F. transformer. The impedance of the loud-speaker is almost certain to be less than that of the transformer primary, and the result is that the detector valve would have to be readjusted every time the change-over was made.

The method of switching adopted in this set overcomes all such difficulties. When the switch is in one position the circuit is a "det. R.C. trans." three-valver. When the switch is changed over, the L.T. supply to the middle (R.C.) valve is cut out, and the detector is connected to the final power stage in an ingenious manner, eliminating all need for readjustment of battery values.

Just follow out the way in which the centre valve is cut out. When the switch blades are "up" (as in the theoretical circuit diagram below the *direct* anode current to the detector valve passes through the 50,000-ohm resistance. The *alternating* speech currents, however, take an easier path via a 1-microfarad fixed condenser and, through the primary of the low-frequency transformer, to H.T. positive, and thence to earth.

Before going farther with a technical analysis, the practical man will want to know just what parts are needed for construction. Only two parts, a change-over switch and the 1-microfarad condenser, are needed, in addition to the components usually needed for a straightforward three-valve circuit.



The Talisman Circuit

An accompanying list shows the complete components needed. The set is inexpensive—a point which will appeal to the majority of "three-valvites"—but good performance has not been sacrificed to cost. As is usual, the first-mentioned component is that used in the original set and illustrated by the accompanying photographs. In most cases a number of alterna-

mpared with the wiring diagram

COMPONENTS (Contd.)

1-mfd. fixed condenser (Dubilier, Lissen, T.C.C., Graham-Farish).

Grid-leak holder (Lissen, Combinator, Dubilier, Graham-Farish).

Two grid leaks, one 2-megohm and one 3-megohm (Lissen, Dubilier, Graham Farish).

Pre-set series aerial condenser value .0003-mfd. maximum (Formodenser type J, Igranic).

30,000-ohms wire-wound anode resistance with holder (Lissen, Varley, Dubilier).

High-frequency choke (Igranic, Lissen, Burndept, Varley, Wearite).

Low-frequency transformer (Telsen, R.I., Lissen, Varley, Igranic).

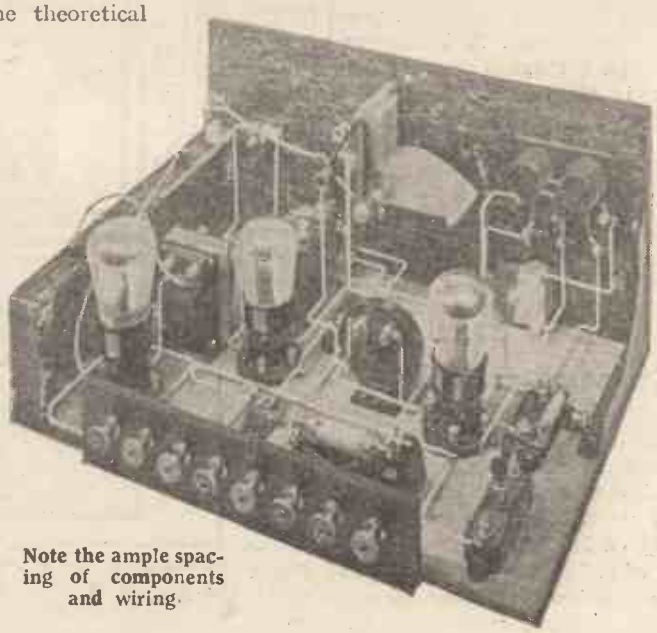
Eight terminals marked Aerial, Earth, L.T.—, L.T.+, H.T.—, H.T.+, L.S.+, L.S.— (Eelex, Belling-Lee, Igranic).

Three wander plugs marked G.B.+, G.B.—1, G.B.—2 (Belling-Lee, Igranic).

One yard of flex (Lewcoflex).

Connecting wire (Glazite).

Dial indicator (Bulgin).



Note the ample spacing of components and wiring.

"THE TALISMAN TWO-THREE" (*Continued from preceding page*)

tives are given, which can be used with but slight modification of the original design. It is most certainly not recommended that constructors should try to make shift with any other alternatives than those mentioned.

In a simple set such as this there is no need to go deeply into technical considerations. A further glance at the circuit diagram, however, will reveal one or two points of interest.

The aerial is connected to a mid point on the coil, through a pre-set variable condenser. This is a great aid to selectivity and ensures a satisfactory sharpness of tuning, no matter whether the two-valve or three-valve circuit is in use.

Wiring

Reaction is obtained in the normal manner, a variable .0002-microfarad condenser with a solid dielectric serving as a reaction control. Leaky-grid rectification is employed, the grid condenser having a value of .0002 microfarad and the grid leak being one of 3 megohms. This combination results in satisfactory rectification both for distant and local-station work.

A 50,000-ohm anode resistance is included in the plate circuit of the detector valve and the R.C. coupling condenser has a value of .005 microfarad. This condenser is put out of circuit, of course, when the R.C. stage is omitted.

The final power stage is quite straightforward. No complication has been introduced, such as a choke-output circuit; but such an arrangement could easily be added if desired and, as has often been pointed out, is an undoubted advantage in many cases, particularly if H.T. is derived from the mains.

One of the accompanying illustrations shows a wiring diagram and panel layout on a reduced scale. As is the case with all AMATEUR WIRELESS sets, a full-size blueprint is obtainable from the Blueprint Department, 58-61 Fetter Lane, E.C.4. The blueprint to ask for if making up this set is No. 203, and the price is 1s., post free. It will make construction ever so much easier, and is the fullest value for money.

Simple construction is a particular feature of this "Talisman Two-Three." There is plenty of room on baseboard and panel, and the wiring is childishly simple.

Coil Connections

There is only just one place where particular care is necessary, and that is when connections are being made to the switch contacts. The blueprint shows this in a much clearer way than could be explained in a written description, and the type of switch used in the original design has conveniently placed contacts to which it is a simple matter to make soldered joints.

The coil connections are as follows: Terminal R to the detector-valve plate terminal; H.T. positive to one side of the reaction condenser; "tap" to the Formodenser series aerial condenser; terminal A to one side of the grid condenser; and terminal RC to the other side of the reaction condenser.

NEXT WEEK:
FULL DETAILS OF A NEW LINEN-DIAPHRAGM SPEAKER

All wiring is carried out with insulated wire, but flex is used for the three grid-bias connections.

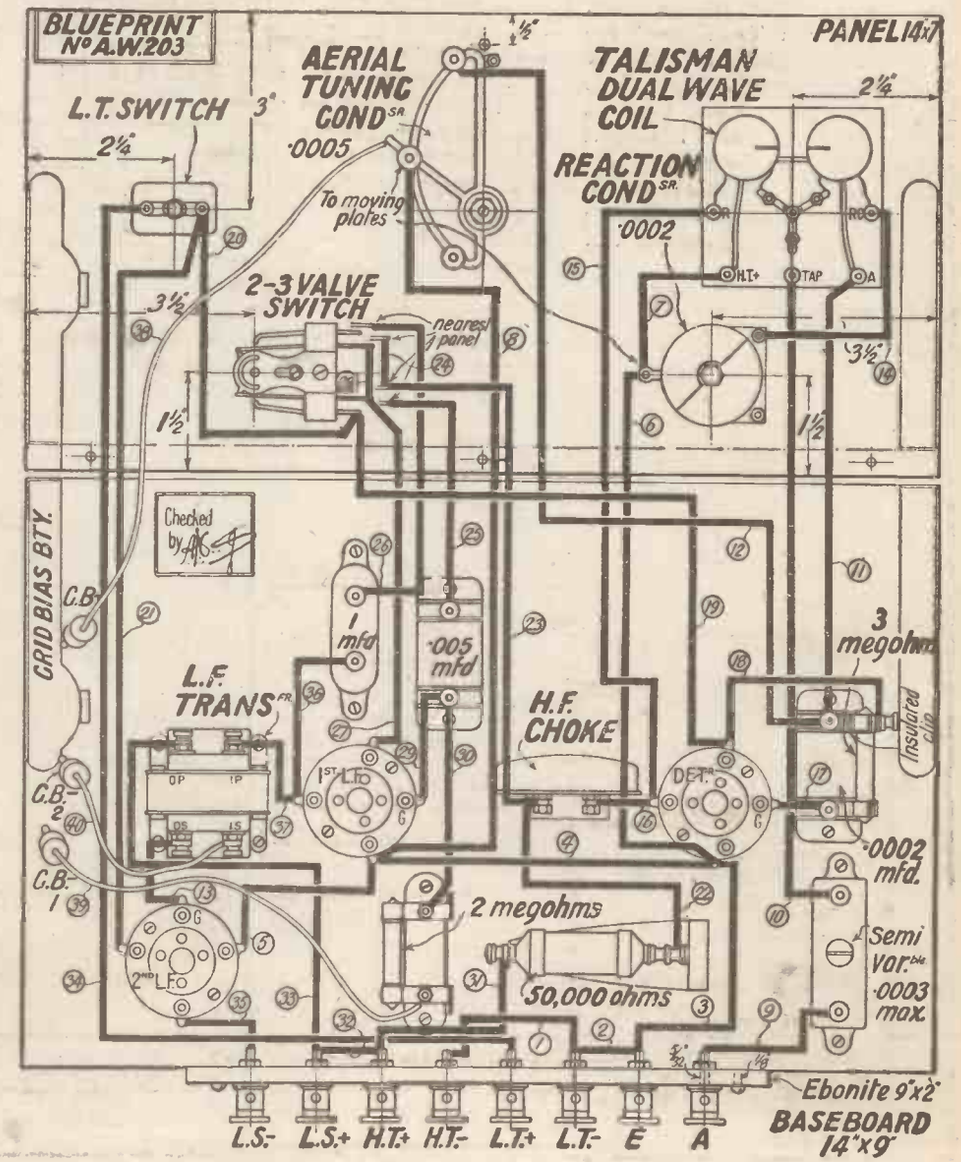
In next week's issue instructions will be given for testing and operating the set, and those readers who are making it up would be well advised to read the concluding instalment before plugging in valves and connecting up the batteries.

CRYSTAL DETECTORS

IN spite of its apparently simple nature, no convincing theory of the action of the crystal detector has yet been established.

According to one school of thought, rectification is due to the difference in electron emission between the two substances making contact, i.e. between crystal and cats-whisker, or between crystal and crystal in the perikon type. To some extent this theory is supported by the observed fact that in certain cases improved rectification results when a slight biasing potential is applied, this having the effect of heating the contact and so increasing the electron emission. On the other hand it has been observed that the rectifying action is almost completely destroyed if the contact point is exposed to the action of X-rays.

B. M.



The wiring diagram of the "Talisman Two-Three." Blueprint available, price 1/-

"A.W." TESTS OF APPARATUS

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

New Lissen Pick-up

RECENT improved designs of pick-up have shown that the complicated type is not necessarily the best; this is true, perhaps, of the new Lissen pick-up, which combines simplicity and an improved performance. Instead of the needle being clamped to a vibrating armature, it is merely inserted directly between the poles of an electro-magnet in which position it forms the core of a pick-up coil.

The needle is kept in position by a rubber surround, which prevents excessive movement when the weight of the pick-up is supported by the needle on the record.

Although this pick-up is simple, the results obtained are surprisingly good, giving freedom from resonance and a commendable uniformity of reproduction throughout the musical scale. Due to the flexible nature of the armature, record wear should be appreciably low.

The magnets and windings of this pick-up are mounted in a small moulded case with an attachment for fixing to a normal gramophone. The recommended types of needle should, of course, be used, and

New Lissen pick-up, in which the needle acts as the armature

when one of these has been pushed into the hole it is ready for use.

We have no hesitation in recommending this interesting but practical device to readers. Lissen's address, of course, is Friars Lane, Richmond, Surrey.

New Cossor Valves

WE have recently tested the new range of Cossor 2-volt valves introduced for the coming wireless season. The characteristics of these, as will be seen from the figures given, are a distinct improvement on last year's type, such results being obtained with the aid of a filament capable of providing a still greater emission.

It is interesting to note that the position of the electrodes have now been altered, and the filament grid and plate are mounted horizontally in the bulb. A V-shaped filament, of course, is employed, supported at three points.

The first valve tested, a 210RC, proved to have an A.C. resistance of approximately 60,000 and an amplification factor of 32; for such a valve the mutual conductance is commendably high. This valve is intended for use with resistance coupling or normal H.F. coupling, and should preferably be employed with a high impedance in the anode circuit.

The next in the series, 210HF, with an A.C. resistance of 20,000 and an amplification factor of 17, makes an excellent general-purpose valve, suitable either for H.F., detector, or even first-stage low-frequency work.

The third in the series, known as the 210LF, is designed primarily as a first-stage low-frequency amplifier, and has an A.C. resistance of 13,000 with an amplification factor of 11.

The 220P, which, as its designation implies, consumes .2 amp., is intended as a normal power valve and has an impedance of approximately 4,500 ohms with an amplification factor of 8. The 230XP is a special power valve capable of handling grid swings of 15 volts at 150 volts H.T. and makes an excellent final-stage amplifier.

A pentode, known as the 230PT, is also included in the range and has greatly improved characteristics. The A.C. resistance is only 20,000, but the amplification factor reaches 40.

The final valve in this series is known as the 220SG and, with an A.C. resistance of 200,000 ohms and an amplification factor of 170, is exceptionally suitable for screen-grid work.

Dario Valve Holders

IN these columns we have previously reported on a number of Dario valves, which come from one of the most flourishing factories on the Continent. A Dario valve holder has now been received for test and represents the manufacturer's endeavour to provide a high-class anti-microphonic holder at a reasonable cost.

The four sockets of this holder are spaced in the conventional manner, and connections from these are taken to soldering tags and terminals mounted on the outer insulated casing. These connections are made in the form of semi-circular strips of metal which serve to spring the holder.

A number of valves placed in the holder fitted securely making good electrical con-

Dario Valve Holder

tact with the sockets and proved to be adequately insulated from external shock.

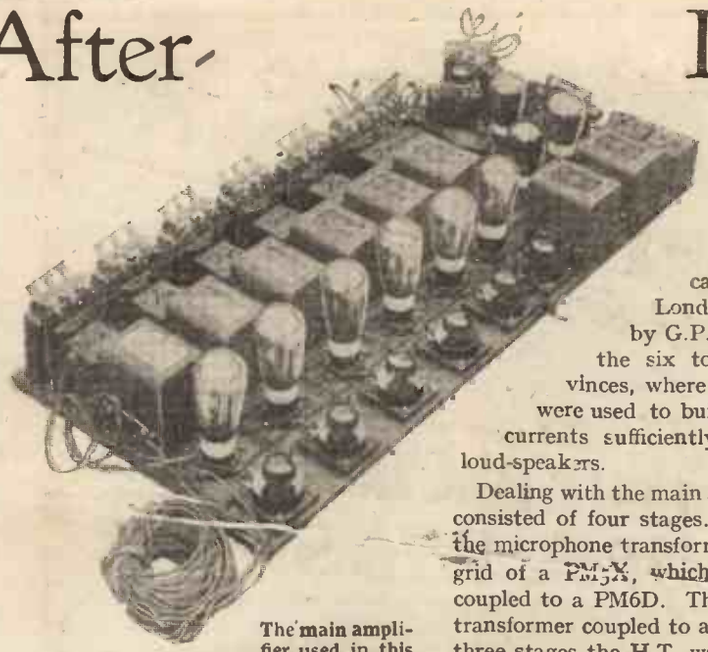
At a price of 1s. 0d. this component represents excellent value for money.

TIGHTENING LOOSE NUTS

UNDOUBTEDLY it is very tiresome for constructors to find, after having wired up a set and soldered the connecting leads to the soldering tags on the various components, that the nuts holding these tags in position have worked loose. It may be the result of an oversight in not tightening them down before screwing the components to the baseboard or panel, or the outcome of keeping the soldering iron too long on the junction during the soldering operation, the excessive heat serving to work the nut loose. Whatever the cause, the defect has to be remedied, otherwise those unpleasant crackling noises are likely to evidence themselves when the set is working, owing to the crazy contacts. While some of the nuts may be in accessible positions, it is more than likely that others are in awkward places and the fingers cannot reach them. Pliers might do the job, but there is a much better plan that can be adopted to meet such contingencies.

Any of the component nuts which are likely to be located in difficult positions should, before mounting the components in position, be removed and a saw cut made across the top so that a screwdriver blade can be used to twist them round. Very likely it will be necessary to cut off a little of the thread on the screw so that it does not project above the nut, but that is quite simple. Now, when any of these nuts loosen it is necessary merely to insert a screwdriver blade. H. J. B. C.

After-Dinner Speeches via the "Mike"



The main amplifier used in this unique relay

THE toasts and speeches of a trade dinner in London were recently relayed to Manchester, Birmingham, Leeds, Glasgow, Newcastle, and Bristol, and Mullard, the company concerned, was thus enabled to outline to the trade its policy for 1930.

The main amplifier and microphone were installed in Frascati's Restaurant, London, and connected by G.P.O. trunk lines to the six towns in the provinces, where further amplifiers were used to build up the speech currents sufficiently to operate the loud-speakers.

Dealing with the main amplifier first, this consisted of four stages. The input from the microphone transformer was fed to the grid of a PM5X, which was transformer coupled to a PM6D. This in its turn was transformer coupled to a PM256. In these three stages the H.T. was 150 volts, with the grid bias suitably adjusted for each valve. The final output stage consisted of six DFA9's, with 200 volts H.T. Each valve fed a G.P.O. trunk line to every town through a choke and transformer, the choke being used to avoid saturation of the transformer primary. Standard Permacore transformers were used throughout for intervalve coupling, together with R.I. chokes.

The speech currents were then carried by the G.P.O. lines to Manchester, Birmingham, Leeds, Glasgow, Newcastle, and Bristol. At each of these towns a further amplifier was installed. The output from this was fed to a PM6D, which in its turn was transformer coupled to a DFA9. The output from this was choke fed to two cone-type loud-speakers in parallel.

In order to avoid overloading, eight volume controls were used in the first amplifier. The first was across the secondary of the input transformer, the second across the secondary of the transformer coupling the PM5X to the PM6D, and the final six across the primary of each transformer of the output stage.

The amplifiers used between the trunk lines and the loud-speakers had one volume control. This was across the secondary of the intervalve transformer.

K.U.

THE UNNECESSARY PERFORMER

WHAT is the necessity for a narrator in the transmission of plays? The idea, up to a point, is quite all right; but, unfortunately, the performance leaves much to be desired.

Taking a case in point, we had a play adapted from a novel by a well-known author for a two hours' transmission. A well-meaning gentleman played the role of the "man telling the story." In the first place, his job was unnecessary for the success of the transmission, and in the second place, as there was incidental music going on while he was "narrating," it would have required a special type of brain to ingest the music and speech at one and the same time. So, not only was the action of the play disjointed by its very (so called) arrangement, but further mental disorder was caused to the listener endeavouring to hear too many things at the one time.

If it is really a necessity to tell the story of a play which is down on the transmission programme, why not tell that story first of all, preferably by an expert of an announcer's calibre; then we will know what to expect.

The technique of the broadcast play has not yet been completely mastered. Occasionally we get specially written little gems, like *The Crossing* and *A Congo Night*, which take something like twenty to thirty minutes to perform, the result being a complete success. A few explanatory phrases were spoken by one of the announcers, and that was really all that was necessary—the play told itself.

There is the further point to consider of permitting listeners to allow their imagination some scope, and this goes quite by the board when an orator introduces a play, butts in at awkward intervals, and then adds a final exhortation after the play is finished.

DOC PAGE.

FLEXIBLE LEADS AND HOWLING

WHEN a receiving set has just been completed, naturally one is eager to make the necessary external connections to batteries, loud-speaker, etc., in the shortest time in order to ascertain whether one's hopes as to the set's capabilities will materialise. This eagerness, however, has been known to give rise to a condition which can upset performance, and as an example of the care which should be meted out in every direction, let me quote the following instance.

A three-valve set—detector and two low-frequency stages—had been made up, and before placing it in the cabinet an aerial test was made. Previous to this, the wiring had been checked carefully, while the valves and batteries were known to be quite in order. As the test was really only of a preliminary nature, the leads to the batteries, aerial, earth, and loud-speaker were laid about in rather a haphazard fashion, and when the set was switched on the loud-speaker began to emit an unpleasant howl. This was most disconcerting, and although one or two stations were tuned in the howl predominated and would not cease. At first it seemed difficult to suggest a reason for this occurrence, but when moving the temporary external leads to find out the cause the problem was unexpectedly solved.

A multi-way battery cord was in use with the leads at the set end, joined direct to the required positions inside the set. The loud-speaker flex had been joined to the two terminals, and then brought round the set and over the components and aerial, and to the loud-speaker itself. This was situated on a small table a few feet away on the left, but in front of the set. The loud-speaker flex was instrumental in producing the howl, for on lifting it so that it was clear of the set and other leads—the howl vanished completely, and all went well.

H. J. B. C.

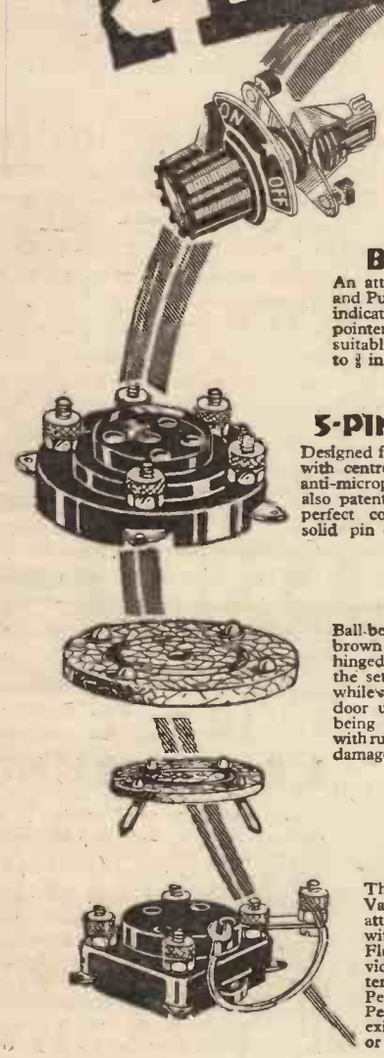
To its programmes Radio Wien has now added the relay of foreign stations, and, as a beginning, on August 29 last gave its listeners a native entertainment provided by the Bandoeng station at Java. During the coming winter relays are to be attempted of the American, Canadian, and Australian broadcasts.

WHAT ARE BENJAMIN'S GOING TO DO!

Here's the Answer—

4 NEW COMPONENTS!

—and they've got all the quality and finish you expect from a Benjamin product



ROTARY BATTERY SWITCH

An attractive alternative to the usual Push and Pull type of Switch. All insulated, with indicating "On" and "Off" dial, pointer knob, double contact and suitable for use with panels up to ¼ in. thickness. Price each **1/9**

5-PIN VALVEHOLDER

Designed for use with the new 5-pin A.C. valve with centre leg. The well-known Benjamin anti-microphonic feature is incorporated, and also patented contact, which ensures perfect contact when using either solid pin or split pin valves. Price each **1/9**

TURNTABLE

Ball-bearing Turntable, 9 in. in diameter, brown crystalline finish. Fitted with hinged and folding legs which enables the set to be used on uneven ground, while maintaining perfect level. For indoor use, the legs can be folded up, being equipped underneath with rubber buffers, to prevent damage to furniture, etc. Price each **7/6**

PENTODE

The famous Benjamin Clearer-Tone Valveholder equipped with small attachment enabling same to be used with the Pentode valve. Flexible connection is provided for attaching to the terminal on the cap of the Pentode valve. Price each **2/3**

Pentode attachment only for use with existing Clearer-Tone Valveholders or Vibrolders, **3d.** each.

The continued popularity of Benjamin Valveholders, Vibrolders and Switches is proved by the past year's sales, which have exceeded all expectations, and with the additional new lines now featured, we are anticipating a still greater demand for Benjamin Wireless Products for the coming season.

The same outstanding features and finish which have done so much to popularise Benjamin Components are incorporated to the full extent in the new lines, and adequate stocks are available.

TO GET BETTER RESULTS—
BETTER GET BENJAMIN

AND HERE ARE 3 TRIED AND TESTED FAVOURITES

★ The original CLEARER-TONE VALVEHOLDER in face of considerable low price competition has more than held its own, and will be continued at **2s.** each list.

★ The BENJAMIN VIBROLDER was last season's most successful accessory, the self-aligning feature ensuring positive contact with all types of English 4-pin valves. Price **1/6d.** each.

★ The popular Push and Pull double-contact Battery Switch. It's off when it's in. Price, with terminals **1/3d.** each, without terminals **1s.** each.

BENJAMIN

RADIO PRODUCTS

THE BENJAMIN ELECTRIC LTD. BRANTWOOD WORKS TOTTENHAM : LONDON N.17

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

OUR INFORMATION BUREAU

RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. See announcement below. Address Queries—AMATEUR WIRELESS Information Bureau, 58/61 Fetter Lane, London, E.C.4

Linen-diaphragm Speakers

Q.—*I have made up several linen-diaphragm loud-speakers, but in every case I have more or less deviated from printed instructions. I now wish to make up one of your designs, but would like to be advised on certain particular points before making a start. What, in your opinion, is the best dope to use and how should the dope be applied? If you can give me information on these points, I think I shall be able to improve upon my other attempts.—H. J. (London).*

A.—You are advised to use Collodion Methylated, obtainable from almost any chemist for approximately three and sixpence for 10 oz. The linen should be doped lightly before being stretched. The diaphragm centres should then be joined together and the stretching process should be begun whilst at the same time further coats of dope should be applied. Dope and stretch alternately until the diaphragm, when flicked with the finger, gives forth a definite "ping." This is the best procedure to follow, but be very careful that the diaphragms do not split at the centres.—C. L.

Faulty Variable Condenser

Q.—*I have built up a simple receiver consisting of a detector and two low-frequency valves, and although I receive the local station, the tuning condenser appears to make no difference to tuning.—H. B. (Roehampton).*

When Asking Technical Queries

PLEASE write briefly and to the point

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped addressed envelope and the coupon which will be found on the last page. Rough sketches and circuit diagrams can be provided for the usual query fee. Any drawings submitted should be sent on a separate sheet of paper. Wiring plans and layouts cannot be supplied.

A.—The fault appears to be in your tuning condenser. You should test it by arranging a battery and a measuring instrument between the terminal of the condenser and the plates to which the terminal is connected. With either the fixed plates or the moving plates you may detect a disconnection between the plates themselves and the actual terminal to which the plates should be connected.—L. C.

Super-power Valves

Q.—*Ordinarily I use a power valve in the last stage with about 120 volts H.T. Recently I was advised to use a super-power valve to get more volume, but I find that on introducing a super-power valve into my set the volume is less and distortion is experienced.—L. L. (Alperton).*

A.—If you are using a super-power valve, you must apply the required amount of H.T voltage. You do not say whether you have done this, nor do you say whether you are using ordinary capacity H.T. batteries or those of the super-power type. The latter are necessary in any case. The H.T. voltage should at least be 180 volts, and preferably more. If you will attend to these points and also apply suitable grid bias, we feel sure you will overcome your difficulties.—L. A.

RADIOGRAMS

ON October 3 a relay will be made to 2LO and 5XX from the Vaudeville Theatre, London, of a part of the Co-Optimists' autumn programme prior to their departure on tour.

October 10 is the date fixed for the production at the 2LO studio of a drama entitled *The First Second*, from the pen of Peter Godfrey. The subject of the broadcast is the beginning of the end of a man's life and should prove gruesome enough to please all lovers of thrillers.

Mr. Dudley Glass, from 5GB on October 9, in co-operation with Miss Colleen Clifford, will present three musical plays, each taking three minutes to perform. They are highly condensed versions of *The Merry Widow*, *The Belle of New York*, and *The Beloved Vagabond*. Mr. Glass claims to be able to play from memory the entire score of any musical comedy heard in this country during the past thirty years.

The Test, by H. J. Simonis and K. J. Thomas, is in the nature of a problem play; it has been specially written for the B.B.C. and will be broadcast for the first time from Daventry Experimental on October 12.

The Nottingham Goose Fair, which has been held annually for over a thousand years, will provide entertainment for listeners to 5GB on October 3.

A portion of the *Faust* broadcast from the Manchester Opera House, with Sir Thomas Beecham conducting, is to be relayed for transmission through 5GB on October 8. On October 12, Manchester listeners will have an opportunity of hearing *The Flame of Love*, an operetta by the well-known composer Walter Mudie who will personally conduct the performance.

The power of Radio Catalana (EAJ 13), Barcelona, has been increased from 1 to 10 kilowatts, but for the present the station is only testing at odd hours. It has been acquired by Union Radio, Madrid. The call is: "Atención! Atención! esta es la stación Union Radio Catalana." The broadcasts are made on 268 metres.

A new motor lifeboat which has just superseded the old pulling and sailing craft hitherto stationed at Stornoway is the first vessel of the type to be fitted with wireless telephony. The installation is rendered necessary on account of the fact that the lifeboat has an effective range for service up to 80 miles from her station.

During the coming winter, the Scottish stations of the B.B.C. intend to put on a series of broadcast performances by local groups of community players. The first of these is *The Kirn*, an Ayrshire harvest play, full of local colour and written specially by Mr. Gilbert Pitt for the Carrick Players, a group of actors who themselves live the life it depicts.

According to the terms of the recent International Conference on Safety of Life at Sea, all passenger ships and all cargo ships of over 1,600 tons gross will be required to be equipped with wireless.

With the consent of the Polish Ministry of Posts and Telegraphs, the Polskie Radio Broadcasting Company intends to reorganise its entire system. According to the accepted plan, Warsaw is to be endowed with a 120-kilowatt transmitter so constructed that its power can be boosted up, on occasions, to 160 kilowatts, thus making it the most powerful European station. With such a power at its disposal, the company hopes to secure crystal reception within a distance of three hundred miles or more. In addition, the Polish capital will also possess a 2-3-kilowatt station to be used solely for weather forecasts, news bulletins, and lectures mainly of interest to city dwellers. The present Warsaw

(*Continued on page 494*)

"RADIOGRAMS"

(*Continued from page* 492)

transmitter will be transferred to Wilno, and the latter's station to Gdingen. Moreover, 10-kilowatt transmitters are to be installed at Lemberg and Lodz.

Owing to the gradual expansion given to radio advertisements in the German programmes, it has now been decreed that no microphone publicity shall be carried out in future on Sundays and holidays. It is also foreseen that such "puffs" will shortly be confined to the morning transmissions only.

The scheme for the re-organisation of broadcasting in Switzerland provides for the installation of a special telephone cable system in order to link up all transmitters, to permit of simultaneous transmissions. New studios are also to be built at Montreaux and Neuchatel, as well as at other important centres.

Radio Zagreb (Jugo-Slavia), which up to the present was supported by voluntary contributions, has been compelled to appeal to the authorities for financial assistance, failing which, it has threatened to close down.

The German Reichsfunk has obtained permission to instal microphones in the Berlin Law Courts with a view to the relay of famous trials which may be of interest to the general public. It is probable that the first transmission of this kind to be carried out will be that of the trial of the thirty Fascists who were arrested during the recent anti-republican demonstrations.

A public wireless telephony service between England and Australia will be opened within the next few weeks. Recent tests made have given satisfactory results. Transmissions from Great Britain are carried out by Rugby, the receiving station having been installed at Baldock (Herts). Although the rates to be charged have not yet been definitely fixed, it is expected that they will approximate those at present charged for Canada, namely £9 for a minimum three-minutes call. At the outset the service will be limited to the period 7 to 9.30 a.m. G.M.T. coinciding with 5 to 7.30 p.m. Australian Standard Time, but if and as demand increases, the service will be extended. At the outset, British calls will only be taken from London.

In the neighbourhood of Prangins (Switzerland), between Geneva and Lausanne, Radio Schweiz has installed a 50-kilowatt wireless telegraphy station to ensure a regular oversea service to Switzerland. The wavelength to be used will be about 4,400 metres. It is also proposed to instal a short-wave transmitter on the same site. By special arrangement, although mainly destined to ordinary official and commercial services, should any critical political situations arise, the transmitter will be placed at the disposal of the League of Nations.

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"RADIOGRAMS"

(Continued from page 494)

The small private station of Ste. Etienne (France), operated by the *Radio Club Forézien*, during four years, has been dismantled and all transmissions definitely suspended.

Rugles, the experimental broadcasting station run by *Journal des 8*, the leading association of French wireless amateurs, has increased its wavelength from 47 to 55 metres.

So great was the success of the "physical jerks" transmissions last winter, Radio Paris has decided to broadcast a similar course of exercises daily at 6.45 and 7.30 a.m. from October 14 next.

The recent decision taken to erect a State broadcasting station in the neighbourhood of Nice (France) has compelled the little Juan-les-Pins transmitter to close down at the end of September.

Radio Vitus, Paris, which is undergoing alterations, will resume its daily transmissions on higher power towards the end of October. In the meantime, short concerts of "canned" music are broadcast at 8.30 p.m. every Tuesday and Friday.

Although established one year later and in spite of the fact that the licence costs more than double, the German broadcasting system has overhauled Great Britain, and now possesses nearly 400,000 more listeners than registered by the Postmaster-General in the British Isles.

Radio Maroc (Rabat), which up to the present has been working on 4 kilowatts, will shortly increase its power to 10 kilowatts in the aerial.

The new Leningrad (Russia) 20-kilowatt transmitter has been working daily since September 1; the broadcasts are clearly heard in the United Kingdom.

Work on the Prague high-power broadcasting station is progressing rapidly; the site of the transmitter is Cesky Brod, some sixteen miles distant from the Czecho-Slovakian capital.

It is stated in Rome that when the Vatican station is in regular operation, an attempt will be made to relay religious services from St. Peter's (Rome) and from the Sistine Chapel; should this prove successful, broadcasts would be made on important Roman Catholic holidays.

Radio Wallonie (Liege) has resumed its concerts on 280 metres; they may be picked up on Sundays, Tuesdays, and Fridays, between 9.10 and 11.50 p.m. B.S.T.

Lewcos Prices.—A mistake unfortunately occurred in the advertisement of the London Electric Wire Co. and Smiths, Ltd., on page 391 of last week's AMATEUR WIRELESS. The second Lewcos centre-tapped coil should be designated C.T. 100-300 and the price of the Lewcos potentiometer should have been 4s. 9d.

FIBRE NEEDLES

THOSE who have not already tried fibre needles, either for the gramophone or for the radio gramophone amplifier, will be astounded at the difference they will obtain in results generally. The fibre needle gives distinctly better results with the latter owing to the fact that with almost any record, even an old one, there is an absolute absence of surface noise. This cannot truthfully be said of the steel needle, however good the record or the pick-up or amplifier may be, as even under the best conditions there is a noticeable indication of the needle noise on the record.

The advantage of the fibre needle is as a result its mellow tone and softness of reproduction, and with the radio amplifier there is ample volume obtainable so that we can well afford to sacrifice a slight drop in favour of more perfect tone. Another point of interest is that record wear is far less. This is an obvious deduction, as where there is any indication of surface noise at all this undoubtedly indicates that there is a degree of wear proportionate to the degree of noise noticeable. One must remember also that where there is any surface noise at all when the pick-up is used this noise is amplified through the radio amplifier, just the same as the sound vibrations from the record are; so that if the noise is particularly bad it will utterly spoil reproduction.

H. BRAMFORD.

BROADCAST TELEPHONY

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

Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)
		GREAT BRITAIN	
25.53	11,751	Chelmsford (5SW)	15.0
*200	1,500	Leeds (2LS)	0.13
*242	1,238	Belfast (2BE)	1.0
*261	1,148	Newcastle (5NO)	1.0
288.5	1,040	Swansea (5SX)	0.13
288.5	1,040	Stoke-on-Trent (6ST)	0.13
288.5	1,040	Sheffield (6LF)	0.13
288.5	1,040	Plymouth (5PY)	0.13
288.5	1,040	Liverpool (6LV)	0.13
288.5	1,040	Hull (6KH)	0.13
288.5	1,040	Edinburgh (2EH)	0.35
288.5	1,040	Dundee (2DE)	0.13
288.5	1,040	Bournemouth (6BM)	1.0
288.5	1,040	Bradford (2LS)	0.13
*301	995	Aberdeen (2BD)	1.0
*310	968	Cardiff (5WA)	1.0
*356	842	London (2LO)	2.0
*377	797	Manchester (2ZY)	1.0
*399	753	Glasgow (5SC)	1.0
*479	626	Daventry (5GB)	25.0
*1,554	193	Daventry (5XX)	25.0
		AUSTRIA	
*246	1,220	Linz	0.5
*283	1,058	Innsbruck	0.5
*352	851	Graz	7.0
*453	666	Klagenturt	0.5
*517	581	Vienna	15.0
		BELGIUM	
216	1,391	Charleroy (LL)	0.25
246	1,219	Antwerp (Anvers) 4ED	0.4
250	1,202	Schaerbeek-Brussels	0.25
250	1,200	Ghent	0.5
280	1,071	Liége	0.1
312	961.4	Arlon	0.25
*509	590	Brussels	1.0
		CZECHO-SLOVAKIA	
*263	1,139	Morava-Ostrava	10.0
*279	1,076	Bratislava (Feriby)	12.5
*293	1,022	Kosice	2.0
*342	878	Brunn (Brno)	2.4
*487	617	Prague (Praha)	5.0
214	1,400	Luxembourg	0.5
		DENMARK	
*281	1,067	Copenhagen (Kjobenhavn)	0.75
1,153	260	Kalundborg	7.0
		ESTHONIA	
*297	1,010	Reval (Tallinn)	0.7
		FINLAND	
*221	1,355	Helsingfors	0.9
*1,796	167	Lahti	40.0
		FRANCE	
170	1,750	St. Quentin	0.25
211.3	1,420	Béziers	0.1
220	1,364	Fécamp	0.5
238	1,260	Bordeaux (Radio Sud-Ouest)	1.0
240	1,250	Radio Nimes	0.25
*255	1,175	Toulouse (PTT)	1.5
*265	1,130	Lille (PTT)	0.7
268	1,121	Casablanca	0.5
*277	1,083	Rennes (PTT)	0.5
277	1,083	Pic du Midi de Bigorre (weather forecasts 9 p.m.)	
*286		Montpellier (PTT)	0.2
292	1,028	Radio Lyons	0.5
*294	1,020	Limoges (PTT)	0.5
304	986	Bordeaux (PTT)	1.0
305.6	981.7	Agen	0.25
309	970	Radio Vitus	1.0
*316	950	Marseilles (PTT)	0.5
326.5	918.9	Grenoble (PTT)	0.5
336	893	Petit Parisien	0.5
346	869	Strasbourg	0.1
364	824	Algiers	2.0
368	815	Radio LL (Paris)	0.5
*381	788	Radio Toulouse	8.0
411	729	Radio Maroc (Rabat)	2.0
436	687	Radio Flandre (Lille)	0.1
447	671	Paris (Ecole Sup. PTT)	1.5
468	640	Lyons (PTT)	5.0
1,350	222	Tunis (Kasbah)	0.6
1,461	205.3	Eiffel Tower	12.0
*1,725	174	Radio Paris	12.0
		GERMANY	
*218	1,373	Flensburg	0.5
*227	1,319	Cologne	4.0
*234	1,283	Muenster	3.0
*239	1,256	Nurnberg	2.0
*246	1,220	Kiel	0.35
*246	1,220	Cassel	0.25
*253	1,184	Gleiwitz	2.0
*259	1,157	Leipzig	1.5
*270	1,112	Kaiserslautern	0.25
*276	1,085	Koenigsberg	2.5
*283	1,058	Magdeburg	0.5
*283	1,058	Berlin (E.)	0.5
*283	1,058	Stettin	0.5
*319	941	Dresden	0.25
*325	923	Breslau	1.5
*339	887	Bremen	0.35
*360	833	Stuttgart	1.5
*372	806	Hamburg	1.5
*390	770	Frankfurt	1.5
*418	716	Berlin	1.5
*453	662	Danzig	0.25
*456	657	Aachen	0.35
*473	635	Langenberg	13.0
*533	563	Munich	1.5
*560	536	Augsburg	0.25
*560	536	Hanover	0.35
570	527	Freiburg	0.35
*1,635	183.5	Zeesen	30.0
2,100 / 2,290	142 / 131	Norddeich	10.0
		GRAND DUCHY	
1,220	246	Luxembourg	2
		HOLLAND	
31.4	9,554	Eindhoven (PCJ)	25.0
*293	1,024	Huizen via Hilversum aerial (until 5.40 p.m. B.S.T.)	6.5
*1,071	280	Huizen via Hilversum aerial (after 5.40 p.m. B.S.T.)	6.5
*1,070	280	Scheveningen-Haven (from 10.30 a.m. to 5.40 p.m. B.S.T.)	5.0
*1,875	160	Hilversum via Hulzen aerial (AVRO)	6.5
		HUNGARY	
550	545	Budapest	20.0
		ICELAND	
*1,200	250	Reykjavik	1.0
		IRISH FREE STATE	
*225	1,337	Cork (1FS)	1.0
*413	725	Dublin (2RN)	1.0
		ITALY	
248	1,209	Trieste (testing)	
*274	1,094	Turin (Torino)	7.0
*331.3	908	Naples (Napoli)	1.5
*385	779	Genoa (1GE)	1.0
*441	680	Rome (Roma)	3.0
453	662	Bolzano (IBZ)	0.3
*501	599	Milan (Milano)	7.0
		LATVIA	
*525	572	Riga	3.0
		LITHUANIA	
*1,935	155	Kovno	7.0
		NORWAY	
239	1,256	Rjukan	0.18
*283	1,058	Notodden	.65
*365	820	Bergen	1.0
*394	761	Frederiksstad	0.7
453	662	Tromsoe	0.1
453	662	Aalesund	0.3
453	662	Porsgrund	0.7
*493	608	Oslo	1.5
1071	280	Oslo (testing)	7.3
		POLAND	
*313	959	Cracow	0.5
*335	896	Posen	1.2
385	779	Wilno	0.5
*408	734	Kattowitz	10.0
*1,411	212.5	Warsaw	8.0
		ROUMANIA	
*394	761	Bucharest	0.12
		RUSSIA	
*351	855.5	Leningrad	1.0
*427	702.5	Kharkov (NKO)	4.0
*483	621.5	Homel	1.2
*825	364	Moscow (PTT)	20.0
950	315.8	Moscow (midday tests)	75.0
1,060	283	Tiflis	10.0
1,000	300	Leningrad	20.0
*1,304	230	Kharkov	4.0
		SPAIN	
251	1,103	Almeria (EAJ18)	1.0
268	1,121	Barcelona (EAJ13)	10.0
314	956	Oviedo (EAJ19)	0.5
*349	860	Barcelona (EAJ1)	8.0
*368	815	Seville (EAJ5)	1.5
403	743	San Sebastian (EAJ8)	0.5
*424	707	Madrid (EAJ7)	2.0
453	662	Salamanca (EAJ22)	1.0
		SWEDEN	
231	1,301	Malmo	0.6
*257	1,160	Hoerby	10.0
270	1,112	Trollhattan	0.45
*322	932	Goeteborg	10.0
322	932	Falun	0.5
*436	689	Stockholm	1.5
*542	554	Sundsvall	0.6
*770	389	Ostersund	0.6
1,200	250	Boden	0.6
*1,348	222.5	Motala	30.0
		SWITZERLAND	
*403	743	Berne	1.0
*459	653	Zurich	0.63
680	442	Lausanne	0.6
760	395	Geneva	0.25
1,010	297	Basle	0.25

All wavelengths marked with an asterisk have been allotted according to the *Plan de Prague*.

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

Oct. 8 A vaudeville programme.
„ 9 *Russian Twilight*, by M. H. Allen. Music selected and arranged by Doris Arnold.
„ 10 *The First Second*, a sequence for broadcasting by Peter Godfrey.
„ 12 *Peep-Bo-Hemia*, a revue by Clifford Seyler.

DAVENTRY EXPERIMENTAL (5GB)

Oct. 7 A vaudeville programme.
„ 8 A programme of selections from the light classics.
„ 10 Reminiscences of Chevalier.
„ 11 *Peep-Bo-Hemia*, a revue by Clifford Seyler.
„ 12 *The Master of the House*, by Stanley Houghton.

MANCHESTER

Oct. 8 Excerpts from Gounod's *Faust*.
„ 12 *The Flame of Love*, an operetta by Walter Mudie.

GLASGOW

Oct. 11 A programme of works by modern Scots composers.

A BURNDEPT DINNER

PRICE-CUTTING, servicing, receiver design, and other vital points of interest to set-users and the trade alike were raised at a dinner held last week at the Criterion Restaurant, London, by Burndept Wireless (1928), Ltd. The guests were Messrs. Burndept's wholesale distributors and service agents, including agents and friends from Holland, New Zealand, and India. Held, as it was, right at the commencement of the Radio Exhibition, the dinner formed an excellent method of gathering together all those interested in Burndept products, and gave the directorate the opportunity to explain in very happy surroundings the Burndept policy for 1930. It is obvious that this go-ahead concern anticipates a greater than ever demand for mains-operated receivers and portables, and giant manufacturing plans are being laid down for the production of the Burndept portable and "A.C. Screened Seven."

In order to improve the reception of the Breslau radio programmes, alterations are to be made in the Breslau and Gleiwitz wavelengths. In future the former station will work on 325 metres (923 kilocycles) and the latter on 253 metres (1,184 kilocycles).

"Amateur Wireless and Radiovision." Price Threepence. Published on Thursdays 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. **Queries** should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed. **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.

New Polish Broadcasting Scheme

THE Polish broadcasting organisation is to be remodelled so as to provide alternative programmes for the greater part of the country. The new equipment will comprise one 120-kilowatt aerial input broadcasting transmitter with full modulation, two high-power regional stations with 16-kilowatt aerial input, and three local relay stations.

Provision will be made for simultaneous broadcast facilities throughout the whole of Poland, the relay stations transmitting on a common wavelength employing the tuning-fork system of control, such as has been in successful operation in Great Britain.

The 120-kilowatt station will be situated near Warsaw, and will be used in addition to the 12-kilowatt Marconi station, which is already giving such an excellent service at Warsaw and has been in operation there since 1927.

The new high-power station will take the wavelength of the present 12-kilowatt station, which is 1,111 metres, and the 12-kilowatt station will work on a lower wavelength. The two stations will be employed simultaneously for the transmission of alternative programmes.

The two new 16-kilowatt stations will be situated at Lemberg and Vilna to provide programmes for the areas outside the range of the lower-powered station at Warsaw.

Of the three local relay stations, one will be situated at Lodz—the Polish Manchester—80 kilometres from Warsaw.

The Marconi Company is entrusted with the supply of everything connected with these stations, including all constructional services. The whole scheme is expected to be in operation before the end of 1930.

In November, 1928, the Tokio Wireless Telegraph and Telephone Company installed the first broadcast transmitter in the Island of Formosa. In order to arouse interest, up to the present no licence fee has been charged, and the number of listeners to date is computed at 8,000. It is now proposed to install a 10-kilowatt station at Itabashi in the neighbourhood of Taihoku, with a view to the organisation of a regular broadcasting system.

C.A.V. Accumulator Booklet

C.A.V.'s have just produced a handy booklet giving in an easily understandable manner particulars of the whole accumulator range suitable for radio work. The non-spillable L.T. accumulators and the new H.T. units are of particular interest. AMATEUR WIRELESS readers can obtain a copy of the book on application to Messrs. C. A. Vandervell & Co., Ltd., Acton, London, W.3.

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The kit is complete without valves, batteries and cabinet, and the main components are already mounted. Follow the simple diagrams and instructions given free and you can have a new Lotus S.G.P. in a few hours.

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Causton

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GET PERFECT TONAL BASS NOTES

The BurTON Transformer has been designed with the same care and precision as its fellow Components, and will be found to give perfect rendering of all Bass notes, which is a most important feature of all Transformer construction; try one now and notice the perfect rendering of all notes throughout the musical score.

PRICE **10/6** EACH

The BurTON Valve Holder is unique in construction; it gives the effect of a Floating Action to your Valves, thus prolonging the life of your Set. It has four Floating Points, has no Rigidity, and gives prolonged life to your Valves.

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PERFECT

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LETTERS TO THE EDITOR

The Editor does not necessarily agree with the views expressed by correspondents.

Correspondence should be brief and to the point and written on one side of the paper.

Brookmans Park

SIR,—With reference to your article in AMATEUR WIRELESS dated September 21, entitled, "Brookmans Park—and What it Means to You," it is stated that Brookmans Park estate consists of thirty acres of field, practically dead flat. This is an error, as Brookmans Park is some 1,000 acres in extent and is rapidly becoming a residential district.

There is a station on the main L.N.E.R. line between Hatfield and Potters Bar, and the place is also served by the buses on the Great North Road.

Brookmans Park has a supply of gas, electric light, and water and is connected to sewers. There is an 18-hole golf course now being constructed, which is due to be opened in the spring.

AN "A.W." READER
(Brookmans Park).

Appreciation

SIR,—The "All-Britain Three" is the set I am using now, and it is excellent. Other sets I have made are the "Proms 3," which, with a mains unit and a linen-diaphragm speaker, receives London and the two Daventrys, the quality being unsurpassed by any set I have ever heard.

The Chapman "Reinartz Two" is hard to beat; to make the coils, as I found it impossible to procure bell flex as specified, I twisted two strands of ordinary d.c.c. wire together and got marvellous results.

B. (Outwood).

Loud-speakers at Science Museum

SIR,—I was rather interested to read in AMATEUR WIRELESS of September 14 the alteration of the reproduction of the demonstration set in the Science Museum at South Kensington, as I had particularly noticed the same myself. I went there casually on the Tuesday after the August Bank holiday and saw the moving coil, also an Amplion Lion speaker installed. I had a look at the set, and thought I saw one output valve where there used to be three, if I remember right, so thought here is a chance to hear some improved reproduction, but after I heard the start on the moving coil I did not stop to hear any more, as it was far inferior to what I expected and certainly not so good as it used to be. I made the "Touchstone" set last winter, one of Mr. James's (*Wireless Magazine*, November, 1928), and am working a moving-coil speaker with it. I was pleased to think the reproduction I get seemed a lot superior to this. I should think the installation wants overhauling and adjusting to bring it up to the natural reproduction we ought to expect from an exhibition set. It is wonderful to what we get accustomed, thinking it is all right until we hear something better.

T. (Colchester).

(*Continued on page* 508)

BLUEPRINTS

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

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AMATEUR WIRELESS 58-61 FETTER LANE LONDON E.C.4

"LETTERS TO THE EDITOR"

(Continued from page 506)

Modern Valves and Efficiency

SIR,—"Thermion's" figures regarding the greatly improved efficiency of modern valves are undoubtedly impressive, and as regards the H.F. side of the set there can be no doubt whatever of the vast improvement which has taken place since the old days, when a stage gain of six was a great achievement. It seems to me, however, that the engineers responsible for our modern valves take this stage gain as a criterion for each and every valve, instead of, in the case of detector and L.F. valves, that of purity of reproduction and output. Am I correct in saying that the steep curves of the modern L.F. valve and its high mutual conductance have been achieved at the expense of purity?

All I can say is that the most perfect reproduction I myself have been able to achieve, without colossal voltages, LS5a's and moving-coil speakers (and, barring these arrangements, I have tried literally scores of different schemes, dozens of output valves, and loud-speakers of every type), was with a crystal and two L.F. set in 1924-5, using one of the first Primax speakers, two ex-Government transformers in polished wooden cases, and two V24's, the last being afterwards substituted by one of the early American power valves, a Rolls-Royce. Ever since (like a fool I broke up this set) I have been seeking the lost quality, buying more and more expensive transformers, valves, and speakers, and trying every conceivable form of hook-up without success.

This is why I smile when I read the apologies which every designer suggesting a two-transformer-coupled L.F. set feels it incumbent upon himself to put forward nowadays.

I have separate and independent testimony of value that the quality obtained at the time I mentioned was real, and not a case of distance lending enchantment to the ear. In those days we took no heed of grid bias, matching impedances, and all the technical fuss which we make to-day, and yet—

What does "Thermion" say about it as regards his own experiences?

W. J. N. P. (London, S.E.).

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OUR "SHOW" SPEAKER—AND HOW TO BUILD IT

Amateur Wireless

and Radiovision

Every Thursday 3d

Vol. XV. No. 383 Saturday, October 12, 1929

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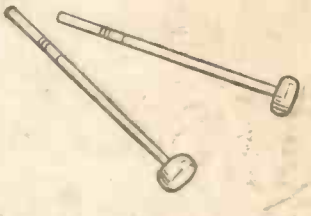

YOU hear so little of the drums in ordinary loud speaker reproduction that the drummer might as well have no sticks! But . . . . now there is a loud speaker that does *not* cheat you of half the broadcast. It finds the missing drumsticks. It reveals instruments hitherto silent. It reproduces notes you've never heard before. It is the new Brown Duplex Loud Speaker.

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OCTOBER 12, 1929 No. 313 Vol. XV

Amateur Wireless and Radiovision

The Leading Radio Weekly for the Constructor, Listener and 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

The Second Show—Our "Infant"—America to Australia!—A Giant Station—Sun Spots—This Adult Education—British Singer for Canadian Radio

The Second Show—Olympia is over, and now, for the consolation of those who live in the Midlands and too far away from Kensington to see the London Show, the Manchester Exhibition will be held from Wednesday, October 16, for ten days. The Home Secretary (the Right Hon. J. R. Clynes) will open the show, and his speech will be broadcast. A great feature of the Manchester Evening Chronicle Show will be the concerts given daily by many of the leading radio artistes.

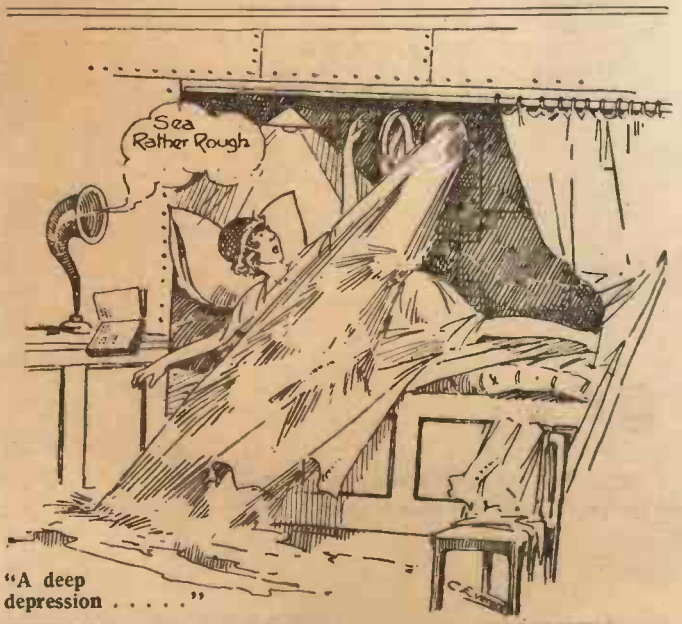
Our "Infant"—As we hinted last week, the dailies are rather apt to go "off the lines" when it comes to describing technical gadgets, as they have to during show time. But they are to be congratulated this year on dodging a most favoured stock phrase, "Wireless is as yet in its infancy. . . ." It really shouldn't take the least scrap of brain to see that in an age when one-knob "fives" bring in the programmes of all Europe, and from America, too, when almost any set can be operated from electric-light mains, when loud-speaker reproduction is wellnigh perfect, and when very successful television is being demonstrated daily from 2LO, radio is getting to be a very experienced "infant." Moreover, all this talk about infancy is damaging to the progress of radio.

America to Australia!—America talked with Australia by means of instruments of the ordinary telephone service for the first time last week, when several officials of the American Telephone and Telegraph Company exchanged greetings with Australian telephone officials in Sydney. The occasion was an informal demonstration by the British Post Office of the practicability of connecting its existing transatlantic telephone system with the new short-wave radio channel between Great Britain and Australia, which may soon be open for commercial use. One of the short-wave transatlantic radio channels now in regular use for the American service was used between London and New York, and the voices of the speakers were thus carried a total distance of 15,000 miles! An interesting aspect of the conversations was that they took place at 4 o'clock in the afternoon, New York (Eastern standard) time, which in Sydney was 6 o'clock in the morning of the *following* day!

Aerials Go Underground!—Experiments are still being conducted in the States with subterranean aerials. A well-known engineer succeeded in transmitting over a distance of 600 miles on this system, and later established communication between Hyattsville, in Maryland, and the Pacific coast. The aerial used consisted of four cables each about 15 yards in length, and placed three feet below the surface. They were so placed that each pointed in a different direction. Should a transmission be effected to a point north of the transmitter, the "north" aerial would be used, and so on.

Sun Spots—By the time this appears in print we shall be about half-way through October. The scientists predicted that this would be a month of "maximum sun spots," and that accordingly it would be a bad month for radio men. Well, things don't seem to have turned out that way. Conditions haven't been strikingly good this summer, but this is probably more likely to be due to the extremely dry season. Never mind. The long, evenings and good radio conditions are only a little way ahead, which is good news for DX folk!

PRINCIPAL CONTENTS



"A deep depression . . . . ."

A SPECIAL GIFT NEXT WEEK—
SEE PAGE 514

CURRENT TOPICS (*Continued*)

This Adult Education—Not a wit abashed by the hard things that have been said about adult education, the B.B.C. is sticking to its guns and is formulating further plans. For instance, the Archbishop of York has accepted an invitation to act as chairman of the Central Council for Broadcast Adult Education in succession to Lord Sankey. How long will it be before the authorities really do appreciate the fact that forced adult education will never be popular? The B.B.C. should read the remarks of a special correspondent on this subject in the next issue of the *Wireless Magazine*.

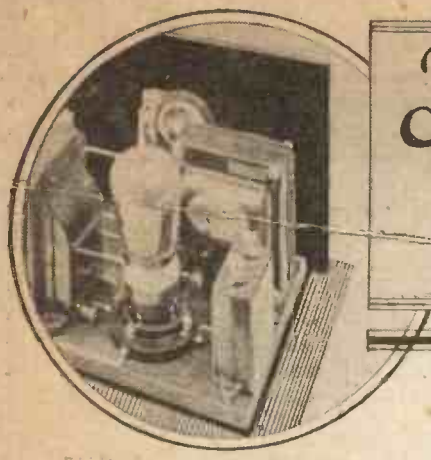
British Singer for Canadian Radio—The first of the British artistes which the Canadian National Railways is engaging to broadcast over its new Dominion-wide wireless network sailed last week from Southampton. She is Miss Thea Philips, the opera singer and concert artiste. The engagement of British artistes forms part of the most ambitious radio project that has been attempted in Canada and by means of which the Canadian National Railways will broadcast throughout Canada programmes twice weekly. To make the project possible 15,000 miles of telephone and telegraph wire will be used to join the fifteen broadcasting stations which will be involved, and the British artistes will be heard not only throughout Canada, but throughout the northern part of the United States.

A Giant Station—Yet another link in the transatlantic chain! A new short-wave transmitter is now in course of erection at Laurenceville, N.J., and will be ready at the end of the year. Twenty-six towers, each 600 ft. high, and placed in the form of an "L", have already been erected. These towers will support twelve aerials which are to be used for working Europe and South America. The long side of the "L" is composed of nineteen towers for the European service, and the remainder will be used for South America. The aerials will be of the directional type and transmitting on either 16, 22, or 33 metres, according to time of transmission. With three alternative wavelengths it will be possible to maintain a 24-hour service. New York will be the centre of the new radio phone-cum-land line system.

The Loud-speaker "Nuisance"—"Sir,—Is it not high time that something was done to abate the loud-speaker nuisance? My neighbour's loud-speaker is turned on morning, afternoon, and evening, day after day, with doors and windows wide open. I am utterly distracted. I am a music-lover and have my own loud-speaker, but I am most careful to keep the sounds within my own house." So runs a letter in the *Daily Express*. We thought that the "listen-to-*my*-speaker" fanatic was quite dead; but apparently not. We sympathise.

What Call-signs Mean—Is there any significance in call-signs? Of course, it is obvious that 2LO represents London, 2BE Belfast, 6ST Stoke-on-Trent, and so on. 5SC (Glasgow) is appropriate for Scotland, 5WA suits Wales, and 5SW fits the short-wave station. But has it ever occurred to you that 2RN *might* be taken to mean 2-Erin? A bad pun on the officials' part, but a good meaning! What will happen when the regional scheme is fully working and no stations are near big towns? Will Brookmans Park be 2BP?

Can you find the loud-speakers? The photograph shows E. L. Rice, the well-known American experimenter, with his "hidden" speakers. Loud-speakers are concealed in the photograph frame, the wall tapestry, the vase, the cushion and even in the pocket book!



Making the Most of the Output Stage

W. JAMES shows how to obtain maximum volume with minimum distortion

THERE is a power stage in the majority of valve receivers. It is sometimes fitted with a small 2-volt valve and supplied with high-tension current from a dry battery of 120 volts, or it may have several

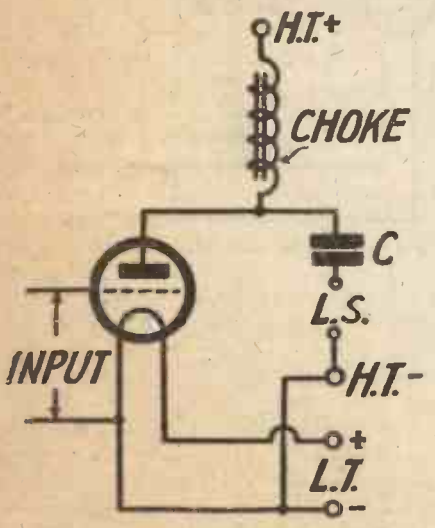


Fig. 1. Choke-condenser connections

valves and be run from a generator or a large rectifier.

But in order to obtain the maximum volume with the minimum of distortion, certain rules must be followed. They apply to all last stages,

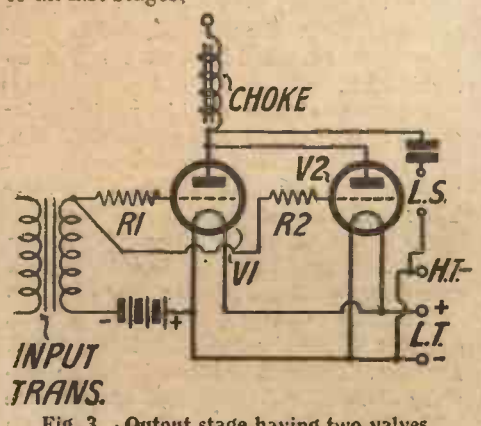


Fig. 3. Output stage having two valves

First, the grid bias must suit the valve and the high tension, and, secondly, the loud-speaker must suit the valve or valves.

Let us deal with grid bias first, as it affects running costs as well as results. What is happening when there is not enough grid bias? The anode current is more than it need be and the output stage overloads and distorts before it is providing its maximum volume. As a result, the reception is poor, and when a high-tension battery is used, it runs down more quickly than need be. If the power stage has large valves which are supplied from a high-voltage mains unit, an effect of too little grid bias is to tend to overheat them and, indeed, their lives may be considerably curtailed. The mains unit, too, may overheat because it is passing too much current.

Briefly, then, it is foolish to use too little grid bias.

Excess Grid Bias

Suppose now we use too much grid bias. Once again distortion is introduced before the normal volume is obtained, but the anode current is less than it should be. A dry battery will, therefore, have a somewhat longer life than under normal conditions. Between these two extremes is a value of grid bias which enables the maximum output to be obtained with the minimum of distortion, and it is, as a consequence, the value that gives economical working.

Too little and too large values of grid bias are both wasteful. But if one has to use the minimum of high-tension current, it is necessary to apply rather more than the normal bias. Moreover, when a little extra volume is required and the necessary signal strength is available by tuning, the distortion will be least noticeable when the last stage is over-biased.

Testing Grid Bias

The reader may now be asking: How am I to know when the bias is correct? Commence by applying the value suggested by the makers of the valve used. Listen carefully and then increase the bias. Notice whether the quality has suffered by the change and in general, use as big a bias as possible, for then the high-tension current will not be greater than necessary.

Before using less bias than suggested, remember that the anode current increases as the bias is reduced.

Let us now consider the second rule, that the loud-speaker must suit the last valve. This has to do with the amount of power supplied to the loud-speaker by the valve. It is really a question of impedances. The

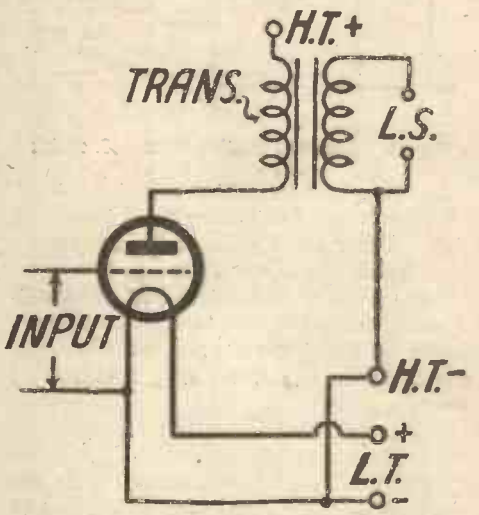


Fig. 2. Transformer output circuit

valve has a certain impedance, and the best results are obtained when the average impedance of the loud-speaker approximates to twice that of the valve. The word approximates is used advisedly, as it is not essential that the impedances be exactly as

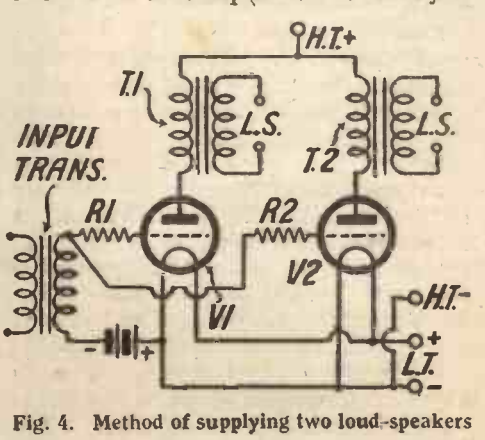


Fig. 4. Method of supplying two loud-speakers

described. They should be reasonably well suited, however, or the volume and quality will suffer.

Ordinary loud-speakers are made to suit

the average small power valve and may, therefore, be connected directly to the valve or through a choke condenser filter (Fig. 1).

A transformer or its equivalent must be used when the impedance of the loud-speaker is very different from that of the valve. Such a transformer may be connected as in Fig. 2, its ratio being suitable for the purpose. Sometimes a 1-to-1 ratio

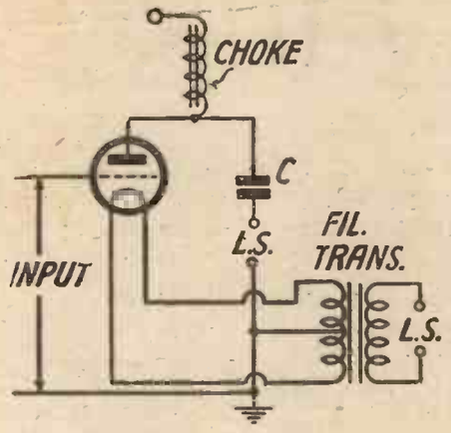


Fig. 5. Filament heating from A.C. mains

is suitable, as when a high-impedance loud-speaker is used, or it may have a ratio of, say, 40 to 1 for the purpose of adapting a low-impedance instrument.

When the characteristics of the loud-speaker are not known, and the makers are not very definite, a tapped transformer is useful as the best value may be found by trial.

An example of an output stage having two valves is given in Fig. 3. A filter circuit is used, and it is assumed that the loud-speaker is suitable for them, and then only the benefit of the second valve is obtained. Notice the two stopping resistances, R1 and R2, which may be of 100,000 ohms each. They are to stop circulating currents, but are not always necessary. Condenser C may be of 1 or 2 microfarads.

Using Two Loud-speakers

A method is shown in Fig. 4 of feeding two loud-speakers. The advantage of this arrangement over the more usual one of joining loud-speakers in series or parallel is, that one may be switched on or off without affecting the quality of the reproduction from the other. Here again stopping resistances are used. Valves V1 and V2 should be of the same pattern.

When a supply of alternating current is available, the filament of the valve in the last stage may be run from it as indicated in Fig. 5. The transformer adapts the mains supply to the voltage required by the filament. There is no hum from a single stage of this description, but a centre tap must be used, or, alternatively, a potentiometer may be connected across the filament and its slider joined to negative of high tension. It is possible to use a valve having a large filament when it can be supplied in this way, as the cost of the current consumed is so small.

A few transformer-coupled circuits have been indicated, as it is usual to drive the last stage through a transformer. This component must, however, be of correct design and it does not follow that a model suitable for supplying a single valve stage is also satisfactory when a large power stage is used. This is because bigger voltages are applied to the grids of a large stage, which also pass heavier currents when grid currents flow. The windings and iron core must, therefore, be of suitable sizes or they may be damaged.

When the last stage is resistance coupled and an amount of power is being dealt with, the grid leak R2 (Fig. 6) must be of the wire-wound type and have a fairly low resistance. This decides the value of the coupling condenser C1, and to a certain extent that of R1, as the values are related. Thus R1 need not have as much resistance as R2, and may, indeed, have as little as one-quarter of the resistance of R2, depending on the valves used. Resistance R2 may be of 100,000 ohms, C1 of .2 microfarad or more according to the quality of the reproduction desired, and R1 of from 20,000 ohms. The filter condenser C2 may be of 1 or 2 microfarads.

Watching for Distortion

It is worth while including meters in the grid and anode circuits of the last stage when considerable power is being dealt with, as shown in Fig. 7. The grid-circuit meter will show when grid current flows. As a rule, its needle will only move when a loud note is being dealt with. It should not show current all the time, but will generally indicate a particularly loud note when the stage is adjusted for maximum volume.

It should be watched with the anode-

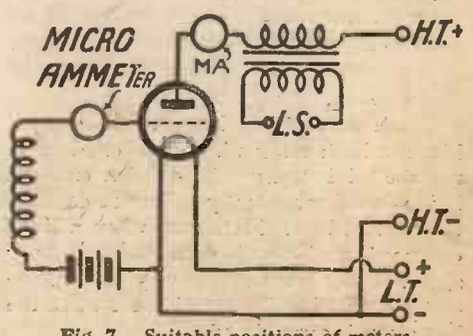


Fig. 7. Suitable positions of meters

circuit meter, as when the needles both move the stage is overloaded. If the grid meter does not indicate grid current whilst the needle of the anode meter jumps about over the scale, there is too much grid bias for the best results.

Generally speaking, movement of the grid-circuit meter indicates too little grid bias, and movement of the anode meter too much. When they both move, the input is too great, although, as a rule, occasional movements may be allowed.

Receivers and amplifiers are usually so designed that the last stage overloads before the others. This can be detected by including meters in the circuit. But when the last stage is a small one, and meters are not available, careful listening and attention to the rules given above is necessary.

Poor results are often due to the adjustment of the last stage. The tendency is usually to overload, and therefore the circuit values must be such that the full

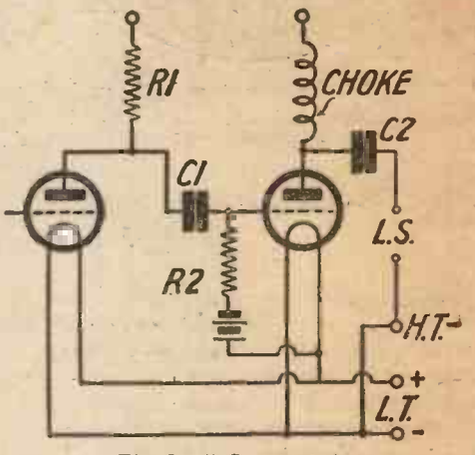


Fig. 6. R.C. output stage

power possible is being obtained with, of course, the minimum of distortion and anode current. Too much attention cannot be given to this part of a set or amplifier.

A final point is this. Reduce the grid bias as the high-tension battery discharges and be satisfied for the time being with less volume. But do not forget to increase the grid bias again when a fresh high-tension battery is fitted.

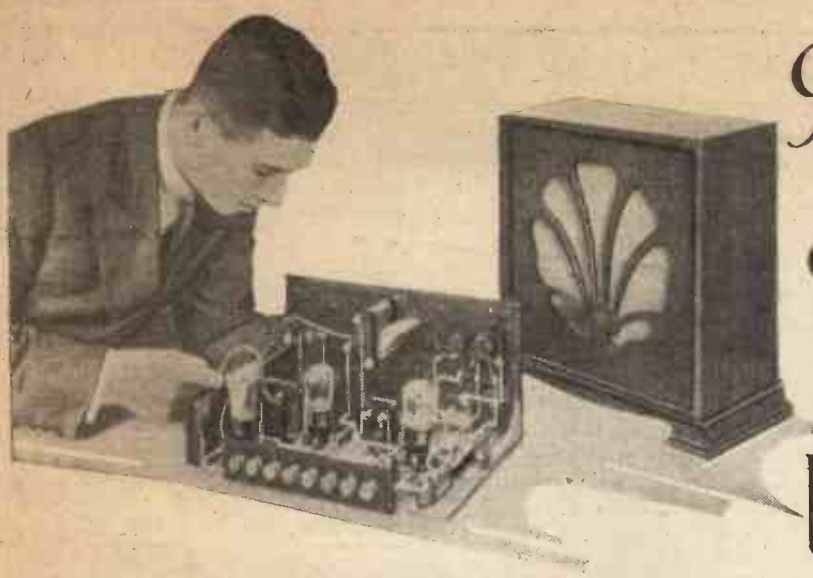
A FREE GIFT NEXT WEEK
(See page 514)

TRANSATLANTIC BROADCASTS

A NEW type of submarine cable, incorporating the recently invented insulating material paragutta, is likely to enable radio engineers to relay wireless programmes from the United States long before a sure method has been found to do so *via ether*.

This new submarine cable, produced by the Bell Telephone Company, is to be laid between Newfoundland and Ireland, and will respectively connect up with New York and London.

Up to the present, with existing cables it has been found difficult to carry speech over long distances, but the new type has surmounted many difficulties and permits of clear telephony between Europe and America. The National Broadcasting Company of America is prepared to lease the cable for a definite period per week in order to carry out an exchange of programmes with the Old World. In this manner the American listening public would be given wireless entertainment from every important city in Europe.



The TALISMAN TWO-THREE UNDER TEST

The construction of this receiver, an optional two-three, was described last week. Here are some operating notes and a report of tests

THE "Talisman Two-Three" being a receiver which, as its name implies, can be changed from a "two" to a "three," is bound to appeal to the many who are sufficiently close to a main station to get ample strength with a two-valve combination, but who want that extra valve when distance-getting.

In last week's issue full constructional details were given. It is quite a simple job to make up the set, and only few parts are needed. Probably quite a number of listeners, present owners of two-valvers, will be able to use some of their parts in this new "two-three." But be sure to adhere to the list of components, given herewith, for the convenience of those who did not start the construction last week.

Wiring

To assist in the construction of the set, a blueprint has been prepared. With it's aid you simply *can't* go wrong! The print costs only 1s, post free, and the number to ask for is A.W.203. It can be obtained from the Blueprint Department of AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4. The print is full size, and you can drill your panel, mount all components in their proper places, cut each wire to length, find its exact position, and make a final check of the wiring—all from the one sheet!

Last week's issue should be obtained by all who want to make up the set. A number of valuable hints were given for construction, and this week details will be given for making a check of the complete set, and of operating.

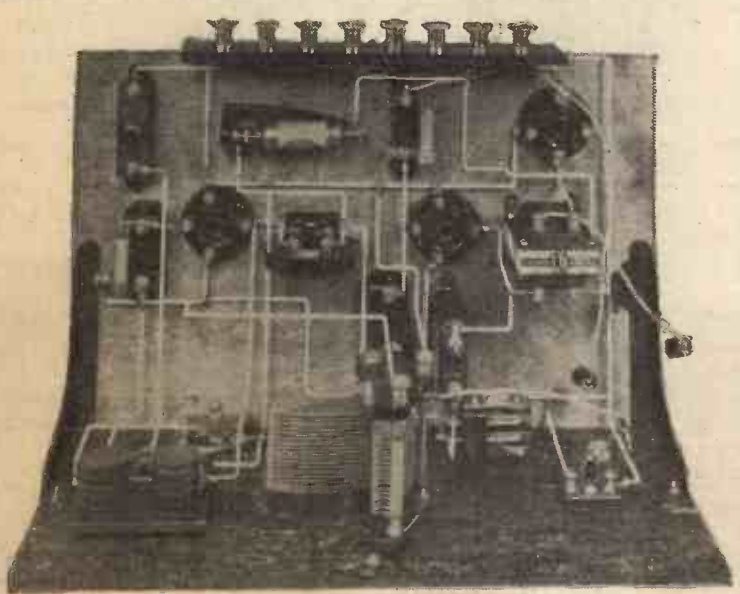
Checking

It will be assumed that all the wiring has been done according to the print. There are two preliminary checks to be made as described below.

First, each wire should be ticked or marked off on the print as its actual counterpart is passed as "O.K." in the set itself. And, when this is done, the positions of all wires should be noted. In the original set a deal of care was devoted to making a neat job of the wiring, and the print is an exact copy of the original. If you follow the print in conjunction with the photographs, then you will have an exact idea of the position of every wire. And if you have gone wrong in the positioning of a wire, even though it may be correctly connected, don't hesitate to re-solder it. After all, it takes only a few minutes to heat the joint, unsolder the wire, replace it and re-solder. Correct positioning of the leads is really highly important in order that a set shall work well and be stable. This is a point which is apt to be overlooked nowadays, but which need not trouble AMATEUR WIRELESS readers, who carefully follow the constructional descriptions.

Testing

When you are quite satisfied that all is well with the wiring, plug in a valve and connect the accumulator to the L.T. terminals. Switch on the set and



The various parts will be recognised upon reference to the accompanying lists

LIST OF COMPONENTS

Ebonite panel, 14 in. by 7 in., and strip, 9 in. by 2 in. (Becol, Ebonart, Raymond, Peto-Scott).

.0005-mfd. variable condenser (Burton, J.B., Polar, Igranic, Formo).

Talisman coil (Wearite).

.0002-mfd. reaction condenser (Lotus, Peto-Scott, Igranic, J.B., Burton).

Double-pole change-over switch (Wearite, Utility).

Push-pull filament switch (Bulgin, Benjamin, Lissen, Trix, Wearite).

Panel brackets (Ready-Radio, Bulgin).

Cabinet, 14 in. by 7 in., with a 9-in. baseboard (Clarion, Camco, Pickett).

Three valve holders (W.B., Lotus, Benjamin, Lissen, Wearite).

.0002-mfd. fixed condenser with series clips (Dubilier, Lissen, T.C.C., Graham-Farish).

.005-mfd. fixed condenser (Dubilier, Lissen, T.C.C., Graham-Farish).

1-mfd. fixed condenser (Dubilier, Lissen, T.C.C., Graham-Farish).

COMPONENTS (Contd.)

Grid-leak holder (Lissen, Combinator Dubilier, Graham-Farish).

Two grid leaks, one 2-megohm and one 3-megohm (Lissen, Dubilier, Graham-Farish).

Pre-set series aerial condenser value .0003-mfd. maximum (Formodenser type J, Igranic).

30,000-ohms wire-wound anode resistance with holder (Lissen, Varley, Dubilier).

High-frequency choke (Igranic, Lissen, Burndept, Varley, Wearite).

Low-frequency transformer (Telsen, R.I., Lissen, Varley, Igranic).

Eight terminals marked Aerial, Earth, L.T.−, L.T.+, H.T.−, H.T.+, L.S.−, L.S.+ (Eelex, Belling-Lee, Igranic).

Three wander plugs marked G.B.+, G.B.1−, G.B.−2 (Belling-Lee, Igranic).

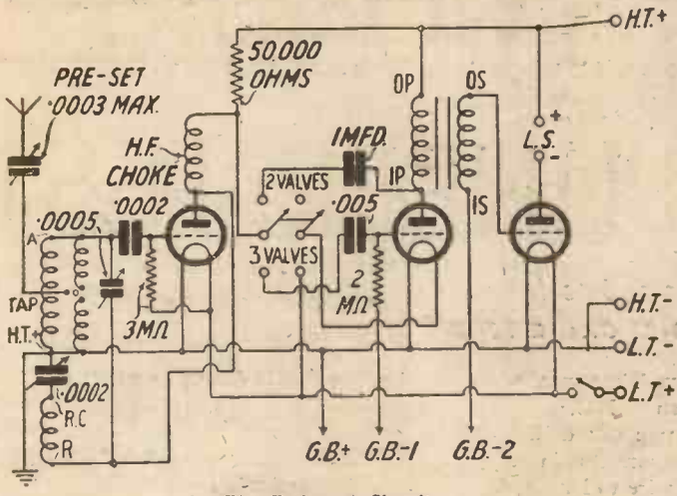
One yard of flex (Lewcoflex).

Connecting wire (Glazite).

Dial indicator (Bulgin).

"THE TALISMAN TWO-THREE UNDER TEST" *(Continued from preceding page)*

notice if the valve glows. If the valve is too heavily "gettered" to emit a glow it will usually be found that if one L.T. lead is brushed over the accumulator terminal a very faint spark will be noticeable in the semi-darkness formed by cupping the hand around the terminal. The spark will

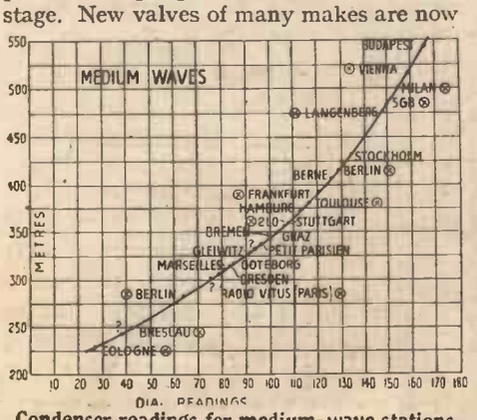


The Talisman Circuit

be more noticeable if all three valves are inserted.

If the L.T. wiring appears to be satisfactory, then it is safe to connect up the H.T., grid bias, loud-speaker, aerial and earth.

So far as valves are concerned, if you are buying an entirely new set, a *medium impedance* HL-type valve should be obtained for the first stage, an L.F. valve, or small power valve for the middle stage, and a power or super-power valve for the final stage. New valves of many makes are now



Condenser readings for medium-wave stations

obtainable, and, given these three types —HL-type, L.F. or power, and power or super-power—no difficulty will be found in selecting a trio of a favoured make. Given these general types, a dealer will advise and particularise so far as make and voltage are concerned. Whether a power or super-power valve is used in the final stage depends, of course, on the amount of H.T. available and the volume required.

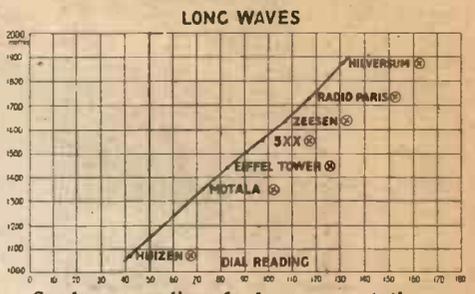
With modest valves and 100 or less volts H.T., the set will work very well, but by far the best results are to be obtained by supplying the anodes with, at least, 120 volts H.T., and a triple-capacity battery is the best to use. A common H.T. tapping is employed, the 50,000-ohms resistance in series with the detector valve anode dropping the voltage down to a value more suited to a detector.

Before continuing with details of operation, it is interesting to state that the "Talisman Two-Three" was tested out in the London area, within six miles of 2LO, immediately it was completed. The results are given in a convenient form in the two accompanying graphs. These are useful, because they give an indication of the distance-getting properties and dial settings of the receiver.

The member of the AMATEUR WIRELESS Technical Staff who carried out the test, reports that the control of the "Talisman" is simple and extremely pleasant. Local broadcast reception with the middle valve cut out was most satisfactory, and ample volume was obtainable. With the full trio of valves in use the results on foreign stations were distinctly also up to standard.

Despite the small maximum capacity of the reaction condenser employed, reaction needs to be carefully controlled to get the best results. The fitting of a slow-motion dial would be distinctly advantageous.

The two-three-valve switch on the panel



Condenser readings for long-wave stations

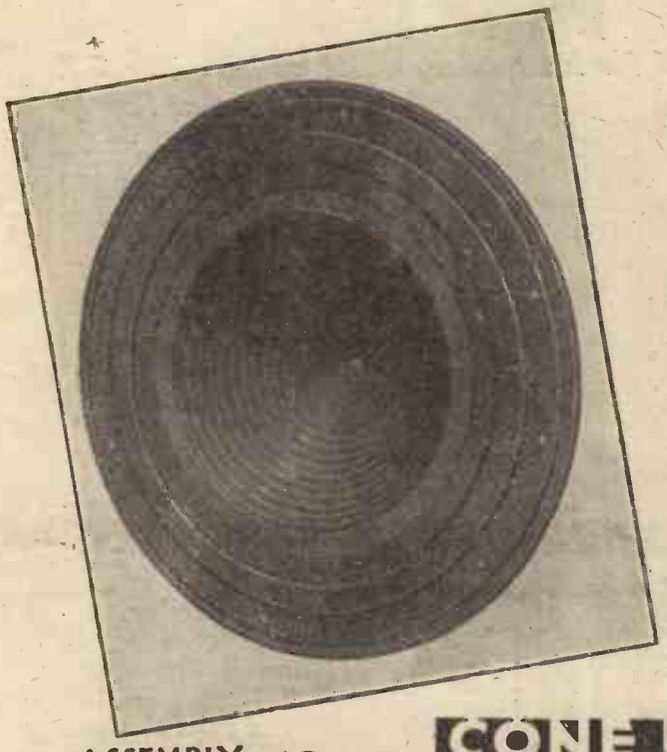
is for the two- or three-valve combination, and is used when either number is desired. *No other alteration has to be made, either in wiring or in battery values.* This is the great feature of the "Talisman Two-Three," and which puts it ahead of all other "convertible" receivers.

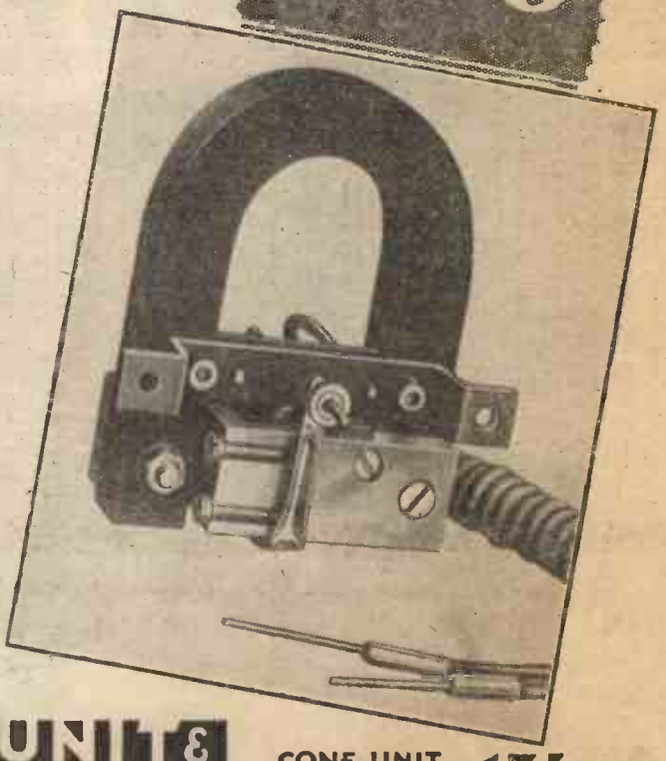
In order to get the most selective working use should be made of the pre-set condenser. A turn or two either way of the knob will make a great difference to selectivity without effecting a noticeable change in sensitivity. The fact that the aerial is taken through the pre-set condenser to a mid-point on the "Talisman" coil, results in most satisfactory selectivity. The "Talisman Two-Three" has been tested on Brookmans Park, of course, and the AMATEUR WIRELESS staff man reports that the tuning is amply sharp to deal with the new conditions without causing tone distortion owing to extreme cut-off.

PROGRESS WITH BROADCASTING HOUSE

Fifty feet below the street level workmen are excavating for the foundations of Broadcasting House in Portland Place. The site covers 20,000 square feet, and the floor space in the building will amount to 200,000 square feet

Build your own Super Loudspeaker for 27/6





ASSEMBLY PRICE 12/6

CONE UNIT & ASSEMBLY

CONE UNIT PRICE 15/-

If you want unusually good reproduction from your home constructed loudspeaker then build with the Ediswan Cone Unit and Assembly. This wonderful unit gives faithful reproduction over the whole range of musical frequencies and is built on the balanced armature principle. The Cone Assembly, which is drilled ready for baffle board mounting, although designed primarily for use in conjunction with the Ediswan Cone Unit, is equally effective with other Cone units upon the market.

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W. 26

On Your Wavelength!

Now For It

TAKEN all round, it has been a pretty poor summer for long-distance reception, especially during the latter part, when we were so much bothered by atmospherics. The long-continued drought was probably an important factor, since it is well known that wireless waves travel best over water and worst over arid ground. During the summer of 1929 the soil was parched many feet below the surface, and this must have increased enormously the resistance offered to the passage of wireless waves. It is interesting to note that simultaneously with the breaking of the drought a sudden and remarkable improvement in long-distance conditions occurred. Good stations at once took on added strength; those which had been only fair to moderate jumped into the star class; others which had been silent for months past had made their voices once more heard in this country. We are now on the threshold of the best time of the year for wireless listening.

The Real Test

We have now a real chance of testing out the efficacy of the Prague Plan. During the summer it was not possible to do so, since when ranges are short heterodynes do not occur to any great extent. There were many who prophesied that with the coming of darker nights the plan would be found almost, if not entirely, unworkable, for then increasing signal strength might well cause heterodynes between transmissions of stations hundreds of miles apart. Though I did not share these views, having been always hopeful that the plan would be a success, I must confess that I had certain misgivings when I sat down at the controls of the long-distance set on the first night when conditions were good.

An Improvement

There are a certain number of heterodynes, some slight, others rather bad; but, taking the wave-band as a whole, the number of foreign stations that can now be received free from all interference of this kind, and with really excellent strength and quality, is nothing short of astonishing. The heterodynes are, I think, mainly caused by stations which have difficulty in adhering strictly to their authorised wavelengths. The monthly reports of the Brussels Laboratory do not appear to have been published since the Prague Plan came into operation, and the only details of wavelength wandering now given by the B.B.C. are those of stations which have deviated by 1.9 kilocycles or more from their proper frequencies. Since the nominal separation is 9 kilocycles, an error of nearly two is a very large one—sufficient in many cases to cause something like jamming. I hope that the European authorities are not going to regard wanderings of anything less than 1.9 kilocycles as allowable. In America, where the State has evolved a scheme on the same lines as the Prague Plan, any station which deviates by only half a kilocycle is promptly and thoroughly told off by the ether police! It does seem, though, that the majority of European stations are doing their best in keeping to their wavelengths.

Stations Worth Going For

It is always as well when making a search round to have a certain number of stations in mind that one definitely wants to pick up. They act as kind of landmarks during the search, and when they have been logged and their settings noted others will soon be found. Here is a list of stations that I have found best during the past week or two. I start from the bottom of the waveband, since searching upwards is always by far the best method. The first landmark is Flensburg on 218 metres, which is often remarkably well heard, despite the fact that a German, French, and Swedish relay all share this wavelength. Flensburg's strength at present seems strong enough to drown any interference from the others. Then comes Cologne on 227 metres, Biarritz, Muenster, Bordeaux, and Nurnberg. There is at present rather a gap between Nurnberg's 239 metres and the 253 metres of Gleiwitz. Above this comes an excellent patch, which includes Toulouse PTT, Hamburg, Leipzig, Moravska-Ostrava, and Barcelona Catalana, who appears to be coming into action again. This station has been closed down for some little time owing to a mishap which seriously damaged the transmitting plant. On 274 metres Turin is one of the best of Continental transmissions, and above him we have Kœnigsberg, Bratislava, and Copenhagen, all good.

Higher Up

Passing over the big groups just above, the next station of note is Lyons. There is rather a gap now, largely on account of spark interference. Above it, on 316 metres, comes Marseilles PTT, Breslau, Petit Parisien, Naples, Posen, Brunn, and Barcelona (EAJ1). Readers living near London may find Stuttgart rather hard to separate from 2LO—it will be harder still when Brookmans Park is at work!—but this station is coming in very well just now. Seville, however, on 368 metres should be receivable with a selective set, and just above this wavelength comes one of the best portions of the medium band. This includes Hamburg, Tolouse, Genoa, Frankfurt, Berne, Kattowitz, Rabat, Berlin Witzleben, Madrid Union Radio, Stockholm, Rome, and Paris PTT. Langenberg and Lyons Doua on the one side and Prague and Oslo on the other are rather overshadowed by 5GB, but on 501 metres Milan is well heard, and above him stations well worth noting are Brussels, Vienna, Munich, and Budapest. It is not really much worth while going above Budapest's wavelength in search of stations, for beyond this much spark interference is experienced from ship and shore stations.

Your Turn Now!

Well, I have given you a pretty lengthy list of selections from my log. It is up to you to pull up your aerial and your socks and to see whether you can't knock "Thermion" into all sorts of cocked hats. More power to your elbow! Note, by the way, that I mention these stations as worth trying for, but I don't guarantee that on any particular night you are going to find the whole lot coming through without interference of some kind. In fact, on the other hand, I am quite prepared to guarantee that you won't. You should, however, be able to make a pretty useful selection from them, and if I may offer fellow DX enthusiasts one little hint, here it is. Don't bother about any transmission that is so weak that it wants heaps of reaction, or is fading, or is heterodyned or sparked. Simply pass on to something else, and when you find something that is coming through to perfection make a note of it. If you do this for a few nights you will soon be able to compile a list of "odds on" stations, by which I mean stations so nearly reliable that you can be almost sure of first-rate reception from them, whenever you feel so minded.

A New Idea

A Chicago correspondent informs me of a new use which the police are making of broadcasting in that city. There has been, as you probably know, in recent years just a tiny hint of crime in Chicago. Nothing really serious, of course. Just that citizens were bumped off with sandbags, lead piping, revolvers, machine guns or bombs at the rate of about one a day, whilst a few trifling burglaries involving a paltry hundred thousand dollars or so occurred each night. Tough-babies *will* be tough-babies, of course. At first the police were rather rough about it. I mean they used armoured cars and tanks, and tear-gas and sawn-off shot guns and things. But now they have discovered a far, far better way. Whilst you are listening to sweet music from your loud-speaker there comes a sudden break in

On Your Wavelength! (continued)

the programme and a voice calls: "Police. Urgent message. A gang is operating at such-and-such a street. All police squads in the vicinity are to report there immediately."

Up to date, the results have been extraordinary. Not only are the police put quickly on to the job, but also householders are warned that there is trouble afoot and are therefore on the look out. I don't anticipate anything of the same kind in this country, but it just shows what wireless can do, doesn't it?

People I'd Like to Murder

Though he is a peaceful person in the ordinary way, your "Thermion" does have blood-thirsty thoughts at times. There are several people, in fact, that he often feels that he would love to murder in a variety of horrible ways. These are:—

(1) The man who invented the solder-proof soldering tag. This is generally made of perfectly good brass or copper *nickel plated*. Solder won't stick to it as it is, so you have to remove the plating before you get to work.

(2) The man who evolved the scheme for saving money by turning out under-size B.A. nuts. Make your nuts a bit smaller and you save brass. Also you ensure that no constructor's box spanners will fit them.

(3) The man who sells a reel of wire with a break in the middle of it. You have got 90 per cent. of the turns on to a very complicated coil. Your helper is holding the reel so that the wire is under just the right tension. Without any warning, you come to a break. The wire flies off the reel. The turns fly off the coil, and the Recording Angel has to use shorthand to get your remarks down quickly enough.

(4) The man who invented the over-size valve socket. This is drilled about one size too large. In the old days you could circumvent this criminal by opening out the valve pins with the blade of a knife. Nowadays you cannot do it, because they are not built that way. What you actually do is to spend hours in hunting for the reason why your set is silent, only to find in the end that it is due to a sloppy valve leg.

(5) The man who invented flannel pliers. Of course, the stuff they are made of does not look like flannel; it looks like steel. When you try to grip something tightly with them the handles come together whilst the jaws remain apart.

(6) The man who invented the twist drill that twists not *in*, but *off*.

The Moving-coil Pick-up

There was a demonstration at the exhibition which particularly caught my eye, and I think the eyes of many others. I refer to the ingenious "laboratory set up" of a moving-coil gramophone pick-up. A very large "working model" of the pick-up was connected in series with a galvanometer, and by its side a card beseeched onlookers to "Try it." Of course, the invitation could not be resisted, and everybody took hold of the huge gramophone needle and moved it backwards and forwards in the imaginary record track, sending pulsations of current through the galvo. And the needle of the galvo. flicked about in a most pleasing manner, attracting the attentions of more would-be "triers." The moving-coil gramophone pick-up is something new, and I am looking forward to "trying" one of these gadgets on my own set during the next week or so.

B.B.C. Behind the Scenes

Actually, the B.B.C. made quite a big noise at Olympia. Hidden in a room below the centre staircase was a fearsome-looking apparatus, not unlike a large relay-station transmitter. In this room B.B.C. engineers picked up the London programmes, the music of the military band in the hall, or relayed gramophone records by means of the elaborate amplifiers and sent the sound to hundreds of exhibitors' stands. The word "elaborate" is well deserved, for the output push-pull stage dissipated no less than 600 watts! Huge valves of the transmitting type were used for this stage, mounted on what was actually a standard relay-station transmitter frame. The push-pull output transformers were each about one foot cube in bulk and considerably more than one hundredweight in weight.

"Seeing In"

As far as the protagonists of television in this country are concerned, the long-looked-for day has arrived. We know that the courtship between the Baird Company and the B.B.C. was not all smooth sailing, but the engagement was announced a week or so ago, and September 30, 1929, was the day when television and broadcasting wed in this country. That the marriage will be blessed with every happy association is the fervent wish of all the wireless fraternity.

Purely Experimental at First

The service to start with will be of a purely experimental nature and at the moment is confined to one wavelength, so that speech and vision cannot be transmitted simultaneously, and it is necessary for the speaker to speak first and then change over to television or *vice versa*. This is due to the fact that at present only one wavelength is available, the Brookmans Park station, which is to be used for television, not having been completed. Upon the completion of this station two wavelengths will be granted to television as soon as can be conveniently arranged by the B.B.C. There is no technical difficulty in the way of sending speech and vision simultaneously, and this was successfully demonstrated by the Baird Television Company at the test given through 2LO in March last to the Postmaster-General and a committee of Members of Parliament. On that occasion the station at Marconi House was used in conjunction with 2LO, so that two wavelengths were available for the tests.

HAVE YOU SEEN OUR GIFT OFFER ON PAGE 514?

The Inaugural Ceremony

Being one of a privileged few, I was able to witness the inaugural ceremony on one of the few televisors available, and could not help being thrilled at what may be classed as an epoch-making event in the history of electrical communications. The studio from which the artistes were televised is at the headquarters of the Baird Television Company in Long Acre, and from there the televised images passed along telephones line to Savoy Hill, where there was a "check" receiver. From Savoy Hill they passed through the usual land lines to Oxford Street (2LO) and thence on to the ether. Just after the scheduled hour, 11 a.m. (the broadcasts are promised daily from 11 a.m. to 11.30 a.m., except Saturdays and Sundays), the proceedings opened with a message from Mr. William Graham, President of the Board of Trade.

Someone Erred

Sir John Ambrose Fleming was then introduced as the president of the Television Society. A peculiar rhythmical humming sound indicated that Sir John had sat in front of the television transmitter, and while I know this worthy wireless pioneer quite well by sight I must confess that I was mystified at what I saw. His face was black; in fact, all light appeared dark and shades light. I soon realised that someone had erred, for we were seeing the picture as a negative. One pictured the flutter in the dovecots at Long Acre, and very shortly afterwards the true face came through. Sir John congratulated the B.B.C. and the Baird Company on inaugurating this new service for the benefit of the wireless public and paid tribute to the genius of J. L. Baird.

It would be foolish to say that at this first test the features as seen in the televisor were perfect. Definitely recognisable images were seen, however, with quite a wealth of detail, and the daily test will enable the two parties concerned to ascertain rapidly the best conditions necessary to make the broadcasts sufficiently standard for the general public to participate.

THERMION.

J·H·REYNER ON THE IMPORTANCE OF CONSTANT INDUCTANCE

A number of constant-inductance chokes have appeared on the market recently and many people are asking what is the exact merit of such a choke. Is there a real advantage in the use of a specially-designed choke of this nature? Our Technical Editor supplies the answer below.

FIRST of all, it will be as well to consider exactly what a constant-inductance choke is. It is well-known that the iron circuit of an ordinary L.F. choke tends to saturate according to the direct current flowing through the winding. In the great majority of cases in which a choke is employed in practice some steady current flows through the winding in addition to the alternating

A typical constant-inductance choke —the Varley

signal current. The larger this steady current, the less the inductance of the choke and unless the iron circuit is generously designed, the variation is apt to be considerable. It is no unusual thing to find a choke having an inductance of 50 to 60 henries without any current flowing through it, whereas with a current of only 5 milliamps, the inductance is less than 10 henries.

The constant-inductance choke overcomes this defect by the use of a modified form of iron circuit. This is not complete as is in the case of the ordinary choke but is provided, at suitable points, with a small gap. The effect of this is to minimise the saturation of the iron core, in consequence of which a much steadier inductance is obtained and if the design is worked out correctly it is possible to maintain the inductance constant over a large variation of current.

This is very pleasant from the point of view of the curve enthusiast who likes to see a straight line drawn on graph paper, but some people will question its practical utility. In a normal circuit, we find the best operating position and leave the choke in use under the particular circumstances. The steady current flowing through the winding is thus constant and therefore the inductance is constant. Why then is it necessary to go to special trouble in order to provide a choke in which the inductance does not vary?

This argument is, unfortunately, fallacious because the current flowing through the choke is not constant even although it appears to be so if measured with a moving-coil meter. The average value of the current remains steady (at any rate providing the amplifier is operating without distortion) but instantaneously the current is varying above and below the mean value by a considerable amount. We apply a voltage to the grid of the valve with the express object of causing the anode current to vary and although for convenience we often regard the anode current as being made up of a steady current with a super-posed alternating current, yet actually in practice, this is only one current which varies above and below a mean value.

What is more, this variation may be, and indeed should be, considerable. If we have a valve taking a mean current of 5 milliamps, then if the valve is utilised in an efficient manner our anode current will vary between about 2 milliamps and 8 or 9 milliamps. The characteristic of the valve will be substantially straight over a range of current of this order and if we utilise the valve efficiently we shall have a current swing of the order of 6 to 8 milliamps. We are, therefore, not at all justified in assuming that the anode current of the valve is constant. Actually, it is varying very considerably and with it, the inductance of any iron-cored apparatus in the set.

Therefore, the need for a constant-inductance apparatus immediately becomes apparent. The amplification obtained from the valve depends upon the impedance of the anode circuit. Let us assume that this is a simple choke-coupled amplifier as shown in Fig. 1. Let us also assume that the impedance of this choke at 100 cycles is

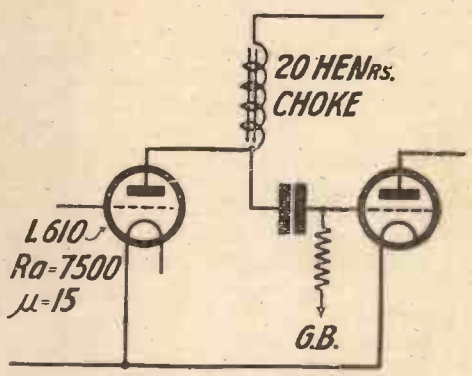


Fig. 1. Choke-coupled amplifier circuit

equal to the internal resistance of the valve (7,500 ohms) at the mean value of anode current. Then theoretically, we should obtain 70 per cent. of the maximum amplification factor of the valve under these conditions, which would be 10.5.

We have just seen, however, that the

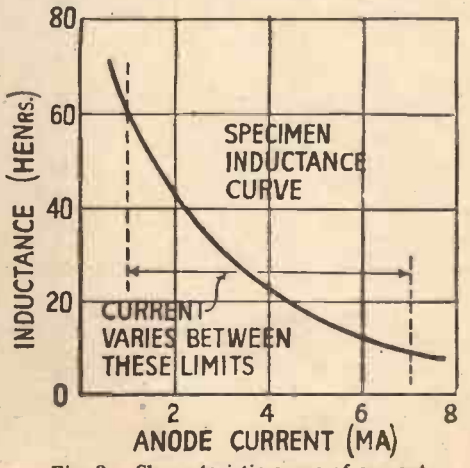


Fig. 2. Characteristic curve of current variation limits

inductance of the choke does not remain constant. Let us look into the matter further. The valve we are using is an L610 operating at 150 volts with 4½ volts grid bias. Under these conditions, the mean anode current will be 4 milliamps and the

(*Continued at foot of next page*)

For the Newcomer to Wireless : THE VOLTMETER QUESTION

I WANT to buy a voltmeter. What kind would you recommend?

If I were you, I would not buy one at all!

But you told me not long ago that every wireless man should have a measuring instrument.

Quite so; but if I were you, I would spend my money on buying a good milliammeter, a 1,000-ohm wire-wound resistance, and a 10,000-ohm resistance of the same sort.

But I thought the milliammeter only measured current?

It does, but by means of the resistances it will give you all the voltage readings that you want in the wireless set and with quite sufficient accuracy for all practical purposes.

I would like to know more about this.

To begin with, the milliammeter itself is by far the most useful instrument that the wireless man can possess. It enables him to see that he is not overloading his high-tension battery, it shows up some of the commonest causes of distortion, and it is *the* fault-finder *par excellence*. You will always be making use of the milliammeter, in fact, if you are wise, you will keep it normally wired in the common high-tension negative lead. A voltmeter you will require only occasionally.

How can it be used for measuring voltage?

What I recommend is a 0 to 25 moving-coil milliammeter. This instrument is so arranged that a full-scale deflection is obtained when 25 milliamperes are driven through it, and other deflections in proportion.

Yes, I follow that.

By Ohm's law 1 volt drives 1 milliampere through a 1,000-ohm resistance.

I see now; you mean that if you wire this resistance in series with the instrument it at once becomes a 0 to 25 voltmeter?

Exactly. And if you buy a goodish instrument with low-resistance windings, and also purchase a good resistance, you will find that, though the method is rough and ready, the error will probably be quite small.

How can I find out what the error is?

Try the instrument with the resistance in series against a good voltmeter, which you can borrow, and note how much it under-reads or over-reads. You will easily be able to work out the percentage and so correct your readings, if the error is big enough to make this necessary.

And the 10,000-ohm resistance means that the instrument reads from 0 to 250 volts I suppose?

Yes. It thus becomes most useful for dealing with the high-tension battery, just as the smaller resistance suffices for the accumulator and the grid battery. One great advantage is that the scale requires no alteration and that you have no complicated calculations to make. With the 1,000-ohm resistance the instrument reads direct; with the 10,000-ohm you simply multiply the reading by ten—a simple process, since you have only got to stick on a nought.

It sounds a good scheme.

It is, though I say it myself, for you really get three instruments for a few shillings more than the price of one, and they are good ones for two reasons.

What are those?

First of all, the recording instrument is a moving-coil milliammeter, with its dead-beat action and its reliability. Moving-iron instruments often become inaccurate as time goes on.

What is the second point?

In measuring voltages you take very little current from your batteries. This is particularly important in the case of the high-tension battery. There is one point, however, that you must be careful of.

What's that?

Don't, in a moment of madness, try to measure a voltage without placing the proper resistance in series.

"THE IMPORTANCE OF CONSTANT INDUCTANCE"

(*Continued from preceding page*)

variation at the maximum grid swing will be from 1 milliamp to 7 milliamps.

Fig. 2 shows the curve of a choke which would comply with the conditions which we previously laid down, namely that the impedance of the choke at 100 cycles should equal that of the valve. This curve is taken from an actual choke and therefore fairly represents practical conditions. It will be seen that when the current rises to 7 milliamps, the inductance falls from 23 henries to 9 henries, in which case the impedance at 100 cycles will be only 5,700 ohms and the amplification will have fallen from 10.5 to 9.

When the current falls, an even more serious change takes place, the inductance at 1 milliamp being 60 henries. The impedance is then 18,900 ohms and the amplification rises to 14.

This example has been slightly exaggerated in order to show the type of effect produced, but it is not an unreasonable estimate of practical conditions. It will be seen that the amplification has not remained constant but has varied well over 50 per cent. at the two ends of the scale, the amplification when the grid is negative being 14, while when it is zero the figure falls to 9. Consequently, the wave form is not magnified truly, but is distorted. The difficulty becomes rapidly worse as we reach the lower frequencies where the inductance of the anode circuit anyhow becomes fairly small comparable with that of the valve and a large difference in amplification results from a relatively small change in the anode impedance.

These difficulties are obviated by the use of a choke which really has a constant inductance, irrespective of the current flowing through it. There are several such chokes on the market now as was mentioned at the beginning of the article. The Varley choke is a very useful component having an inductance of 20 henries at any current between 0 and 100 milliamps. This is particularly useful for power work where wide variations of current have to be dealt with. Messrs. Wright & Weaire make a range of constant-inductance chokes from the H.T.1 which is 10-henry choke capable of carrying 125 milliamps up to the H.T.4, a 120-henry choke capable of carrying 25 milliamps.

Needless to say the improved performance of these chokes is obtained at some expense in other directions if the bulk is to be kept the same and the sacrifice which has to be made takes the form of a small increase in the resistance. A constant-inductance choke, therefore, may be expected to have a slightly higher resistance than a variable-inductance one, but the advantages gained from its use more than out-weigh any possible slight disadvantage from this cause. With our improved knowledge of filtering, the need for a very low-inductance choke has largely passed away.

An Impression of Sir Frank Benson

"Seeing In"—A start with Television from 2LO

Sir J. Ambrose Fleming with Mr. Baird on the occasion of the first public television broadcast

B.B.C. broadcasts of Baird television are now being made every day, except Saturdays and Sundays, between 11 and 11.30 a.m. Anyone can "see-in"; amateurs are invited to co-operate, and so soon as an initial experimental period has expired, television apparatus will be put on the market.

Monday, September 30, was a red-letter day for television enthusiasts, for the B.B.C. made the first public broadcast from the Baird studios. At the invitation of Mr. Baird, an AMATEUR WIRELESS Special Correspondent was able to witness the whole of this first television broadcast, and some of the photographs on this page give a very good general idea of the scene on this occasion.

The broadcast was carried out in the Baird laboratories in Long Acre, London, and the studio was connected by land line to Savoy Hill's control room, and thence to the 2LO transmitter, all the announcing and television transmissions taking place from the Baird studios.

Only one transmitter was allotted for this test, so each artiste had to speak first before the microphone and subsequently repeat the speech while sitting before the television transmitter. It is hoped to be able to transmit television and speech simultaneously when the Brookmans Park dual transmitter is operating.

During the course of the transmission the AMATEUR WIRELESS man was able to leave the scene of operations and witness *radio* reception by means of a televisor installed in an adjacent room. This was operated by an engineer of the Baird Television Development Company, and the results obtained were of good quality, but trouble with "hunting" (up and down movement of the picture) was experienced.

For the benefit of those unacquainted with the Baird televisor, it may be explained that one sees the image through a wide lens, about 8 in. in diameter, and the general effect is similar to that of looking into an automatic picture machine as installed in amusement halls. The image appears as a "soft-tone" photograph illuminated by a reddish-orange light. The degree of detail noticeable from radio reception was quite good, and there appeared to be no jamming or interference. On many occasions, however, the televisor started to "hunt," the image moving out of its proper square like a cinematograph film wrongly set, and this had to be checked by fresh adjustment taking about twenty seconds.

The general impression gained was that the present televisor has reached the state of development of the early, flickering cinematograph. There is much, very much, yet to be done, but the present stage is highly creditable and the fact that public broadcasts are now being given will undoubtedly hasten progress.

Professor Fleming expressed himself very pleased with what he had seen, and Mr. Baird, while claiming success for the B.B.C.'s first public broadcast, said that in even a few days an improvement in quality would be noticeable. He refused to go into technicalities, but conversation with some of the engineers rather indicates that further developments will be along the line of getting more picture detail into the frequency channel at present available.

A picture of the Baird studio and (right) the check television receiver in the Baird premises in Long Acre

Prompt at 11 a.m. the announcer came "on the screen" and a letter was read from the President of the Board of Trade (Sir William Graham, M.P.). Speeches were then made by Sir Ambrose Fleming (the inventor of the valve) and Professor Andrade, who were also both televised, and a light programme was afterwards given by three artistes.

Previous to this television broadcast, a demonstration of land-line television had been given at a laboratory within a stone's throw of Olympia, during show-time. Here a glass-fronted studio and apparatus room were fitted up so that visitors could see the whole process of transmitting sight and sound. Two televisors were working, connected by wire with the transmitter, and simultaneous speech and television were given.

There are many amateurs in the country with experimental television apparatus available, and the AMATEUR WIRELESS Technical Staff is co-operating with the tests so far as possible. Faces can be "heard," of course, by the ordinary listener to the 11 o'clock transmissions. Speeches are given by the announcer, and the television transmitter is then switched on. The characteristic note of a full-face view of a head, "Brrrump . . . brrump . . . brrrump . . ." is easily recognised.

A GIFT ANNOUNCEMENT APPEARS ON PAGE 514

HOME TALKIES—
A SUGGESTION

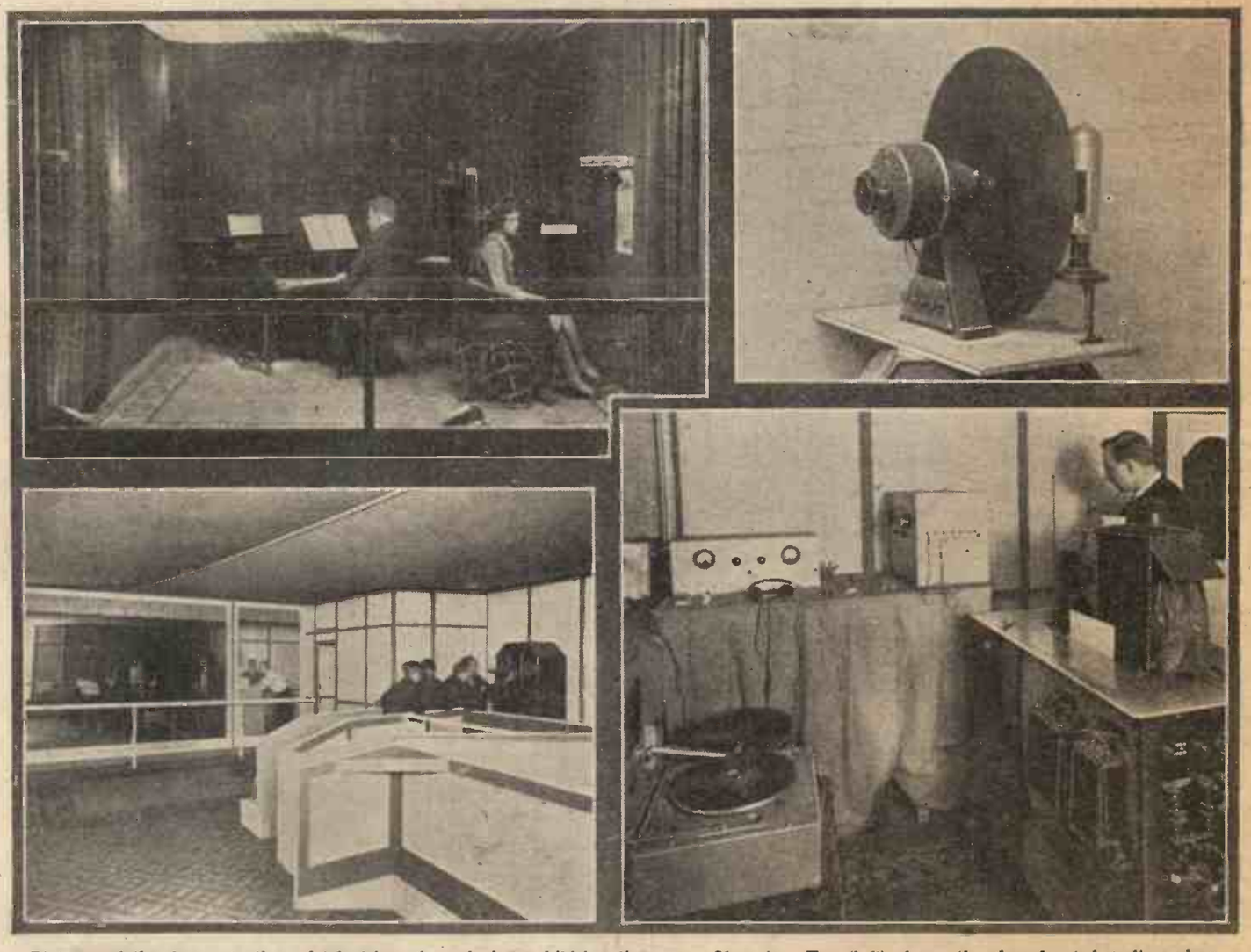
THE construction of talking-picture apparatus should present no great difficulty to the advanced amateur wireless man. Of course, with the use of his radio amplifier and a home-projection machine, he is unlikely to achieve the same standard of quality heard in the leading cinemas. On the other hand, it could hardly be worse than some of the unpleasant noises that are given the name of talking pictures.

I heard a small home machine the other day in which the sounds were picked up from the edge of a film and amplified to loud-speaker strength with three stages of L.F. In this case, the picture was not projected, but this, I was assured, would be dealt with "in its stride."

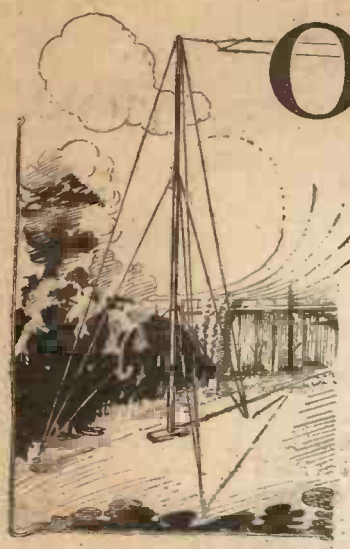
The apparatus was exceedingly simple. The film moved continuously through an ordinary motion picture gate and a slot-shaped beam of light was projected on to the sound track on the edge of the film. On the other side of the gate was a box containing a G.E.C. photo-electric cell, mounted so that it received the rays of light through the film. The photo-electric cell had 120 volts impressed on it through a 2-megohm resistance and was coupled to the first L.F. stage through a small condenser.

The chief trouble of this amateur job was the difficulty of maintaining a constant speed of travel for the film. The film was drawn through the sound gate by a sprocket wheel, the teeth of which engaged the film perforations, and this was driven by a belt coupling to a D.C. motor. The variations of speed of the motor raised and lowered the pitch of the musical sounds coming from the film; on speech this variation was not noticeable.

B. H.



Pictures of the demonstration of television given during exhibition time near Olympia. Top (left) shows the glass-fronted studio and on the right is shown the elements of a television receiver. Below (left) is the demonstration room, and right the transmitter



OUTSIDE AERIAL OR FRAME?

By MORTON BARR

THE modern portable set will pick up on a small self-contained loop aerial as many distant stations as could be brought in, say a couple of years ago, with the same number of valves coupled up to a 100-ft. garden aerial.

This remarkable development is, of course, mainly due to the improved standard of performance of the latest types of valves, particularly the screen-grid high-frequency amplifier combined with the pentode as note-magnifier. At the same time it opens the way for the abolition of the unsightly outdoor aerial.

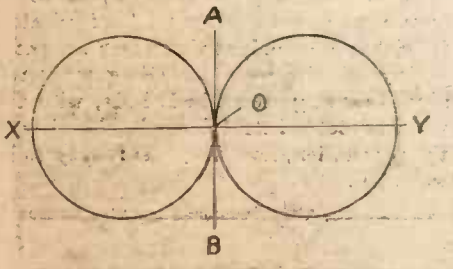


Fig. 1. Directional curve of frame aerial

Apart altogether from purely æsthetic considerations, the elevated wire aerial is still regarded with suspicion by many people, who consider it a possible source of danger from lightning. Experience has proved this fear to be ill-founded in practice, though it will no doubt help to hasten the final disappearance of the garden pole, now that the latter is no longer indispensable for long-range reception.

Time was when the difference in efficiency between the indoor frame and the outside wire was estimated at two stages of high-frequency amplification. That is to say, other things being equal, the change-over from a standard P.M.G. aerial to an inside frame meant adding two high-frequency valves to the set.

This no longer holds good. Even with an outdoor aerial, one stage of ordinary H.F. amplification is usually necessary to cut out the local B.B.C. station and receive distant programmes. By converting the one H.F. stage into a screen-grid amplifier practically the same results can now be secured on a small frame aerial.

Although, as previously stated, this is, in the main, due to recent developments in valve design, some credit must also be given to the advantages of the frame aerial, particularly its directional properties as an aid to selectivity.

It is well-known that a frame aerial receives signals at maximum strength when the plane of the windings is turned in the direction of the incoming wave. Conversely the same property helps to cut out any interfering signals coming from a different direction.

For stations situated at right angles to the plane of the frame windings, the pick-up is practically zero, whilst for stations lying between these two critical directions the strength varies according to the particular angle concerned.

The reason for this directional discrimination lies in the fact that a frame responds only to the magnetic component of the signal wave. For the ordinary B.B.C. transmitter this must be conceived as an oscillating flux taking place parallel to the surface of the earth and at right angles to the direction in which the wave is moving as a whole.

Directional Effects

It is, then, easy to see that if the frame is placed so that the windings are end-on to the incoming signal wave, the open face of the windings lies athwart the magnetic flux, and therefore picks up maximum signal voltage. On the other hand when the frame is turned through a right angle the magnetic flux cannot thread through the windings (because they are now end-on to the magnetic flux), and therefore no signals are received from that direction.

For instance, suppose in Fig. 1 that the transmitting station lies somewhere along the line OX, and that the frame aerial is gradually turned through 360 degrees, starting with its plane lying along OX and moving in succession through OA, OY, and OB back to OX. The figure of eight curve then indicates the manner in which the incoming signal strength varies during the course of rotation.

It will be a maximum for the direction OX, and will then gradually fall off until the frame windings lie in the plane OA, when signals fall to zero. From OA to OY signal strength gradually increases to a maximum. This process is reversed as the frame is swung around from OY to OB, and finally from OB to OX.

The first point to be observed is that when the frame is set for maximum reception from a station along the line OX or OY, it automatically cuts out any station that may be transmitting simultaneously in either of the directions OA and OB.

The ordinary garden aerial does not exhibit this useful directional discrimination.

The second point to be observed is that the frame when set to receive a station lying along the line OX responds with equal efficiency to any other station of the same or similar wavelength located along the line OY. In other words, it does not discriminate between two stations lying in the

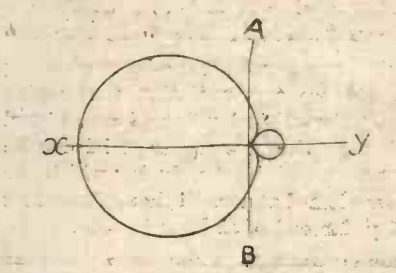


Fig. 2. Effect of open and frame aerial combination

same plane, although one may lie to the front and the other to the rear of the frame.

When using a frame for direction-finding in marine or aeronautical navigation, this presents a problem which is overcome in practice by combining a small vertical or upright wire with the frame aerial.

The response in the vertical aerial is the same whether the signal wave comes in from the fore or aft direction. In the case of the frame aerial when used alone, the received signal strength is also the same in both directions, as is indicated in Fig. 1.

In actual fact, however, the "phase" of the frame voltage as compared with that induced in the vertical aerial differs by 180 degrees, according as the wave impacts along the X line or along the Y line. Now by combining the voltages induced in the vertical wire with those induced in the frame, the two will combine or add together when the signal wave is travelling along the X line, whilst they will oppose each other

(*Continued at foot of next page*)

when the wave comes from the direction Y. The resulting signal strength is accordingly indicated by the cardioid curve shown in Fig. 2, and the listener is able to determine in which of the two "critical" directions, viz., XO or YO, the transmitting station is located by comparing the relative strengths of the received signals.

In the ordinary portable set, the comparatively bulky batteries form a counterpose "earth" to which the frame, as a whole, is capacity-coupled. It will, therefore, act to a certain extent as a vertical aerial, picking up the electrostatic component of the wave in the same way as an "earthed" aerial of the same height.

The combination of the two induced voltages, namely, that due to the true "frame" action caused by the magnetic flux threading through the windings with the "accidental" electrostatic voltage induced along the vertical wires to "earth" through the batteries, is often sufficient to discriminate between two transmitting stations located 180 degrees apart.

When used aboard ship or on aircraft, the directional action of a frame aerial is affected to some extent by the action of magnetic bodies in the vicinity, such as a metal funnel, or the steel stays of the fuselage which deflect the front of the incoming wave from its true direction. This is called "quadrantal" error, and must be allowed for and corrected by an operation similar to that known as swinging the compass.

Another source of error is "mast effect," in which the presence of near-by conducting bodies set up a re-radiation field which "blunts" the critical point of zero signal reception, so that the frame aerial can be swung over a definite arc, during which the signals are heard at a small though constant intensity, instead of sinking to zero.

In practice this is compensated by the use of a small auxiliary aerial, which is designed to pick up a small voltage from the re-radiation field sufficient to nullify the undesired effect on the frame when the two voltages are combined in the receiver.

IF CONDITIONS ARE FAVOURABLE

Jottings from my Log
by Jay Coote

DURING the past week or so conditions for the reception of distant stations have been gradually improving. In the course of a few nights, I picked up at good strength many foreign transmissions which for the previous two months had been conspicuous by their absence. Yet, my pet morning paper, basing itself on information supplied by pessimistic scientists, forecasts a bad October for wireless enthusiasts, inasmuch as during this month we are to suffer from an outbreak of sun spots, which exercise a disastrous effect on the ether. I am even told that the intensity of these unpleasant eruptions, although gradually diminishing in November, may last some five years, and until that time, radio reception will not be at its best.

I am inclined to believe, however, that this autumn will prove no worse than previous years, and that the average "fan" with the newly constructed set will still declare himself satisfied with the results obtained.

However, with daylight disappearing at an earlier hour, try for weaker transmissions; you will find that they have now gained strength. Such giants as Zeesen, Moscow, Leningrad, Motala, Radio Paris, Eiffel Tower, Kalundborg and Hilversum have weathered the worst (wireless) period of the year. To-day they will shout at you, and weaker brethren such as Munich, Algiers, Lahti, Kovno, Genoa, Seville, Berne and others, which appeared to be resting, are already adding their voices to the radio community.

"If conditions are favourable," is a good saving clause, but there is no need to be depressed by the possibility, or even probability, of spots on the sun.

Owing to interference, caused by morse telegraphy transmitted by the Dubendorf and Basle aerodromes, the Zurich broadcasting station has been authorised to work alternately on two different wavelengths, namely, on 466 metres during the afternoon and on 459 metres in the evenings. At odd times this latter wavelength is also used by the 200-watt military transmitter at Sottens near Moudon (Western Switzerland) in a series of experimental transmissions with a view to obtaining the necessary data for the erection of a 12½-kilowatt transmitter on that site.

The Prague short-wave transmitter regularly transmits on Tuesdays and Fridays between 7.30 and 9.30 p.m. G.M.T., on a wavelength of 58 metres. The call sign is OKIMPT.

The Post Office D.F. van is expected to make a long stay in Glasgow, so as to ensure a grand "clean-up" of pirates. Officials are confident that there are more unlicensed wireless sets in Glasgow than in any other large town in Britain, with the possible exception of London. In view of the population, however, this is only to be expected.

MR. FLEX IS IN A MOOD FOR A BIG FIGHT—

—AND MRS. FLEX PROVES A PERFECT "KNOCK OUT"

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

I WAS unable to listen-in and "see-in" at the first transmission of television, owing to the fact that I was doing the announcing at the time!

◆ ◆ ◆

More sunny Sunday programmes:—

Morning.	Nix.
3.30.	Brass Band.
5 30.	Bible Reading.
5.45-6.15.	Church Cantata.
6.25-7.45.	Harvest Festival Service.
8.0.	Religious Service.

Why not vary the business and have a talk on the Stock Exchange?

◆ ◆ ◆

A band of brass blaring out an alleged humoreske on "Lassies and Lads" is a strange contrast to this other Sunday

Tarver Penna as Roberts sees him

saintliness, and a trombone solo, "The Joker," and other items like it, remind one of the sort of thing the local Temperance Band gives at Paddleton-on-Sea.

Why this sudden craze for brass bands, anyway?

◆ ◆ ◆

I listened-in to the "Vaudeville of Many Countries" programme the other night and, while applauding the idea (which had the merit of sounding original), wondered exactly how "different" it would turn out to be—but it didn't.

We had the usual nasal singers moaning their way through some American songs, each song picking up the thread of sentimental slosh from the last; and then, "by way of a change," an "English" composition, which differed from the others in one respect only—the title.

◆ ◆ ◆

I listened again to *Congo Night*, the interesting little sketch by Richard Hughes, and found that, somehow, this time without the atmosphere being created by the announcer, that it was not so dramatic. I am not certain whether the same artistes were engaged, but the suggestion when the little play was first produced to turn down the lights, etc., might have had something to do with the effect that the previous transmission had. However, it is not at all a bad little broadcasting sketch.

◆ ◆ ◆

When I was announcing the other day at the Baird studios, somebody suggested that the speeches ought to be applauded in the studio.

I beg to inform readers that I acted up to my principles in this matter and forbade the applause. This particularly after another example of the claque at 2LO studio when a very ordinary overture, played in an ordinary fashion, brought forth vociferous applause.

◆ ◆ ◆

Anna Fillipova, singing some Russian songs, revealed a voice of pure quality.

◆ ◆ ◆

Here is a piquant item for listeners:—

During the first television transmission Professor Andrade came into the studio and I asked him to broadcast a few words, and he did so. It occurred to me afterwards that the Professor no longer broadcasts from 2LO. This was a pure coincidence, and, as I say, was an impromptu performance. Nevertheless, it raises some interesting questions, does it not?

◆ ◆ ◆

Lovers of Massenet must have thoroughly enjoyed the recent broadcast of *Thais*, a lyric comedy adapted from the poem by Louis Gallet after the novel of Anatole France.

This transmission, in which Leonard Gowings took the part of Nicias, the rich young man, bears out his note to me recently in which he gave me some interesting details about his repertoire. He has subsequently written to me to the following effect:—

"I was interested and gratified to see your reference in AMATEUR WIRELESS to my letter apropos my repertoire, etc. We still seem to be at cross purposes over the title of the song, 'Songs my mother taught me'! This is quite correct. You first of all referred to it as 'Songs *that* mother taught me.' No doubt a slip of the pen, but I could not resist correcting you when I wrote. Now you have twisted it round again!"

Not in the least. What Mr. Gowings forgets to remember is that "Songs my mother taught me," the music being by Dvorak, must have had a foreign origin. Therefore the translations would differ.

Anyhow, it is rather splitting hairs about the word "that." So that's that!

◆ ◆ ◆

Thus Harold:—

"As one of your readers said recently, 'You will never make a man appreciate good music by inflicting it upon him.'"

I agree. Nor will you make the lowbrow alive to the beauties of the classics if you

An Impression of J. A. N. Caruso

give it to him for nearly three hours at a time. I am referring to the recent broadcast of *Thais*.

The MUSIC-LOVER'S LOUD-SP

Although designed to fit the "Music-lover's Gramo-Radio," constructional details of which were given in the two preceding issues of "A.W.," the loud-speaker described below is complete in itself and may be used

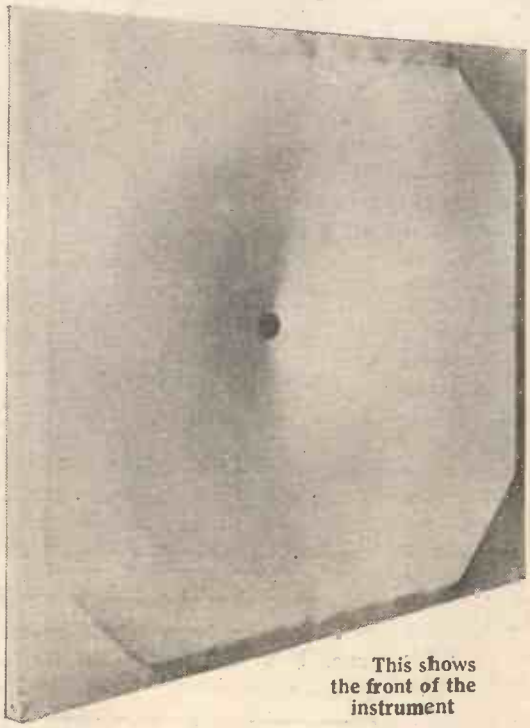
THE final link in the electrical chain of a gramo-radio outfit is the loud-speaker. If the reproducer is not capable of dealing with the final amplifier output, then no great advantage will be obtained by using an electrical reproduction arrangement in place of the more normal mechanical action.

This means that only the very best type of loud-speaker can be used with a gramo-radio outfit, and in designing the "Music-lover's Gramo-radio" receiver it was decided to incorporate a linen-diaphragm loud-speaker of the type which has been described in previous issues of AMATEUR WIRELESS, and which has proved to be so successful in the hands of amateurs.

A Complete Speaker

The present loud-speaker is designed primarily for the complete gramo-radio receiver, but it can be used with any type of set. Only in so far as general dimensions are concerned is special reference made to the "Music-lover's" equipment. The loud-speaker can be made up by anybody and can be fitted to any type of receiver.

The linen-diaphragm loud-speaker consists essentially of two wooden frames over which are stretched tightly two sheets of fine linen joined at the centres and to the reed movement of a loud-speaker drive.

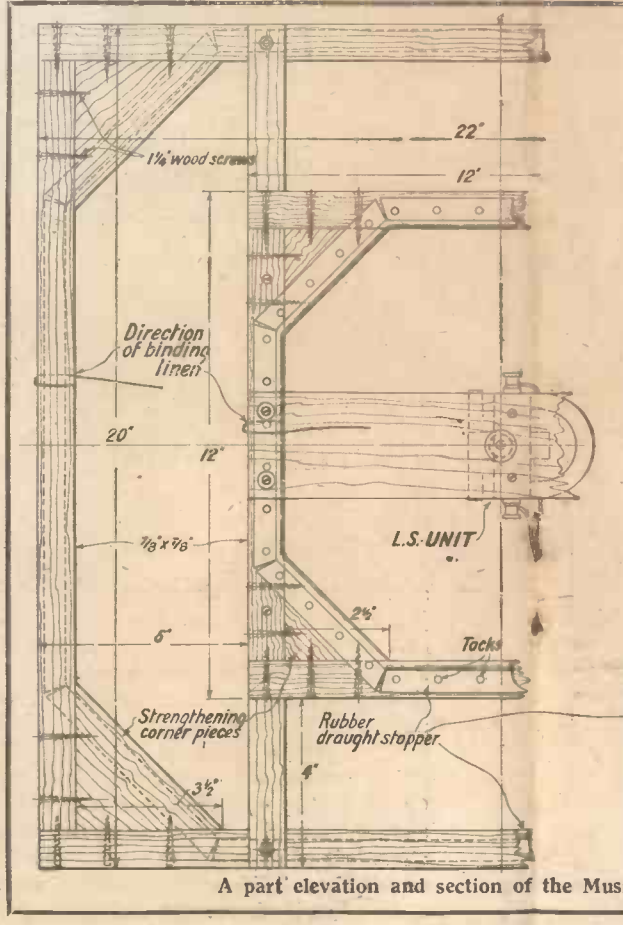


This shows the front of the instrument

The linen is "doped" with a special preparation having celluloid as a basis in order to tauten the diaphragms. One of the sheets is larger than the other in order to result in a natural response frequency of such a figure as to produce a natural tone. The natural characteristic of a linen-diaphragm loud-speaker is brilliant reproduction with plenty of bass, but not unduly accentuated.

As has been explained in previous articles dealing with the construction of the receiver portion of the "Music-lover's Gramo-radio," economy has been considered in every detail; and for this reason it was not considered wise to fit a moving-coil loud-speaker. Excellent as these can be, they are naturally more expensive than a linen speaker; and while AMATEUR WIRELESS never makes wild claims on behalf of any receiver or component not well deserving of them, the Technical Staff is confident that a linen-diaphragm assembly such as is about to be described is the best vibratory unit which can be attached to almost any type of reed movement. The linen diaphragm really does make a moderately priced reed unit produce wonderful results.

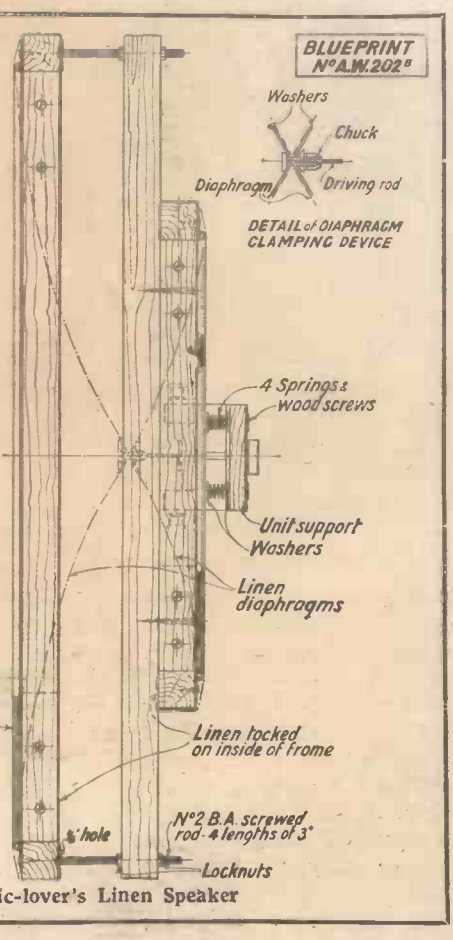
The parts necessary for construction are simply wood, linen, dope and screws, and, of course, also a reed movement unit. A word of caution must be given. The total cost of all parts is absurdly low; there is no comparison with the cost of the castings or complete parts needed for an M.C. speaker. And for this reason *do not economise.* Good results depend on using the best quality linen (such as best Irish cambric), good strong wood for the frames so that no warping will occur, and the loud-speaker unit recommended. The difference in cost between the best possible parts and a cheaper edition is only a few shillings at the most, and results may be



A part elevation and section of the Mus

INEN-DIAPHRAGM EAKER

as a separate instrument. It was on view at the Radio Exhibition and aroused a great amount of interest by reason of the excellent volume and quality of reproduction it provided



ic-lover's Linen Speaker

entirely different if false economy is indulged in.

Roughly, the constructional operations are as follow: The frames are made up from ⅞-in. wood, the linen is stretched over them and over the rubber edging tacked round the frames, doped, stretched again, and the cone unit then added.

A good general idea of the speaker can be obtained from the accompanying illustrations. For the benefit of those who like to work from scale drawings when making up any radio apparatus a blueprint has been prepared dealing with this speaker. All constructors are advised to get the print no matter whether they intend using the speaker with the "Music-lover's Gramo-radio" or with their own receivers. The number of the print is A.W.202b, and the price is 1s. Prints are also available of the receiver section of the gramo-radio unit (as mentioned last week) and of the motor board for the turntable drive. The prices are as follow: Blueprint for four-valve set (A.W.202a), 1s. 6d.; blueprint for linen-diaphragm loud-speaker (A.W.202b), 1s.; blueprint for motor board (A.W.202c), 9d. Total, 3s. 3d. *Provided all three are ordered at one time they will be sold at an inclusive price of 2s. 6d.* The prints can be obtained from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4.

Construction of Frames

The first constructional operation is to make up the frames from ⅞-in. wood. All dimensions are given on the blueprint, and can also be gathered from the small reproduction of the print given here. The larger frame has the dimensions 20 in. by 22 in., and the smaller frame is 12 in. square. In order to make the frames as strong as possible they should be fitted with triangular corner pieces of wood glued and screwed in position. Great strength is vitally necessary, for the constant tension of the doped linen will easily warp a weak structure.

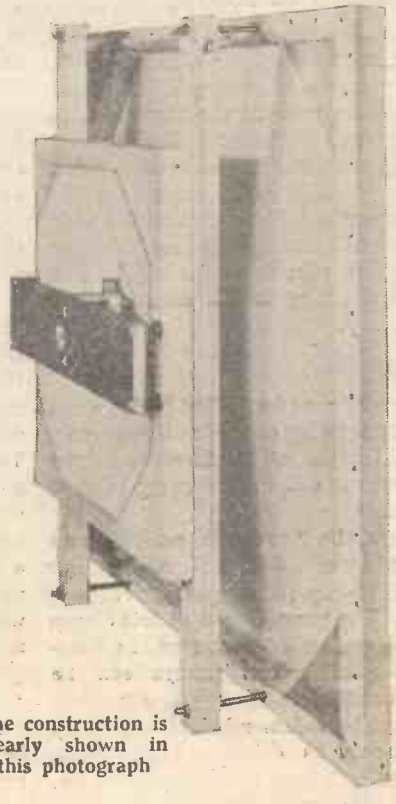
The corner pieces for the main frame have sides each 3½ in. and the smaller corner pieces can have sides 2½ in. in length. The wood used should be only ⅞ in. thick, so that the frames can lie quite flush. The use of corner pieces is an improvement on metal angle brackets which, while being strong, place a strain on the screw fixings for them at the corners of the frames.

When both frames are complete and the glue has dried, then the rubber edging may be tacked all round. The purpose of this rubber is to act as a "buffer" when the linen is stretched, and to help to insulate the frames from audio vibrations; a well-doped linen diaphragm vibrates over most of its surface.

Fitting the Linen

The rubber edging used is that employed as a draught-stopper, and is like thick-section rubber tube with a "flange" (for fixing) along its length. It is this "flange" which is tacked tightly to the wooden frames, and the linen is stretched over the tubular portion. This detail can be clearly seen from the blueprint.

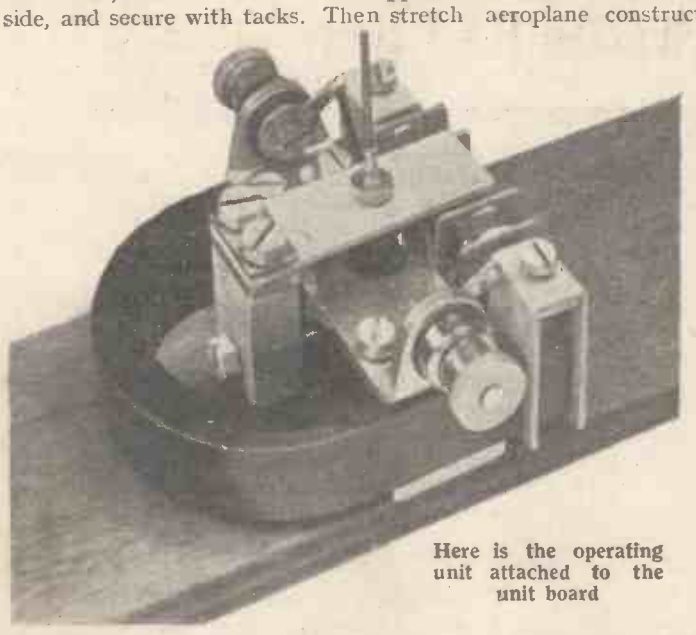
The next operation is to stretch the linen over both frames. Cut the material



The construction is clearly shown in this photograph

"THE MUSIC-LOVER'S LINEN-DIAPHRAGM LOUD-SPEAKER" *(Continued)*

to shape, leaving an ample margin, and, of course, complete one frame at a time. Tack one rectangle of linen to one side of the frame, stretch across to the opposite side, and secure with tacks. Then stretch the two remaining sides, and finally secure the corners neatly. In this initial stretching the linen should be stretched fairly tightly. The rubber at the corners prevents corner creases.



Here is the operating unit attached to the unit board

When both frames are covered the diagonals should be drawn to find the *exact* centres. At the centre of each sheet a hole should be formed by poking a fine spike between the threads of the linen, without causing an actual breakage of the threads. This done, the two holes should be buttonhole stitched to prevent the threads from spreading apart. Buttonhole stitching may be beyond the capabilities of some wireless men, coming, as it does, more into the feminine province! Nevertheless, the lady of the house will usually offer no objection to undertaking this five-minute job; and buttonhole stitching in this case is really very necessary.

Doping

Holes should next be drilled in the wood to allow of the fixing of the tautening rods. Four 3-in. lengths of 2B.A. screwed rod are used, and it will be necessary to drill ⅛-in. holes.

Now place the frames in position and join the centres of the diaphragms together by means of the special diaphragms clamping device. The construction of this clamp is shown by an inset drawing on the blueprint; these little components can be purchased complete.

The "dope" recommended after lengthy trial is known as collodion-methylated, and can be obtained from any chemist. This is much more convenient in use and more efficient than home-made cellulose prepared by dissolving strips of celluloid in amyl-acetate. A commercial dope which has also been used with great success is known as Titanine-Emaillite, as used for aeroplane construction. All these dopes are highly inflammable and the fumes are not healthy. It is therefore advisable to carry out the process of doping at an open window, and, of course, well away from any naked light.

When the diaphragms are first in position and are joined they should be given one coating of dope on each side. The collodion-methylated is just painted on with an ordinary brush, and will be found to dry very quickly.

While this dope is drying the frames should be stretched apart by the distance of ¾ in. on the 2B.A. threaded rod This stretching must be done most carefully. Each corner of the frame should be stretched a little at a time and the nuts tightened to take up the new position. When the half-distance of ¾ in. is reached a second coat of collodion-methylated should be applied to the outside of each sheet. While this is wet stretch the frames apart to the full distance of 1½ in. and apply a third coating of dope.

It is in this final stretching that the greatest care must be taken not to split the linen. The degree of tautness should be such that, when dry, the sheets respond with a drum note when tapped. There is a distinct danger that if the corners are not held firmly and moved carefully during the final tightening, the linen may burst. It is possible to repair a split linen diaphragm with a double patch, in order to save doing the whole work over again, but this state of affairs is not to be recommended!

The Cone Unit

Details of the cone-unit mounting can be gathered from the accompanying illustrations. The unit is held on a spring assembly so that if the setting of the reed is altered by the pull of the diaphragms then correction can be made by means of the four screws. This is a most important addition and improvement to existing linen-diaphragm instruments.

Adjusting

The cone units recommended are G.E.C., Ormond, B.T.H., Bluespot, and Hegra, and the four-screw compensating device will be found of particular advantage with non-adjustable cone units.

It is important to see that the driving rod of the reed movement is very securely attached to the diaphragm-clamping device. If there is any looseness here an annoying rattle will be set up and nothing like true reproduction will be obtained.

When the reed movement is mounted and adjusted the speaker is ready for operation. Amateurs who intend using the instrument with their own receivers should preferably employ a baffle box with an open or only partly closed back. If the speaker is used with the "Music-lover's Gramo-radio" receiver, however, the special Clarion cabinet with a loud-speaker compartment will be found to be an efficient baffle.

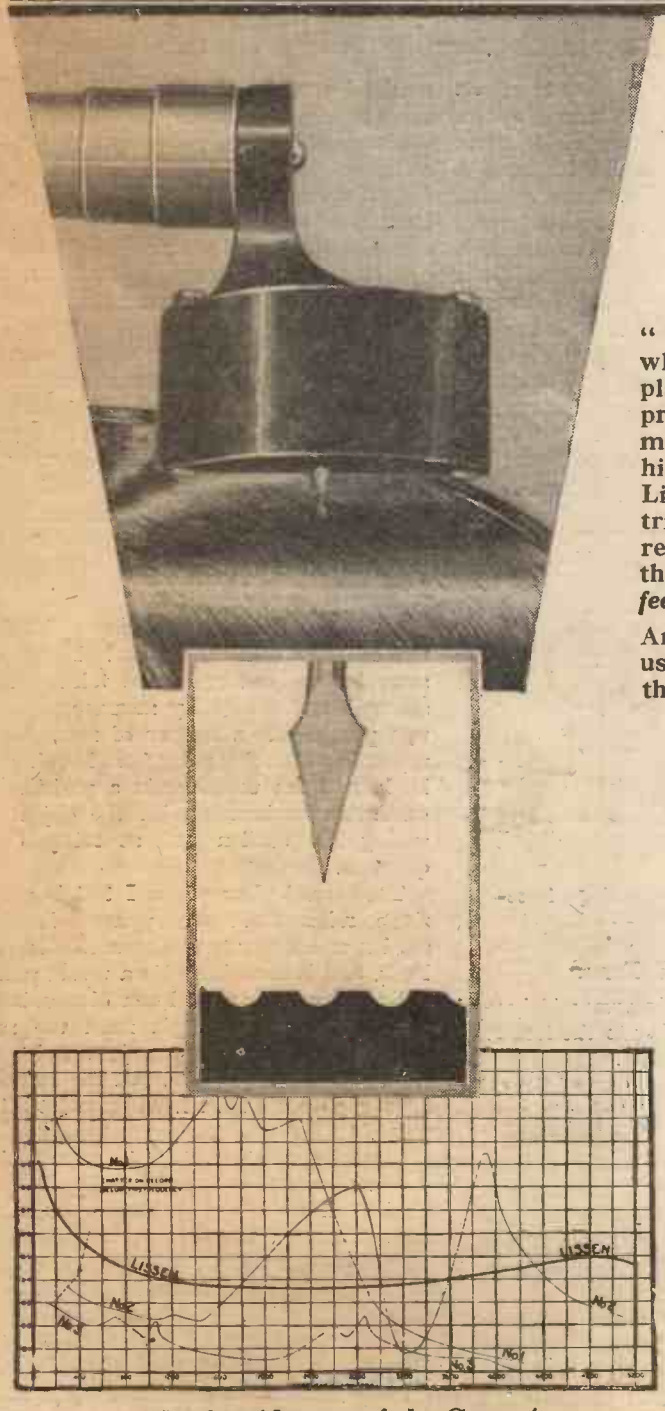
The loud-speaker is behind the ornamental panel

In next week's issue will be given details of the motor board and complete assembly of the gramo-radio instrument.

During the month of October the following German stations will broadcast a midnight musical programme according to the following schedule: Hamburg (Wednesday, 2), Munich (Saturday, 5), Breslau (Tuesday, 8), Langenberg (Friday, 11), Berlin (Monday, 14), Stuttgart (Thursday, 17), Koenigsberg (Tuesday, 22), Frankfurt (Saturday, 26), and Leipzig (Wednesday, 30). The transmissions start at 12.30 a.m. on the above-mentioned dates.

Revolutionary new Lissen Pick-up

MAKES EVERY RECORD A PICTURE TRUE IN TONE COLOUR



The Significance of the Curve!

Look at Curve 1. A particularly fine response for part of its curve, but notice the peaks and depressions and the very serious falling off in output after 2,800 cycles—after 200 cycles it would not remain on the record. In curves 2 and 3 the same deficiencies exist. NOW LOOK AT THE LISSEN CURVE. It is the only even curve. These are actual tests under ordinary conditions. The real significance of the Lissen curve is that you get true musical values from one end of the scale to the other.

New Needle-Armature so light that response is perfect at all frequencies

"Better than 'Talking' Picture reproduction"—that is what everybody says who hears a gramophone record played by this new Lissen Pick-up. And actually the reproduction *is* better than the film experts have achieved—more natural, nearer to reality, because no longer are the high notes thinned out or the lower bass notes lost. The Lissen Pick-up is so responsive that even the perfect electrical recordings of to-day can hardly do it justice. It responds to the most minute indentation on the record—the needle armature is so light that the needle-point actually *feels* its way along the record groove.

And you'll find your records almost everlasting when you use this new Lissen Pick-up, because the needle follows the groove and does not plough its way along.

If you want every single record to sound much better than those you hear at demonstrations—if you want radio-gramophone reproduction that comes so near to reality that in a darkened room you would suspect the presence of the artist—get this new Lissen Pick-up and learn what perfection means. Any Lissen radio dealer will demonstrate it for you.

LISSEN

NEEDLE-ARMATURE PICK-UP

30/-

Complete with moulded tone arm 37/6

LISSEN LIMITED

WORPLE ROAD, ISLEWORTH, MIDDLESEX

Factories also at Richmond and Edmonton

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My Wireless Den

Weekly Tips—Constructional and Theoretical—by W. JAMES

Getting Selectivity

SIMPLE receivers are often perfectly satisfactory as regards volume and the quality of the reproduction, but are not sufficiently selective to enable the powerful local station to be cut out. Of course, a wavetrap may be inserted in the aerial circuit for cutting down the strength of the local station, but it occurs to me that some listeners might be satisfied with the results obtained by joining the aerial to a point on the tuning coil near the earthed end.

A terminal connected to this point could be added to the set, and it may so happen that the results will be so good that a wavetrap will not be required. Alternatively, one of the several types of semi-fixed condensers could be included in the aerial circuit if there is not already a fixed one in the set.

More Aerials—Weaker Signals!

A few nights ago I set up my apparatus for measuring the strength of the signals set up across various tuning coils, which could be connected in turn to an aerial. I commenced testing in the early evening, and obtained results which were normal with my standard coil. But after an hour or two the voltages commenced to fall away, until, between nine and ten o'clock the signals were comparatively weak.

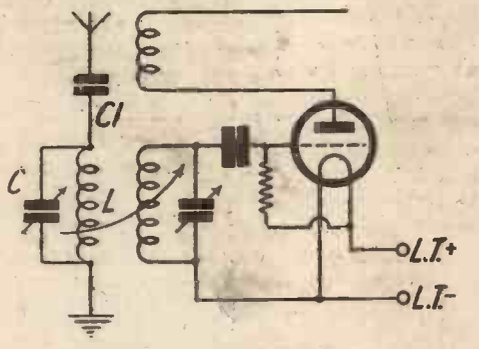
Later they improved, and I commenced to wonder why there should be such variations. Afterwards it occurred to me that the signal strength fell as more listeners tuned in their receivers. It is well known that a near-by set fitted with reaction to the aerial may tend to increase or decrease the signal strength. In fact, it is nearly impossible to make serious tests when someone near by is continually adjusting the tuning or reaction. The best time for testing coils or amplifiers involving the use of an aerial is during the daytime, when few people are listening.

'Ware Switches!

A push-pull switch such as is often used in the filament circuit of a set is such a simple component that one would not expect faults to develop. It is a fact, however, that some of them make such a poor contact that the filaments do not light properly or light intermittently.

It is a good plan to examine the switch occasionally, and when necessary to adjust it. Owing to faulty manufacture, noises may be heard when the switch knob is rotated. The springs should be bent a little in order to minimise the chances of a really bad connection developing.

When this type of switch is used with a tuning coil the effects of a poor contact are more serious in that they are not so easily traced to the switch. An example is when a long-wave section is short-circuited by a switch. The actual control may be erratic and the tuning much broader than normal, simply because the switch is not short-circuited at all, but is only making a high-resistance connection across the coil.



Explaining the action of tuning a loose-coupled circuit

Tuning Three-circuit Tuner

A circuit that at one time was widely used and appears to be coming to the fore once more is illustrated herewith.

It is a three-coil tuner. One of the coils, L1, is included in the aerial circuit, and L2 is in the grid circuit. Coil L3 is for reaction from the detector. These three coils used to be arranged in a three-coil holder so that their relative positions could be varied.

Tuning is none too easy at first. The two condensers are adjusted with coils L1 and L2 fairly well together, and sufficient reaction is applied to make the circuit sensitive. When the desired station is heard and more volume is needed, coil L1 is brought towards L2. But this alters the sensitivity of the circuit and the reaction must be increased.

If now coil L1 is moved away from L2, the circuit will probably oscillate. This is the difficulty with a circuit of this description, and it is often so handled that many squeals and howls are produced. Before coil L1 is moved away from coil L2, the amount of the reaction must be reduced a little.

With a circuit of this type, the controls must be fine or good results will never be obtained. Condenser C1 may be of .0001 microfarad, C of .001 microfarad, and C2 of .0005 microfarad. Modern sets are usually fitted with slow-motion knobs and dials, or with such large knobs that fine tuning is relatively easy.

NEXT WEEK:
W. JAMES on
TUNING FOR VOLUME.

Brookmans Park

Have you listened to the new London regional transmitting station? I have on several occasions, and have taken signal strength and selectivity measurements in two places. As a matter of fact, I live rather less than five miles from Brookmans Park, and am therefore in a position to conduct experiments with the object of tuning the station out at fairly close quarters.

The second place where I test is about three miles from the present London station and ten or twelve from Brookmans Park, and is therefore also a useful point.

I must confess that I am disappointed with the signal strength from the new station. The signals are just twice as strong at the first place, but the increase is only 50 per cent. at the second testing point.

Careful tests show that the new station does not spread so much as the London station. The quality appears to be excellent. The percentage of modulation employed is more than is usual on the London station. My own tests have definitely proved this point.

Readers will know, I expect, that at the Brookmans Park station the high-frequency oscillations generated by a small valve are modulated by the signals from the studios, and the output is magnified in stages and is finally applied to the aerial. At the present London station the choke-control method is in use, the power for high-frequency oscillations being modulated by the low-frequency magnifier.

"A.W." TESTS OF APPARATUS

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

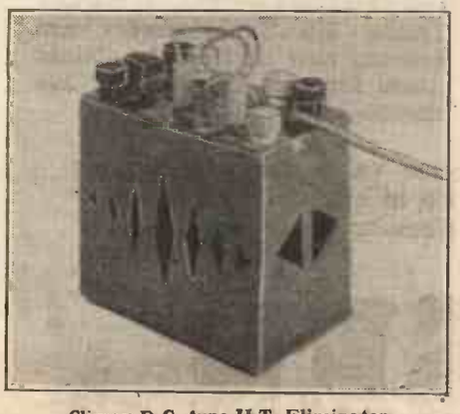
Climax H.T. Unit

THOSE who have D.C. mains at their disposal are adequately catered for by the large number of D.C. eliminators available at a reasonable cost. Although the apparatus required for a D.C. eliminator is certainly simple, its design cannot be undertaken lightly owing to difficulties in smoothing and voltage regulation.

This season, Messrs. Climax Radio Electric Ltd., of Parkhill Road, Hampstead, are marketing a variety of mains apparatus for both D.C. and A.C. use. We have recently received for test a neat and compact Climax D.C. eliminator having overall dimensions of 4¼ in. by 2½ in. by 4¼ in. high. The necessary choke, condenser and voltage-breaking resistances are mounted in a metal case freely ventilated. On the top of the case is an insulated panel on which are mounted terminals and wander plugs.

Altogether there are three positive H.T. tappings. One of these gives the full voltage of the D.C. mains whilst the other two are connected to wander plugs for insertion in two of the nine sockets providing varying potentials down to 50 volts.

On test this little unit behaved quite satisfactorily and supplied 30 milliamps at 180 volts on the full tapping with commendable silence in operation and freedom from over-heating. This eliminator can be strongly recommended.



Climax D.C.-type H.T. Eliminator

Te-ka-De Valve

A GLANCE at the characteristics of many inexpensive foreign valves shows that our neighbours are not backward in design, for the figures compare quite favourably with English valves.

This week we have tested a Te-ka-De valve, marketed in this country by Dr. Nesper Ltd., Colindale Avenue, N.W.9

The sample tested, type V.T.126, has two sets of electrodes mounted in a single container, which is no greater in diameter than the majority of normal valves. Connections from the electrodes are taken to 6 pins, and a special holder can be supplied with the valve. One set of filament pins only is fitted, since the two separate filaments are connected in parallel internally.

The characteristics of each set of electrodes are similar and during the tests carried out in our laboratories, we obtained figures of 8,000 ohms for the A.C. resistance and an amplification factor of 12, giving a mutual conductance of 1.5 The filament current consumption is approximately .2 of an amp at 3.5 volts.

It is evident from the tests carried out that the bulb is not completely evacuated and therefore if used without grid bias, it is necessary to limit the H.T. voltage to the specified values of from 30 to 60. If used, however, as an amplifier with adequate grid bias, this voltage may be raised.

There is no doubt that the fitting of two electrodes in a single bulb makes for compactness in the layout of a set and also cheapness in production. This system of duplicating the electrodes in a single container has not been introduced into this country and it remains to be seen whether it will be done in the future.

Varley Ni-core Transformer

THE design of low-frequency transformers has been considerably modified by the addition of certain elements to the iron core. It has been found that with certain percentages of nickel in the core, the permeability is considerably increased, thereby giving a higher value of inductance for a given number of turns on the winding; and in consequence, the size of low-frequency transformers and the self-capacity of the windings has decreased.

Messrs. Varley have recently introduced a new low-frequency transformer utilising a nickel-iron core. This transformer is made in two types, one with a particularly high primary inductance and the other smaller in size with a correspondingly lower inductance. The core and windings are housed in a neat moulded casing with four terminals arranged in an accessible position. Recent tests carried out on these instruments have shown that when operated under normal conditions, the characteristics are appreciably uniform over a wide range of audible frequencies, indicating that the constants of the windings have been correctly chosen.

We have tested this week, one of the Varley smaller type transformers known as Ni-core II which sells at the modest price of 15s. and yet proved on test to have a primary inductance of 28 henries with a D.C. polarising current of 2 milliamps. If the polarising current is increased to 4 milliamps, the inductance falls to 20 henries.

These figures indicate the suitability of these instruments for wireless work and

New Varley Ni-core Transformer

they may certainly be recommended to readers.

The address of the makers is 103 Kingsway, W.C.2

Iceland has under construction a 16-kilowatt broadcasting station to replace the smaller installation at present operating at Reykjavik.

Recent tests made by the American Telephone and Telegraph Company have successfully demonstrated the practicability of talking round the earth by short-wave wireless telephony. On these occasions, United States officials carried out a conversation with engineers of the Wireless Company of Australia, the speech being taken by landline to the transatlantic transmitter, thence via England to the Antipodes.

It is reported that certain alterations in wavelengths have been decreed by the *Union Internationale de Radiodiffusion of Geneva*, in order to improve the original Plan de Prague. They will affect Radio-Paris, Eiffel Tower, Radio L.L. (Paris), Algiers, Petit Parisien, Mont de Marsan, Rennes, Beziers and others.

Since the *Plan de Prague* has come into operation by which the wavelength of the Leipzig transmitter was considerably reduced, reception of the transmissions has considerably suffered and its effective working area curtailed. For this reason, the power of the Leipzig transmitter is shortly to be increased to 5 kilowatts in the aerial.

THE GRAMOPHONE AMPLIFIER IN THE CINEMA

By W. A. AGNEW

PERHAPS the greatest tribute that has yet been paid to the great advances which have taken place recently in the technique of audio-frequency amplification is the fact that an ever-increasing number of cinema proprietors are installing disc-amplifying equipments to provide the musical accompaniment to silent pictures and are dispensing with the services of musicians.

Special effects records are available covering almost every effect required for the successful presentation of any feature, and these rendered on the amplifier are much more realistic and in keeping with the atmosphere of the picture than the average picture-house drummer can provide whilst keeping one eye on the musical score and his other on the effects and the picture.

There are quite a few successful equipments on the market specially designed for this particular purpose, and a description of one of the best—that produced by the British Thomson-Houston Co.—may prove of interest to the experimenter and the amateur interested in what can actually be done in first-class power amplification.

The Amplifier

The amplifier is straight transformer coupled, the transformers being paralleled, with four power valves in parallel giving a total output of 10 watts.

When necessary, as in cases of very large theatres requiring a great amount of volume adequately to serve them, the requisite extra power is obtained by the addition of valves paralleled in the output stage.

A view of the interior of the B.T.H. amplifier is shown in Fig. 1 on page 542.

The cabinet housing the amplifier is metal screened to eliminate any chance of picking up stray static which might make itself heard in the speakers.

In this illustration the turntable motors —which are, of course, electrical—can be clearly seen, the two resistances at either side being wired in series with each motor, so that the speed can be adjusted by means of a sliding contact.

These motors can be used on either A.C. or D.C. supply of any standard voltage, slight variations being adjusted by means of resistances. The motors are very silent and constant in speed, a very efficient governor system being incorporated which effectively adjusts any slight variation in speed due to fluctuations of the supply voltage.

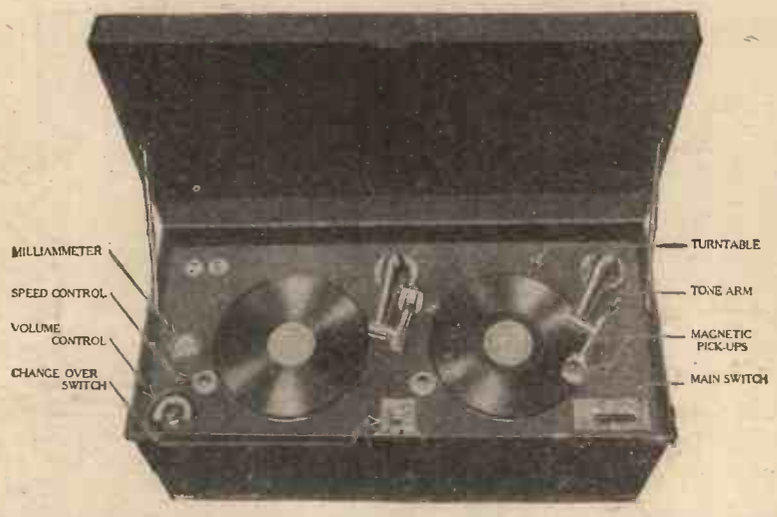


Fig. 2. Top view of amplifier panel, showing turntables, pick-ups and control switches

The control panel and turntables are housed in the top of this cabinet, a photograph of the layout being shown in Fig. 2. This shows the position of the various controls which are carefully placed for convenience of operation.

The volume control is placed conveniently to the left hand of the operator, enabling one recording to be faded out as the other disc is slowly brought up to the desired volume.

The particular control used in the B.T.H. equipment has a resistance of 200,000 ohms, a supplementary resistance of 500 ohms being placed in series with it to eliminate all trace of generator ripple when the control is in the silent position.

A milliammeter, which is always in circuit, serves to indicate the current consumption of the output valves, and to a certain extent it also indicates distortion in the anode circuit.

The change-over switch in the centre of the panel enables an immediate switch-over from one disc to another to be made, and is very useful when a quick change-over is required, as when effects records are being used.

The double turntable is necessary in order to provide a non-stop musical programme. In practice, one table is used for effects, as indicated by the musical cue sheet, whilst the other carries the recording accompanying the picture.

The Power Supply

The power supply for the anodes is provided by a small and compact motor generator which operates from the lighting mains.

The generator itself is standard and generates a pressure of 720 volts with a suitable milliamperage.

The motor has to be wound according to the voltage of the supply, and in the case of A.C. is of the induction type. The induction motor is very interesting, and a brief description of the principle upon which it depends for its operation may not be out of place.

The field coils are connected to the A.C. supply, and the short-circuited armature, which has no commutator or slip rings, is entirely insulated from the fields and the supply. The current alternations in the field coils sets up a constantly alternating magnetic field which causes current to be induced in the armature. The interaction of the resultant fields causes the armature to rotate in accordance with the attraction and repulsion laws of magnetism.

The two machines are coupled together either directly or by means of a belt.

The dynamo is lap wound with a large number of commutator segments which raises the ripple frequency, and consequently enables it to be smoothed out more easily.

Both generators are completely screened in a metal cabinet.

The filament-heating current is obtained from 6-volt accumulator feeding, in the case of the equipment illustrated, one B4 and four B12 Mazda valves. These batteries have an actual capacity of 85 ampere hours. Three L.T. batteries are used as a rule, one being the service battery, one a stand-by, and the third on charge.

Grid bias is obtained by the automatic method, a resistance being included in the anode feed and the volt drop across this made use of to supply the bias potential.

The loud-speakers are the famous R.K. moving-coil type fitted with a large baffle board.

(*Continued on page* 542)

RADIOGRAMS

CAPTAIN BRASSBOUND'S CONVERSION, one of Bernard Shaw's liveliest comedies, will be broadcast from 2LO on October 16 and from 5GB on the 19th. It is expected that other works by the same author will later be given to the radio public.

Philip Ridgeway, author of the musical comedy, *The Blue Train*, has prepared a special vaudeville programme, which listeners are to hear on October 16.

On October 11 the Old Vic Shakespearean Company will visit the London studio to broadcast a performance of *The Merchant of Venice*. Portia will be played by Martita Hunt, Shylock by Brember Wills, and Antonio by John Gielgud. A return visit will be paid on November 22, when Miss Lilian Baylis's company will be heard in *Richard II*.

An all-Norwegian programme has been arranged for transmission through London and Daventry on the evening of October 17, and it is expected that either, or both, Oslo and Bergen broadcasting stations will relay it for the benefit of their listeners.

On October 16, an all-Norwegian national programme will be broadcast by the Oslo station, and it is stated that in view of its exceptional character, it will be picked up and re-transmitted through the French PTT stations, including Ecole Supérieure and Eiffel Tower, Paris.

Although it was stated that the Juan les Pins broadcasting station would close down definitely, it is understood that the transmissions are only to be suspended for three months, after which period of re-construction the station will be again on the air with increased energy.

Eiffel Tower gramophone transmissions and speech can now be heard nightly on 31.5 metres; the power is 2 kilowatts in the aerial.

"THE GRAMOPHONE AMPLIFIER IN THE CINEMA"

(*Continued from page* 540)

The wiring of the B.T.H. system is shown in Fig. 3.

The equipment is controlled by an operator who has the music cue sheet for the picture placed in front of him, and who can, whilst watching the picture, control the volume as required for best results and bring in special effects which are cued on his plo sheet.

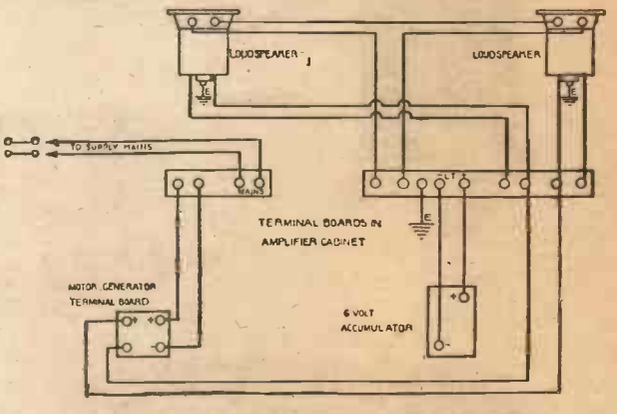


Fig. 3. Connections of amplifier and loud-speakers

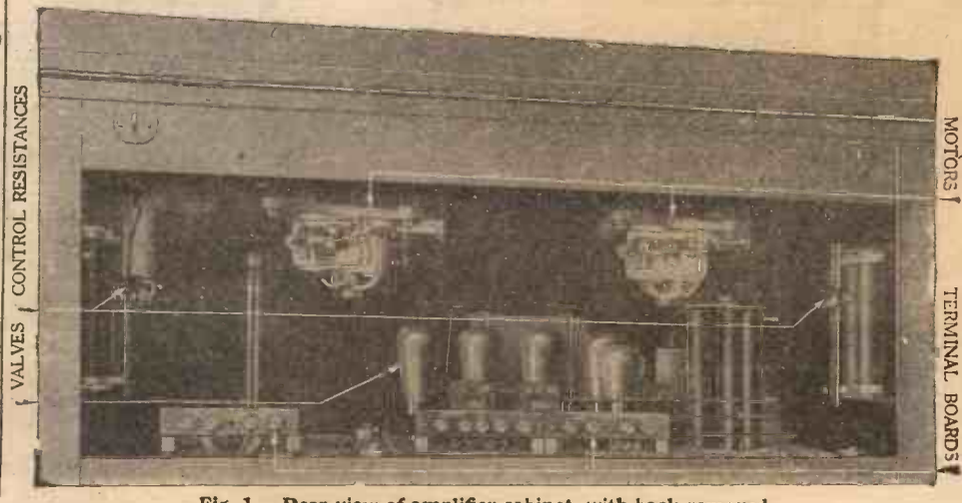


Fig. 1. Rear view of amplifier cabinet, with back removed

A Radio Clock

AN ingenious combined clock and radio set has just been placed on the market, and as it enters a rather new field it merits particular attention.

The complete apparatus is contained in a

The appearance of the radio clock does not differ greatly from that of an ordinary one

clock-case of attractive design, and includes an electric self-winding clock, a self-contained transportable set and a time switch to operate the set over any time range.

The clock consists of an ordinary stop spring movement and is wound by means of a heavy laminated armature movement operating through a ratchet mechanism. The armature winds the spring every 2½ minutes in normal running, and the spring cannot be overwound. The spring alone will work the clock for two days, and it can be fully wound in 15 seconds. The current for winding is taken from the L.T. accumulator, and amounts to only about three ampere hours per year.

Two dials on the face of the clock control the time switching for the wireless set. The mechanism controlled is similar to the alarm movement of an ordinary clock. One dial is set to the time of switching on, and the second dial to the time of switching off. Any intermediate period can be covered, and the indicators can be set to within a few minutes.

Either a three- or a four-valve receiver can be fitted, the circuit incorporating a screen-grid valve and a pentode. The tuning is virtually pre-set, a small knob for

This picture shows the wireless set and loud-speaker, together with the self-winding mechanism

a fine adjustment condenser projecting through the panel. All batteries are included, and it is interesting to note that the H.T. consumption is only 6 milliamps. A frame aerial is wound inside the case, but provision is made for the addition of an outside aerial if desired, and also for a gramophone pick-up.

"RADIOGRAMS"

(*Continued from page* 542)

A radio-beacon is now in operation on the Maas light-vessel in the North Sea, and may be heard transmitting L.C.W. morse on about 962 metres. The characteristic signal emitted by this station consists of the letters MS, followed by fourteen one-second dashes, this signal being repeated seven times. In clear weather two groups of signals are transmitted every three hours and in foggy weather six groups during the last forty-five minutes of each hour. These alternate with similar transmissions (consisting of the letters NR followed by dashes) from the radio-beacon installed on the Noordhinder light vessel. Both vessels are of Dutch nationality.

The voice of Big Ben has been artificially reproduced in the United States by KDKA. KDKA first introduced the sound by relaying it from London through a short-wave receiving set. Hearing these mellow sounds coming from his loud-speaker, Dr. Frank Conrad, assistant chief engineer of the Westinghouse Co., conceived the idea of reproducing the same sound artificially, and as a result the replica of Big Ben is broadcast by KDKA each hour.

Sweden leads the world to-day in the number of radio receivers in proportion to its population. There are about 412,115 sets to its 6,000,000 inhabitants, or about 67 to each thousand.

Every reserved seat on the Warsaw-Cracow express, a Polish train, is equipped for radio reception. Headphones can be rented from the conductor for about one shilling.

"RADIOGRAMS"

(*Continued from page 544*)

Fivemiletown, in County Tyrone, with a population of only 1,000, may well be the smallest town in the British Isles which can boast a choral society and orchestra. That this society is both flourishing and talented is proved by its recent concert in Omagh being booked for relay purposes from the Belfast station.

In order to give its local listeners excerpts from foreign and transatlantic wireless programmes, the Koenigsberg Broadcasting Company has erected a special listening post at Godrienen, at a favourable spot some six miles from the city. The station is equipped with the most modern type of short- medium- and long-wave receivers, and is to be made capable of dealing with a complete transmission of German or foreign programmes, irrespective of wave-length.

After infirmaries, nursing homes, and hospitals had been circularised in Scotland by the B.B.C. it was found that the general vote was in favour of a later afternoon mid-week service for invalids. Accordingly the decision has been taken to hold this mid-week broadcast from 3.40 to 4 p.m. instead of 2.45 to 3 p.m., as formerly held.

Three new short-wave transmitters are stated to be under construction at Tananarive, Madagascar. One, using the call-sign FZT, will work on 13.4, 24.4, 30.5, and 39.1 metres approximately, the transmissions being in C.W. morse, with a spacing-wave. The other transmitters are to be equipped for C.W. and radio-telephony on 16.7, 20.3, and 59.5 metres with the call-sign FZU, and 12.2, 15.4, and 34.8 metres with the call-sign FZV.

Whilst the French Broadcasting Bill is being held up, new stations are springing up daily in that country; the latest, Radio Banlieue (Paris), will start on October 15 on 300 metres. Although its power is under 250 watts, it is expected that it may secure an audience in Belgium, Holland, and Great Britain.

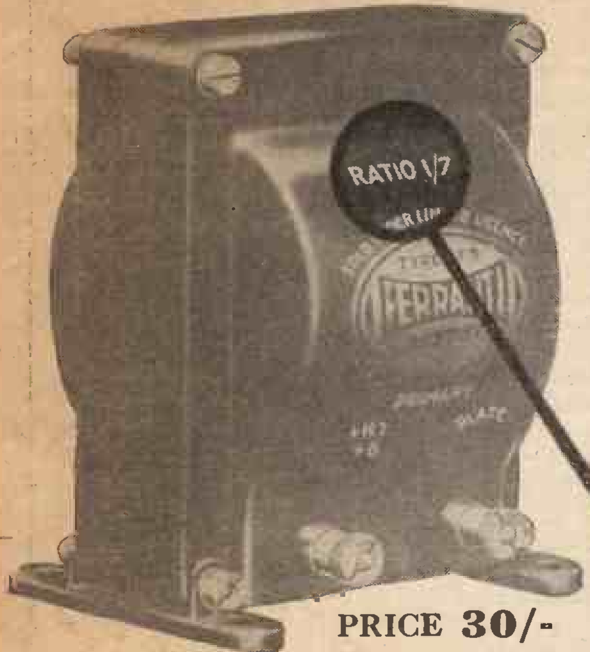
A recommendation has been made to the Canadian Government at Ottawa by the Federal Radio Commission that broadcasting in Canada should be placed on the basis of a public service and that the stations should be owned and operated by one national company.

According to a New York daily, Dr. Louis W. Kalozsy, an American inventor, has made a wireless receiver with which it is possible to transmit the programmes throughout large buildings by using the steel girders.

A popular thriller, *The Monkey's Paw*, by W. W. Jacobs, is down for transmission through 5GB on October 22, at 10.15 p.m.

(*Continued on page 548*)

A NEW TRANSFORMER



ANOTHER LEAD BY FERRANTI

Recent developments in Radio have created a demand for a new transformer of the same quality and reliability as the AF5, but capable of greater L.F. amplification. In their class of medium ratio, the Ferranti AF3, AF4 and AF5 are still supreme; but changed conditions—notably the advent of the Screened Grid Valve—have rendered this a necessary addition to the standard range.

THE AF5 RATIO 1/7

Designed to ensure the maximum volume where only ONE L.F. stage is employed with Grid Leak rectification. It is particularly suitable for sets of the S.G.3 type, where greater amplification is desired than is usually obtained from one L.F. stage. The new ratio is not intended for use in receivers employing more than ONE stage of L.F.

PRICE 30/-

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Turn the world your way!

The effect of placing Polar Condensers behind your panel is equivalent to turning the world round the way you want it.

The combination of Slow Motion and Direct Drive, as fitted to Polar Condensers, is the surest method of quickly bringing in those evasive stations.

THE POLAR "IDEAL." This is one of the most popular types of condensers because it can be used most effectively with practically any modern circuit.

PRICES:

·0005 - 12/6. ·00035 - 12/3. ·0003 - 12/-.

Write for the new Polar Catalogue, in which the full range of Polar Condensers is illustrated and described.

Polar 'Ideal' Condensers

WINGROVE & ROGERS, Ltd., 188/9 Strand, London, W.C.2

"RADIOGRAMS"

(Continued from page 546)

A new wireless fog beacon has been installed on the Dutch lightship at Noordhinder (North Sea); it transmits on 962 metres, and can be identified by its call letters NR (in morse) repeated twice and followed by fourteen dot-seconds.

It is reported from Germany that Oslo's high-power transmitter constructed by the Telefunken Company has beegun to test on 1,072 metres, a wavelength which had been allotted by the Prague Plan to Trondhjem. The announcement made by the German engineers on these occasions is: *"Hallo! Hallo! Hier Sender Oslo (Norwegen). Versuchssendung auf 1,072 meter."* Tests are made almost daily between 9.30 and 11.30 p.m.

In Bukarest (Rumania), in view of the news that the new transmitter will be officially opened on or about November 1 next, some increased interest is being taken in radio matters. The Posts and Telegraphs are delivering receiving licences at the rate of some 250 per week.

Owing to the demands upon our space in this issue, it has been necessary to omit the feature "Our Information Bureau."

TAKE YOUR CHOICE

M.P.A RESEARCH DEPARTMENT OFFERS YOU THESE 3 NEW M.P.A. SPEAKERS. SCIENTIFIC MASTERPIECES! EACH ONE A TRIUMPH OF GOOD LOOKS, TONAL PERFECTION AND VALUE! HEAR AND COMPARE!

THE NEW M.P.A. POPULAR PLAQUE

A BETTER INSTRUMENT THAN EVER BEFORE—and AT A LOWER PRICE! Fitted with the wonderful new Mark VI unit; with new robust protecting grille at back; mounted on wooden base. Remarkably sensitive, clear and loud! Even response over wide range of frequencies, attractive mahogany or oak finish. And look at the price! **25/-**

★ *Don't forget also to hear the new Mark VI Speaker Unit. It is only 12/6, chassi with 14" wood baffle and 9" cone costs 10/-; full mounting instructions are given.* ★

THE NEW M.P.A. POPULAR CABINET

ANOTHER EXAMPLE OF M.P.A. VALUE! An attractive speaker with a first rate performance. Yet low in cost! Like the Popular Plaque, it has the unique Mark VI movement. Extremely sensitive. Splendid reproduction. Exceptionally wide range. Handsome polished oak cabinet. Box resonance eliminated. Hear it and you'll buy it! Price **45/-**

Mahogany Cabinet 47/6

THE NEW M.P.A. MOVING COIL SPEAKER

SEE AND HEAR THIS AMAZING NEW SPEAKER! Whatever price you are prepared to pay, you will not get anything better! Here indeed is "Hearing that is almost seeing!" Built on entirely new principles. Permanent magnet. No separate energising current required. Patent baffling system eliminates box resonances. Glorious tone! Dignified design in polished oak. A delight for the eye and the ear! Complete **15 GNS.**

Unit only on base, 12 Gns.

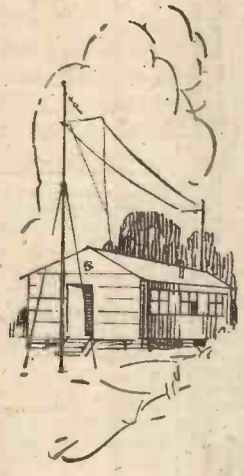
MANCHESTER Radio Exhibition STANDS 21 & 22 *and Demonstration Room 49, Liverpool Road.*

M.P.A *Hearing that is Almost Seeing*

M.P.A. products above £5 may be purchased on deferred terms. M.P.A. Wireless Ltd., Dept. 19, Radio Works, High Road, Chiswick, London, W.4

DO YOU REMEMBER?

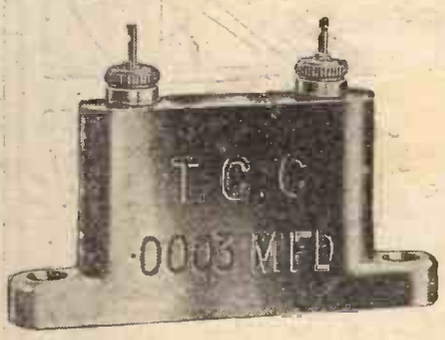
Hullo! Hullo!! this is Wrrr--ittle



If you're a real "old stager" in radio you will remember "Writtle"—"Two Emma Toc," Capt. P. P. Eckersley's station. How his "Wrrrr-ittle" used to thrill us! Those were the days! The B.B.C. first official transmission—via 2LO—was in 1922—"Writtle" days were pre-B.B.C. days—days when we knew only "R" valves—long, cumbersome sliding tuners, and hefty .001 variables. In those days transmitting and receiving gear depended largely on T.C.C. Condensers for their efficiency.

It's the same to-day—the choice of serious experimenter and amateur alike is T.C.C. Be guided by them—ask for T.C.C. always.

There is a T.C.C. Condenser for every purpose. This is the ·0003 mf. Upright Type Mica Condenser, price 1s. 6d. Other capacities from ·0001 mf. to ·25 mf. Prices 1s. 6d. to 18s 0d.



T.C.C. CONDENSERS

WERE USED THEN

Advt. Telegraph Condenser Co., Ltd., Wales Farm Rd., N. Acton, London, W.3

CA 881

FOR CONSTRUCTORS

A MOST useful booklet has been produced by A. F. Bulgin & Co., of 9-11 Cursitor Street, Chancery Lane, E.C.4, dealing with the whole range of Bulgin radio components. This is of particular interest to the home constructor, for the Bulgin range includes every accessory and component required. Apart from conventional parts, such as coils, transformers, switches, condensers, and so on, there are numerous small parts and "gadgets" which are not ordinarily included in the specification of standard receivers. This catalogue should most certainly be in the hands of all home constructors, and AMATEUR WIRELESS readers can obtain a copy on application direct to Messrs. Bulgin, mention being made of this journal when applying.

In December next, the Soviet authorities will begin the construction of a 75-kilowatt transmitter; its site will be in the immediate neighbourhood of Moscow.

"Amateur Wireless and Radiovision." Price Threepence. Published on Thursdays 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. Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed. **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.

BROADCAST TELEPHONY

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

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
		GREAT BRITAIN	
25.53	11,751	Chelmsford (5SW)	15.0
*200	1,500	Leeds (2LS)	0.13
*242	1,238	Belfast (2BE)	1.0
*261	1,148	Newcastle (5NO)	1.0
288.5	1,040	Swansea (5SX)	0.13
288.5	1,040	Stoke-on-Trent (6ST)	0.13
288.5	1,040	Sheffield (6LF)	0.13
288.5	1,040	Plymouth (5PY)	0.13
288.5	1,040	Liverpool (6LV)	0.13
288.5	1,040	Hull (6KH)	0.13
288.5	1,040	Edinburgh (2EH)	0.35
288.5	1,040	Dundee (2DE)	0.13
288.5	1,040	Bournemouth (6BM)	1.0
288.5	1,040	Bradford (2LS)	0.13
*301	995	Aberdeen (2BD)	1.0
*310	968	Cardiff (5WA)	1.0
*356	842	London (2LO)	2.0
*377	797	Manchester (2ZY)	1.0
*399	753	Glasgow (5SC)	1.0
*479	626	Daventry (5GB)	25.0
*1,554	193	Daventry (5XX)	25.0
		AUSTRIA	
*246	1,220	Linz	0.5
*283	1,058	Innsbruck	0.5
*352	851	Graz	7.0
*453	666	Klagenfurt	0.5
*517	581	Vienna	15.0
		BELGIUM	
216	1,391	Charleroy (LL)	0.25
246	1,219	Antwerp (Anvers) 4ED	0.4
250	1,502	Schaerbeek-Brussels	0.25
250	1,200	Ghent	0.5
280	1,071	Liége	0.1
312	961.4	Arlon	0.25
*509	590	Brussels	1.0
		CZECHO-SLOVAKIA	
*263	1,139	Morava-Ostrava	10.0
*279	1,076	Bratislava	12.5
*293	1,022	Kosice	2.0
*342	878	Brunn (Brno)	2.4
*487	617	Prague (Praha)	5.0
		DENMARK	
*281	1,067	Copenhagen (Kjobenhavn)	0.75
1,153	260	Kalundborg	7.5
		ESTHONIA	
*297	1,010	Reval (Tallinn)	0.7
		FINLAND	
*221	1,355	Helsingfors	0.9
*1,796	167	Lahti	40.0
		FRANCE	
170	1,750	St. Quentin	0.25
211.3	1,420	Béziers	0.1
238	1,260	Bordeaux (Radio Sud-Ouest)	1.0
240	1,250	Radio Nimes	0.25
*255	1,175	Toulouse (PTT)	1.5
*265	1,130	Lille (PTT)	0.7
268	1,121	Casablanca	0.5
*272	1,103	Rennes (PTT)	0.5
277	1,083	Pic du Midi de Bigorre (weather forecasts 9 p.m.)	
*286		Montpelier (PTT)	0.2
288.5	1,040	Mont de Marsan	
292	1,028	Radio Lyons	0.5
*294	1,020	Limoges (PTT)	0.5
304	986	Bordeaux (PTT)	1.0
305.6	981.7	Agen	0.25
309	970	Radio Vitus	1.0
*318	950	Marseilles (PTT)	0.5
326.5	918.9	Grenoble (PTT)	0.5
331.4	905	Petit Parisien	0.5
346	869	Strasbourg	0.1
364	824	Algiers	2.0
368	815	Radio LL (Paris)	0.5
*381	788	Radio Toulouse	8.0
411	729	Radio Maroc (Rabat)	2.0
436	687	Radio Flandre (Lille)	0.1
447	671	Paris (Ecole Sup. PTT)	1.5
468	640	Lyons (PTT)	5.0
1,350	222	Tunis (Kasbah)	0.6
1,444	207.5	Eiffel Tower	12.0
*1,725	174	Radio Paris	12.0
		GERMANY	
*218	1,373	Flensburg	0.5
*227	1,319	Cologne	4.0
*234	1,283	Muenster	3.0
*239	1,256	Nurnberg	2.0
*246	1,220	Kiel	0.35
*246	1,220	Cassel	0.25
*253	1,184	Gleiwitz	2.0
*259	1,157	Leipzig	1.5
*270	1,112	Kaiserslautern	0.25
*276	1,085	Koenigsberg	2.5
*283	1,058	Magdeburg	0.5
*283	1,058	Berlin (E.)	0.5
*283	1,058	Stettin	0.5
*319	941	Dresden	0.25
*325	923	Breslau	1.5
*339	887	Bremen	0.35
*360	833	Stuttgart	1.5
*372	806	Hamburg	1.5
*390	770	Frankfurt	1.5
*418	726	Berlin	1.5
*453	662	Danzig	0.25
*456	657	Aachen	0.35
*473	635	Langenberg	13.0
*533	563	Munich	1.5
*560	536	Augsburg	0.25
*560	536	Hanover	0.35
570	527	Freiburg	0.35
*1,635	183.5	Zeesen	30.0
2,100 / 2,290	142 / 131	Norddeich	10.0
		GRAND DUCHY	
293	1,356	Luxembourg	3.0
		HOLLAND	
31.4	9,554	Eindhoven (PCJ	25.0
*298	1,004	Huizen via Hilversum aerial (until 5.40 p.m. B.S.T.)	0.5
*1,071	280	Huizen via Hilversum aerial (after 5.40 p.m. B.S.T.)	6.5
*1,070	280	Scheveningen-Haven (from 10.30 a.m. to 5.40 p.m. B.S.T.)	5.0
*1,875	160	Hilversum via Huizen aerial (AVRO and Vara)	6.5
		HUNGARY	
550	545	Budapest	20.0
		ICELAND	
*1,200	250	Reykjavik	1.0
		IRISH FREE STATE	
*225	1,337	Cork (1FS)	1.0
*413	725	Dublin (2RN)	1.0
		ITALY	
248	1,209	Trieste (testing)	
*274	1,094	Turin (Torino)	7.0
*300.3	908	Naples (Napoli)	1.5
*385	779	Genoa (IGE)	1.0
*441	680	Rome (Roma)	3.0
453	662	Bolzano (IBZ)	0.3
*501	599	Milan (Milano)	7.0
		YUGOSLAVIA	
*308	973	Zagreb (Agran)	0.7
*433	692	Belgrade	2.5
509	527	Ljubljana	2.5
		LATVIA	
*525	572	Riga	3.0
		LITHUANIA	
*1,935	155	Kovno	7.0
		NORWAY	
239	1,256	Rjukan	0.18
*283	1,058	Notodden	0.5
*365	820	Bergen	1.0
*394	761	Frederiksstad	0.7
453	662	Tromsoe	0.1
453	662	Aalesund	0.3
453	662	Porsgrund	0.7
*493	608	Oslo	1.5
1071	280	Oslo (testing)	7.3
		POLAND	
*313	959	Cracow	0.5
*335	896	Posen	1.2
385	779	Wilno	0.5
*408	734	Kattowitz	10.0
*1,411	212.5	Warsaw	8.0
		ROUMANIA	
*394	761	Bucharest	0.12
		RUSSIA	
*351	855.5	Leningrad	1.0
*427	702.5	Kharkov (NKO)	4.0
*483	621.5	Homel	1.2
*825	364	Moscow (PTT)	20.0
950	315.8	Moscow (midday tests)	75.0
1,060	283	Tiflis	10.0
1,000	300	Leningrad	20.0
*1,304	230	Kharkov	4.0
		SPAIN	
251	1,107	Almeria (EAJ18)	1.0
268	1,121	Barcelona (EAJ13)	10.0
314	956	Oviedo (EAJ19)	0.5
*349	860	Barcelona (EAJ1)	8.0
*368	815	Seville (EAJ5)	1.5
403	743	San Sebastian (EAJ8)	0.5
*424	707	Madrid (EAJ7)	2.0
453	662	Salamanca (EAJ22)	1.0
		SWEDEN	
231	1,301	Malmo	0.6
*257	1,160	Hoerby	10.0
270	1,112	Trollhattan	0.45
*322	932	Goeteborg	10.0
322	932	Falun	0.5
*436	689	Stockholm	1.5
*542	554	Sundsvall	0.6
*770	389	Ostersund	0.6
1,200	250	Boden	0.6
*1,348	222.5	Motala	30.0
		SWITZERLAND	
*403	743	Berne	1.0
*459	653	Zurich	0.63
466	644	Zurich (during afternoon)	0.63
680	442	Lausanne	0.6
760	395	Geneva	0.25
1,010	297	Basle	0.25
		TURKEY	
*1,200	250	Stamboul	5.0

All wavelengths marked with an asterisk have been allotted according to the *Plan de Prague*.

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

Oct. 14 "Points of View" (3), by Dean Inge.
,, 15 Speech by General Dawes at Hull Civic Week banquet. S.B. from Hull.
,, 16 *Captain Brassbound's Conversion*, by Bernard Shaw.
,, 19 A vaudeville programme.

DAVENTRY EXPERIMENTAL (5GB)

Oct. 14 A vaudeville programme.
,, 17 Selections from the operas.
,, 18 *Smoke Rings*, a bachelor retrospect by Dorothy Eaves.

MANCHESTER

Oct. 16 Speeches at opening of Sixth Manchester Radio Exhibition.
,, 17 Hallé concert

GLASGOW

Oct. 15 A Scottish ballad concert.
,, 17 A Scottish concert.

BELFAST

Oct. 14 "Round the Town," a funny sort of programme. Sketches adapted by Halbert Tatlock from stories by O. Henry.

Scottish listeners have had nothing but praise for the Sunday afternoon band programmes which have been relayed recently from the "open-air studio" of the band-stand in Kelvingrove Park, Glasgow. Some of the finest military bands in the country have appeared or are to perform there.

LETTERS TO THE EDITOR

The Editor does not necessarily agree with the views expressed by correspondents.

Loud-speakers at the Science Museum

SIR,—May I, through the medium of your paper, correct the mis-statements made by C.H.G. (London, W.) and G.B. (London, N.W.) in No. 381 about the Science Museum demonstration set.

The horn type of speaker installed there is a 27-ft. exponential horn coupled to a standard 555W Western Electric unit, while the standard Western Electric curved horn referred to by C.H.G. (London, W.) is only rated at 15 ft.

The output valve of the demonstration set is not one LS5a, as stated by G.B. (London, N.W.), but one LS6a, which was used to replace the three LS5a's previously fitted.

I must agree that the present reproduction is decidedly mediocre, but, having heard a 555w. speaker with an adequate output valve (1,000 volts and about 120 milliamps.), I feel sure that when the Science Museum authorities re-design their output stage they will regain their old reputation for first-class reproduction.

G. B. S. (West Ealing).

Are We Progressing?

SIR,—Having returned to radio after an absence of almost a year and a half, I have been struck by the similarity of the receiving set of to-day and that of four years ago. In appearance there is certainly a great improvement; compactness and simplicity are keynotes. Dials are fewer in number and are infinitely more handsome. Terminals and valve holders do not disfigure the face of the panel. Coils are well out of harm's way and do not require to be changed. But—and it is a hard question—are the results obtainable any better? Screen-grid valves are everybody's toys, but do they justify their expense?

Selectivity is now more important than ever it was, and many receivers are certainly very good in this respect; but I feel that the selectivity is obtained at very great expense to real sensitivity. And why? Our up-to-date tuners are almost identical in principle to those we scrapped four or five years ago on account of their inefficiency. Nowadays one never hears mention of "dead-end" effects; not because such phenomenon is non-existent, but just because it seems easier to have a tapped coil put away in some corner behind the panel. Again, we were always told that if we are to cut down "damping," and so obtain maximum selectivity, our coils must be wound with large-section wire. The present aerial tuner would have been immediately condemned on that score

(*Continued on page 556*)

BLUEPRINTS

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

All Post Free

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1929 Favourite Two (D, Trans) ... AW186
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Meteor Two (D, Trans) ... WM114
Clipper Two (D, Trans) ... WM135
Continental Two (D, Trans) ... WM143
Stay-put Two (All-AC, D, Trans) ... WM155
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THREE-VALVE SETS (1s. each)

All-Britain Three (H.F., D, Trans) ... AW158
The Binowave Three (D, RC, Trans) ... AW172
Clarion Three (SG, D, Trans) ... AW175
1929 Favourite Three (D, RC, Trans) ... AW179
Broadcast Three (SG, D, Trans) ... AW192
James dual-range Three (HF, D, Trans) ... AW196
All-wave High-mag. Three (D, 2 Trans) ... AW199
Knife-edge Three (D, RC, Trans) ... AW201
Talisman Two-three (D, RC, Trans) ... AW203
All-wave Screen-grid Three (HF, D, Trans) ... WM110
Standard Coil Three (HF, D, Trans) ... WM117
Wide-world Short-waver (SG, D, Trans) ... WM120
New Year Three (SG, D, Pentode) ... WM123
Lodestone Three (HF, D, Trans) ... WM129
Simple Screen Three (HF, D, Trans) ... WM131
Dynamic Three (AC—SG, D, Trans) ... WM136
At Home Three (D, 2RC) ... WM141
Short-Wave Link (D, RC, Trans) ... WM142
Binowave S.G. Three (SG, D, Trans) ... WM152
Fanfare (D, 2 Trans) ... WM157
Brookman's Three (SG, D, Trans) ... WM161

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

Overseas Short-waver (HF, D, 2 Trans) ... AW133
Clarion All-electric Three (SG, D, Trans, AC Rectifier) ... AW200
*Music-lover's Gramo-radio (SG, D, RC, Trans.—1s. 6d.) ... AW202a
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Standard-coil Four (HF, D, 2RC) ... WM122
Dominions Four (2SG, D, Trans) ... WM134
Short-wave Adaptor for Dominions Four ... WM140
Music Player (HF, D, RC, Trans) ... WM144
Arrow (SG, HF, D, Trans) ... WM154
1930 Monodial (2SG, D, Trans) ... WM158
All-electric Four (All AC—SG, D, RC, Trans) WM162

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

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All-wave Lodestone Five (HF, D, RC, Push-pull) ... WM146

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AMATEUR WIRELESS 58-61 FETTER LANE LONDON E.C.4

"LETTERS TO THE EDITOR"

(*Continued from page 553*)

alone a few years ago, but now it is just as popular as it was unpopular then.

Our valves have improved very considerably—we now know the requirements of a good H.F. choke—but this improvement is certainly not reflected by our reception log. Now, in 1924 and 1925 we did not think we were doing anything very wonderful if we received all the B.B.C. stations then in existence on a single valve. Nor did we rush into print because we were able to listen to Madrid, or Radio Belgique, or Ecole Supérieure on the same receiver. To log WGY was something of a feat, but by no means unheard of. Why is it, then, that, with all our splendid slow-motion condensers, efficient valves, chokes, etc., our standard of reception is actually lower than previously?

To prove I am not exaggerating, I might mention a letter of mine published in your paper about April, 1925, telling of my experiences with a single valve.

The L.F. side is admittedly better now than ever, but that is because our transformer manufacturers have tackled their problems from the point of view of efficiency.

One more point I wish to mention is that of the regional scheme. In an October number of AMATEUR WIRELESS I suggested this, just three years ago; but when are we going to get it effectively in operation?

F. P. (Liverpool).

A Grouse

SIR,—Why is it that our B.B.C. is so fond of agitating one's nerves by the harsh, irritating music they are so fond of putting over? Whenever I switch on to a B.B.C. station someone is trying his very best to jar one's nerves by thumping the same key on the piano for five minutes or so. It's soothing music that the public like.

W. R. D. (Rochdale).

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Advertisements under this head are charged THREEPENCE PER WORD, minimum charge THREE SHILLINGS.

DEPOSIT SYSTEM

As the Publishers cannot accept responsibility for the bona fides of advertisers in this publication, they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

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FIGURED OAK CABINETS.—Mullard Orgola, 15/-; Mullard Orgola Senior, 23/6; Brookmans Three, 15/-. Handmade and french polished. Rubber feet. Carriage paid. Lists free.—Gilbert, Cabinetmaker, Swindon.

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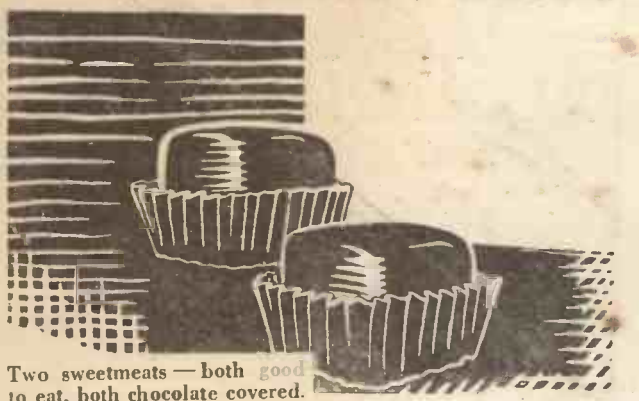
PRIVATE GREETING CARDS.—Largest Manufacturers require Agents. FREE sample book. DELIGHTFUL NOVELTIES. Calendars. New Feature in Cut-out Velour Designs. SENSATIONAL Calendar Novelty on WOODEN STANDS; detachable SPRAYS OF FLOWERS, Notepapers; Celluloid Pocket Calendar; Blotter; Greeting Cards for every taste. Most extraordinary book ever published. ENORMOUS PROFITS. Prizes for all.—All-British Christmas Card Co., Dept. 345, Blackburn.

BOTH LOOK ALIKE BUT ONE LASTS LONGER



Two sweetmeats — both good to eat, both chocolate covered. But one contains a caramel, the other a cream filling. One lasts longer.

Special chemicals contained in the new Dubilier H.T. Battery make it far more than just another good battery — they make its working life materially longer than that of any other make of similar type.

This claim is unquestionable. Read chapter and verse for it in the booklet—"A Bit about a Battery"—obtainable free from your dealer. Prove it by using a Dubilier Battery in your set now.

66 VOLT

7/9

SUPERIOR (Single Capacity)	
9 volt	7/6
63 ,,	7/6
66 ,, (with G.B. Tappings)	7/11
99 volt	11/9
108 ,,	12/9
SUPREME (Treble Capacity)	
60 volt	13/6
63 ,,	14/3
100 ,,	22/-

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THE DUBILIER BATTERY

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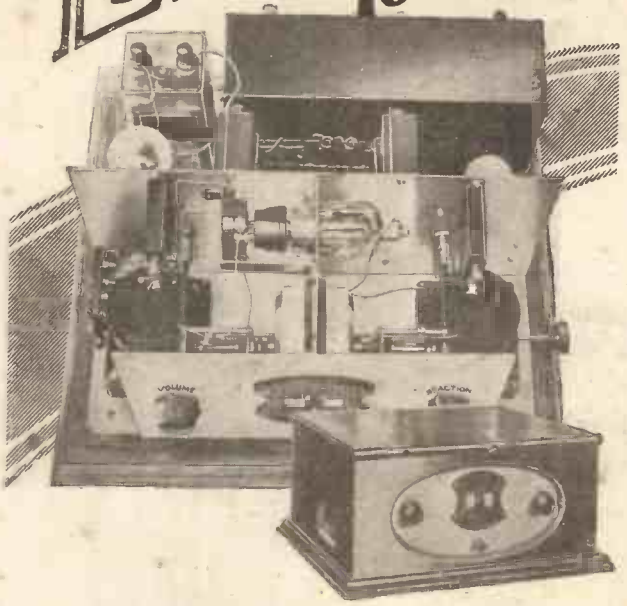

Set builders—build and own the very latest radio development, the new 3-valve Lotus S.G.P. set. You can buy the kit for it complete, assemble it in a few hours and demonstrate to your friends the greatest range, power and selectivity of any set this season.

Start building the new Lotus S.G.P. to-day. The kit contains every unit you need except valves, cabinet and batteries and can be bought at your nearest retailer's for the modest sum of £7 12s. 6d. . . . Diagrams and instructions enclosed.

LOTUS

3-valve S.G.P. Set

Supplied with main components mounted and ready for immediate assembling. Prepared by the makers of Lotus components

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Please send me Free copies of the latest Lotus Booklets and instructions for building the Lotus S.G.P. Set.

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AW 12/10/29

Causton

Tone so natural that you might actually be in the studio!

Fit this new Marconiphone Moving Coil Speaker to your set, and you will know for the first time how good wireless can really be.

WHAT a difference this new Marconiphone Moving Coil Speaker makes! Tone—so absolutely pure and natural that you might be in the studio instead of miles away. Volume—strong enough to fill a dance hall, or subdued for a chamber concert in your drawing-room.

As soon as you possibly can, hear a Marconiphone Moving Coil Speaker at any dealer's. If you do not know of a dealer near you, write to the Marconiphone Company Limited, 210-212 Tottenham Court Road, London, W.1.

WHY SO GOOD? BECAUSE—

An entirely new type of diaphragm ensures perfectly balanced reproduction and ample strength to handle considerable output. Strictly accurate centering of the moving coil gives enormous sensitivity. And—all made by the men who first made wireless.

Moving Coil Cabinet Speaker type 110 for 6-volt accumulator, £7. Type 120 for D.C. Mains, £7.10.0. Type 130 for A.C. Mains (new Rectifier Unit, U 9 Valve) £12.12.0. Moving Coil Units can also be obtained from £4.10.0.

The first and greatest name in wireless

MARCONIPHONE *Moving Coil* SPEAKERS

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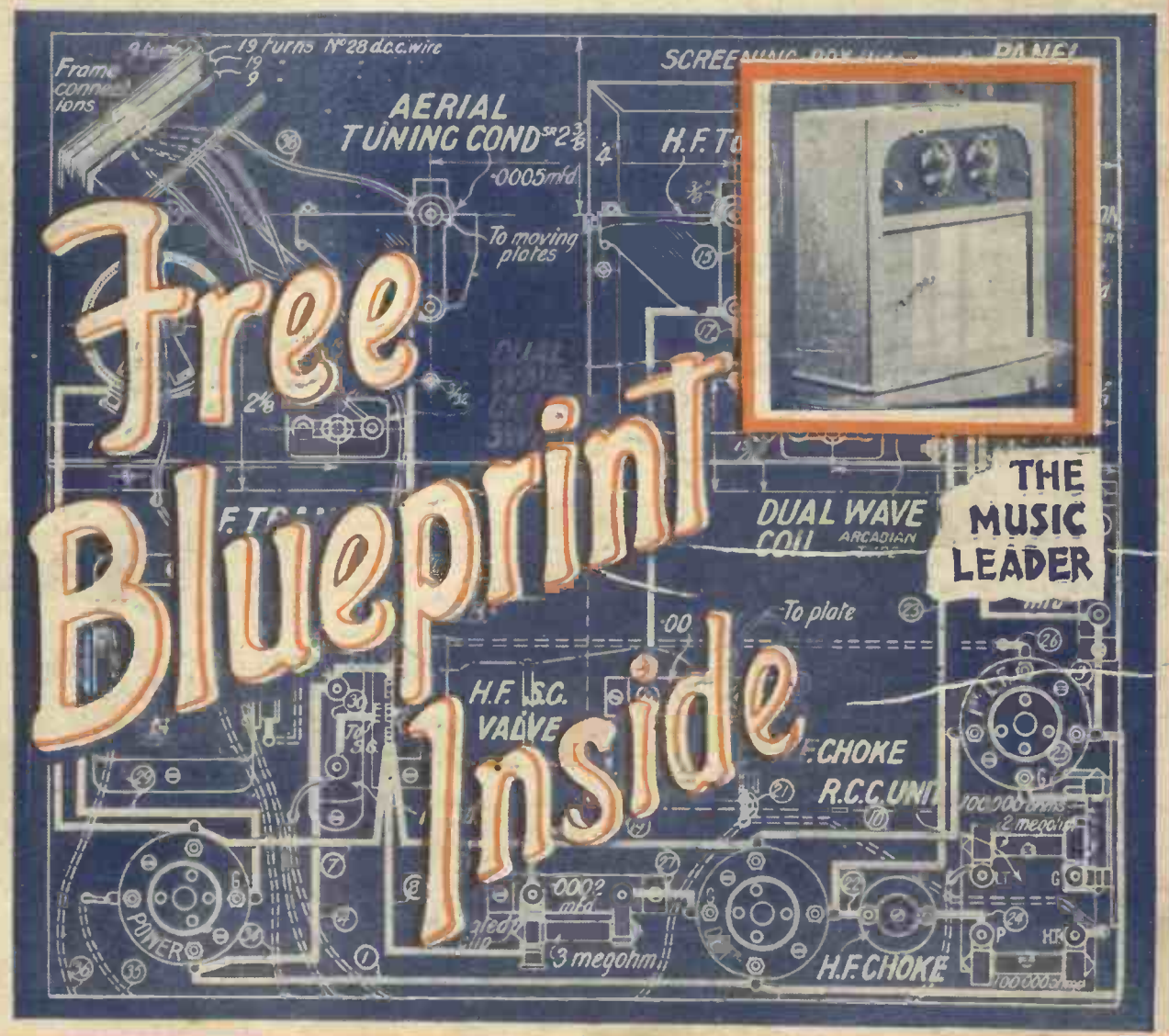
Amateur Wireless

and Radiovision

SIXTY PAGES 3d.

Vol. XV. No. 384 Saturday, October 19, 1929



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SOMETHING NEW *and* ORIGINAL *in* LOUD SPEAKERS!

. . . . . and you can assemble it yourself IN 3 MINUTES

NOTHING like it has ever been known among loud speakers before! A handsome Honduras mahogany screen on which you can mount the famous Brown "Vee" Unit, Cone and Chassis and have a novel, distinctive loud speaker *in three minutes!*

The Brown Screen, which stands 2 feet 7 inches high and has a beautifully carved grill, is a piece of furniture which will do justice to the most distinctively-finished room. With the Brown "Vee" Unit, Cone and Chassis neatly mounted, you have a loud speaker equal in appearance *and* performance to instruments costing three times its price.

Ask your Wireless Dealer to let you see — and hear — this handsome Brown innovation. You will be charmed with its appearance so rich and dignified. And you will marvel at its performance — so vivid and true-to-life. Remember: the Brown "Vee" Unit is the first Unit which cannot possibly be overloaded. It cannot chatter. It cannot distort. It reproduces the broadcast faithfully. And now, with the coming of this handsome screen, which costs £2 2s., you can make it *look* as good as it *sounds!*

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The

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"VEE" UNIT, CONE, CHASSIS & SCREEN

"As British as Britannia"

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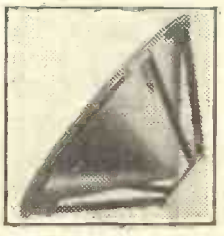
is designed on entirely new principles, the product of lengthy research by the leading loud speaker authority in the country. No other Unit reproduces the entire harmonic scale so faithfully. Its direct-drive mechanism cannot become unbalanced. **25/-**



The Cone & Chassis

The Brown Cone is ruggedly made from cast aluminium and fitted with a 12-in. Chassis. Anyone can assemble the "Vee" Unit to the Cone and Chassis in three minutes. All holes are drilled and the necessary screws are supplied. Price. **15/-**

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OCTOBER 19, 1929 No. 384 Vol. XV

Amateur Wireless and Radiovision

The Leading Radio Weekly for the Constructor, Listener and 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

Broadcasting a "Dirt" Meeting—The Cenotaph Service—Dean Inge's Debût—He Spoils It—The Science Museum Set—Nerves and Microphone Fright

Another Free Gift—Are you interested in "kit" sets? Next week we are making another free gift with every issue of "A.W." which is sure to interest you. Turn to page 580 for full details.

Broadcasting a "Dirt" Meeting—A running commentary on a "dirt track" meeting is to be given on November 7, and this is of particular interest in view of our article on loud-speakers on the dirt tracks, given in a recent issue of "A.W." The event to be broadcast will be run off at the Wembley Stadium, and will be given through London and 5XX, so you won't miss it.

The Cenotaph Service—The B.B.C. is again relaying the service at the Cenotaph, and the arrangements are very much the same as last year. In a forthcoming issue, the technical arrangements in connection with the arrangement of the microphones will be described. One of the difficulties which the B.B.C. engineers have to face is that the microphones must be hidden, and all wires and switches must be out of sight. As a matter of fact, the B.B.C. outdoor van is used for the occasion, and is situated in Richmond Mews, just off Whitehall and near the Cenotaph.

Dean Inge's Debût—The editor of the *Sunday Express*, Mr. James Douglas, has made some interesting remarks upon Dean Inge's microphone debût. When the Dean broadcast for the first time recently, he proved to be a very brilliant speaker, and Mr. Douglas thinks that he was too brilliant and too "stimulating" for the radio audience, which can only hear and not see. Mr. Douglas says: "I cannot follow a long literary sentence in the air as easily as I can follow it on the printed page . . . he (the Dean) should study the art of the microphone." So there *is* a microphone art, after all?

He Spoils It—And then, after making many sensible remarks anent radio and the programmes in general, Mr. Douglas comes out with this: "I think the B.B.C. should give us more than two or three alternative programmes, so that highbrows, mezzo-brows, and low-brows could choose their own meat." Now, isn't that what we have all been wanting since the inception of broadcasting!

Here is the "Music Leader," the set which forms the subject of the Free Blueprint given with this issue. The original set on which the "Music Leader" was based has been developed and tested since last May, and has travelled a total distance of 9,000 miles during tests.

The Science Museum Set—The AMATEUR WIRELESS correspondence columns are always redolent of interest, and a subject which has been occupying the minds of correspondents recently is that of reproduction given by the receiver in the Science Museum in South Kensington, London. It is generally agreed that this set, England's prime wireless exhibit, should represent in some degree the very best that can be had from radio. And some of our correspondents do not think that the set is anything like perfect. So to clear matters up an AMATEUR WIRELESS Special Correspondent went down to the Museum a few days ago, and the "truth" about the Science Museum set is given on page 579.

Nerves and Microphone Fright—The unfortunate Mr. Philip Drew, who has been occupying the daily papers so much these days, said of the inquest: "It was difficult to give evidence at first, but I soon began to sense what I can only call responsive waves, just as I do in the theatre." And yet many actors and actresses who have been interviewed by AMATEUR WIRELESS from time to time have declared that there was no such feeling, and that broadcasting (with no audience) is therefore no different from a stage performance. And yet there *is* such a thing as "mike-fright," and one well-known actress fainted after making her microphone debût. So perhaps there are responsive waves!

Our Free Print—With this issue we are presenting (as announced last week), a 1s. 6d. blueprint *entirely free*. The subject of the print is the "Music Leader," the best transportable for the home which has yet been designed.

PRINCIPAL CONTENTS

SEE OUR SECOND GIFT OFFER ON PAGE 580

A USEFUL TEST BOX

The completed test box

TO every set owner some sort of testing equipment is indispensable for checking the behaviour of the set or batteries, or the conditions under which they are working, otherwise guesswork as to the cause of defective reproduction is the only means of putting matters right.

The test box about to be described is easy to make and easy to use. Its cost is small and it may save the initial outlay involved. In any case, it is false economy to work without instruments.

The Materials Required

First, the materials required are as follows :—

A small quantity of 3/8-in. wood (deal will do) and a small quantity of 1/8-in. plywood.

Ebonite panel, 6 in by 3¾ in. (Raymond).

Wates volt-amp meter.

Nine-volt grid-bias battery (Lissen).

Six sockets and three plugs (Eelex or Belling-Lee) (shielded).

One pair of Elbetto testing prods.

Making the case is a simple matter, which will not require much description. The details are clearly shown in Fig. 1. The divisions are of plywood and positioned by plywood spacing pieces, which also serve to carry the panel. A false bottom is fixed in the section to hold the prods so that they can easily be got at. The lid is hinged and secured with a small screw and catch. It is a good idea first to make the box in one piece and then saw right across, thus accurately obtaining uniformity of the base and lid.

The Panel

The preparation of the panel is also quite simple. First drill to receive the six sockets as shown in Fig. 1 A 2-in. diameter cut-out must be made also to fit the meter, and this can be done with a fretsaw or keyhole saw. Mount the sockets with colour indicators on the front, using red to indicate positive, and fit the meter in position. The wiring can be followed from the diagram, which shows the back of the panel. It is recommended that for a test instrument each point of contact should be soldered. Note that a soldered connection is made at the spike of the meter. This completes the construction, and the panel is simply fitted into the box with a grid battery placed for use at the back and the prods and links in the front division as shown in the photograph.

How to Use the Test Box

The simpler tests consist of reading battery voltages. First, the L T. accumulator. Test this while the set is working to get a true idea of condition and preferably at the end of the programme when it has been in use for an hour or so. Insert the plug of the black prod in the negative socket 1 and the plug of the red prod in socket 2, thus using the 6-volt reading. Place the black prod on the accumulator terminal and the red prod on the accumulator positive terminal and note the reading from the meter. Never test on this scale above 6 volts.

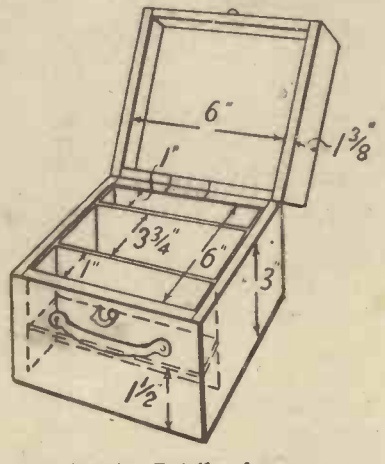


Fig. 1. Details of case

To take a reading of the H.T. voltage, use sockets 5 and 6, and see that negative goes to negative and positive to positive. This test may also be carried out while the set is working.

To take a total milliamp reading of H.T. current which the set is using, disconnect the H.T. negative plug from the H.T. battery and insert it in socket 4, and in socket 3 insert the plug of the black prod. When the negative socket of the H.T. battery is touched with the prod the meter will give a milliamp reading. This test, of course, must be made while the set is working.

To detect overloading, use the same panel sockets and place the meter in series with the plate circuit of the last valve.

Valve Testing

Valves may be tested to see if the filament is broken by taking a prod from socket 1 to one of the filament pins and the link from socket 2 to the positive socket of the G.B. battery. Then the other prod is taken from, say, the 1½-volt negative socket of the grid battery to the other valve pin. In the same way any continuity test may be made for low-resistance windings, etc. When testing a valve, do not use more volts than the valve is rated at for the filament.

These examples are only a few of the uses which will be demanded of such an adaptable little instrument.

News has been received from the Russian ice-breaker *Sjedof*, that the experimental wireless station erected on Franz Josephs Land in the Polar regions, is now in regular operation. Transmissions are carried out nightly between 8 and 10 p.m. on a wavelength of 43 metres; the call signs are TSJ, TSR and TSCH.

Experimental transmissions on short waves by the Eiffel Tower, Paris, are now taking place every Tuesday and Thursday between 9.15 and 10 p.m. B.S.T. Several wavelengths are being tried out.

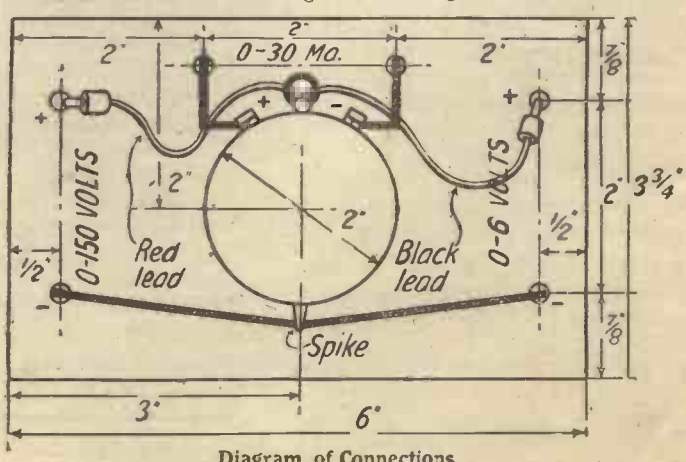


Diagram of Connections

There are many details connected with tuning of which the average listener is unaware. It will be found that the information given below by W. JAMES will be a real help

THE ordinary detector and low-frequency type of set is easily tuned, for the reason that there are only two controls —one for wavelength and the other for volume.

Easy though it is to tune such a set, the beginner is apt to fail to obtain the best results. In the first place, the volume control is not always properly used. Maybe it cannot be used as the designer of the set intended, or perhaps it is not adjusted correctly even when the circuit values are just right.

This control in a modern set takes the form, as a rule, of a variable condenser in the reaction circuit, and by adjusting it the amount of the reaction is varied. A typical circuit is given by Fig. 1 Here the reaction condenser is marked C1, the wavelength tuning condenser is C2, the grid condenser is C3, and the grid leak R1

When listening to the local station, condenser C1 will probably be set at its minimum value and C2 will, of course, be so adjusted that the circuit is tuned to the wavelength of the station. The only difficulty here is that the local station may be so strong that the detector is overloaded with the result that it does not function properly. In this event a point on each side of the correct tuning point (as regards wavelength) will be found where the signals are loudest and clearest. This effect is met with only when a strong signal is being received, but should be recognised as such, and not thought to be a defect in the set.

When tuning a more distant station the volume control must be used, and as the signals are weaker the control becomes of more importance. It is then that one may notice a defect in the volume control or reaction circuit. Does the control steadily increase the volume until the point of oscillation is reached? If it does, and there is no sign of "overlap" or "plopping," the circuit is behaving properly.

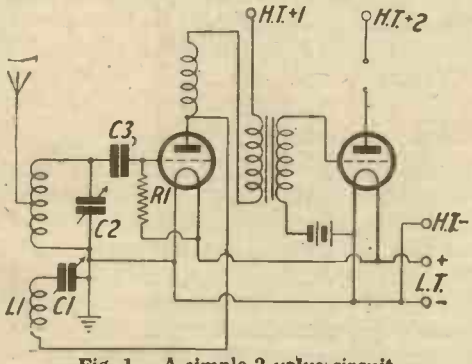


Fig. 1. A simple 2-valve circuit

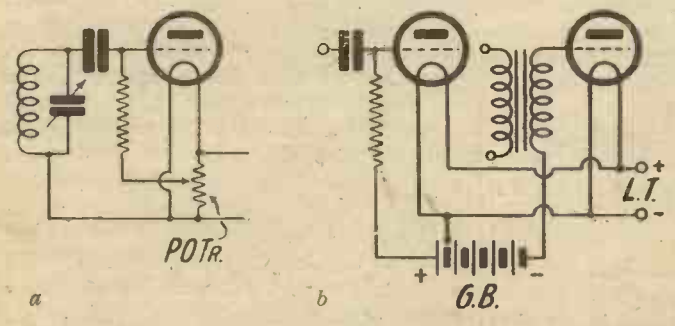


Fig. 2. Methods of connecting grid leak to avoid poor reaction effects

Quite often the reverse is true. There is a certain amount of overlap, which perhaps prevents fine tuning. This condition will quickly be noticed. As the reaction is turned the signals increase in strength until presently the circuit oscillates, as shown by the sudden change in quality or the production of a whistle or howl. Overlap is present when the reaction control has to be turned back past the point where the oscillations commenced, and there is usually a "plop" when the set is passed into and out of oscillation.

Obtaining Greatest Volume

The maximum volume cannot be obtained when the set behaves in this manner, and, further, a user is far more likely to disturb other listeners by oscillating than when the control is nice and smooth.

To remedy this state of affairs the high tension, H.T.+1, Fig. 1, should be adjusted and a different grid leak R1 be tried. If no better results are obtained, the bottom end of the grid leak should be taken to a potentiometer, as in Fig. 2a, or the scheme of Fig. 2b may be tried. One of these methods will cure reaction overlap.

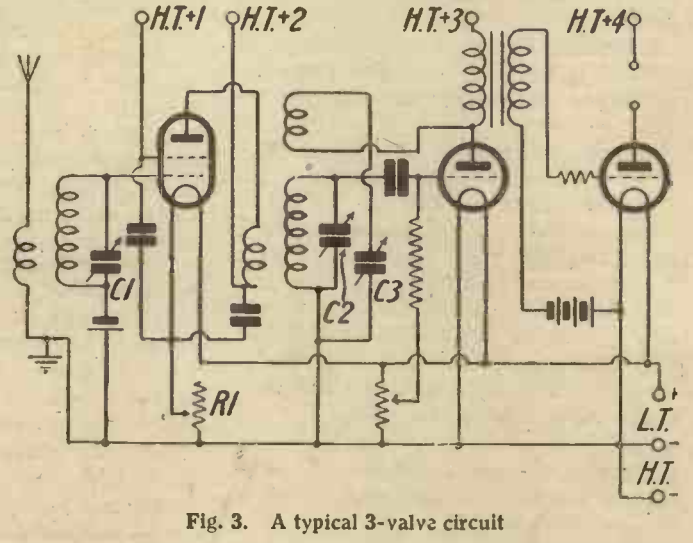


Fig. 3. A typical 3-valve circuit

The only point then remaining is whether the reaction is too fierce. If it is, a few turns should be removed from the reaction coil L1, Fig. 1. Having now so adjusted the circuit that the reaction is smooth, it is fairly easy to bring up the strength of a

distant station, for it is only necessary to tune with the aerial condenser whilst slowly advancing the volume control. The set is in its most sensitive condition, and is therefore providing its maximum magnification, when it is just not oscillating.

A careful user will not allow his set actually to oscillate, and will therefore not hear a whistle or howl whilst tuning, but he will hear a gentle "breathing" or "rushing" sound when not actually tuned to a station that is transmitting. When the station commences to broadcast, the speech and music will be heard as loudly as is possible with that particular set.

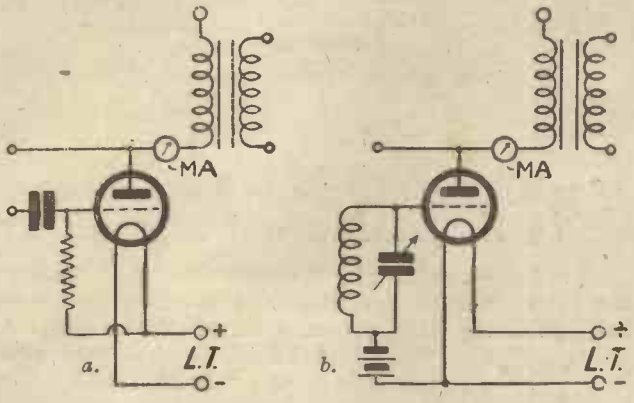


Fig. 4. Diagrams showing positions of meters to indicate strength of signals

H.F. Tuning

A receiver having a stage of high-frequency magnification as well as a detector and a low-frequency stage, generally has three controls at least—probably there are four. It is therefore much more difficult to tune a set of this type, although the tuning should be mastered in a few minutes.

The wavelength controls are in the aerial and detector circuits, the tuning condensers being C1 and C2, Fig. 3. Reaction is controlled by C3 and there is often the volume control R1, which is a filament resistance connected to the high-frequency valve.

When about to tune this set it is advisable to follow a definite procedure. First turn the filament resistanee R1 full on. Then set the two condensers C1 and C2 alike, and finally set condenser C3 at its mid position or at a point where the set is not oscillating. A fine adjustment may now be effected by slowly turning C2 and C3. If a station is heard, C1 may have to be adjusted a little to bring the aerial circuit into tune.

Resistance R1 is turned when the volume is too great or when interference is experienced. The high-frequency magnification is reduced by putting more of the resistance into circuit and the selectivity of the set is improved. Signal strength may be maintained by increasing the reaction, excepting, of course, when the full amount is already being used.

When searching for a station move the condenser C2 very slowly or, better still, in steps of one degree whilst moving condenser C1 backwards and forwards about the tuning point. Fine tuning cannot be carried out until a station is heard, and then the reaction should be adjusted with the resistance R1 in various positions.

The best cannot be obtained from a set of this description unless the various operations are carried out in their correct order, and when the set is selective the various controls must be turned slowly, or stations will be missed.

Owing to the fact that a shielded valve is used, there is no harm in oscillating occasionally, although one must remember that unless the high-frequency amplifier is of good construction the aerial circuit will oscillate and therefore radiate oscillations. I find that the volume control provided in a set of this type is often not used sufficiently, with the result the detector overloads and distorts.

Meter Indications

The aim when tuning should be to obtain the desired strength with the minimum of reaction, and the tonal quality may be adjusted, within limits, by maintaining the volume, but using different settings of the reaction and volume controls.

A very good indication that the circuit is properly tuned is a milliammeter connected in the anode circuit of the detector. This instrument will also roughly show the strength of the signal applied to the detector. The circuit of Fig 4a shows a milliammeter joined to a leaky-grid detector, whilst Fig. 4b shows an anode-bend detector. The current flowing through the instrument will decrease in one instance and increase in the other when a signal is tuned in.

Thus, in Fig. 4a the instrument may indicate 1 milliampere when the set is not tuned. When a moderate signal is tuned in the current will fall, say, to .75 milliampere, and it will fall further, say, to .5 milliampere when a strong signal is being received.

It this meter is watched whilst tuning, accurate results may be obtained, as the current decreases as the signal strength is brought up in strength. It falls because the grid of the valve is made more negative during reception and shows clearly the relative strength.

The meter of Fig. 4b, which is joined to an anode-bend detector, normally shows only a small current when no signal is being received. Thus, it might show a current of .1 milliampere. When a moderate signal is tuned in the current increases, perhaps to .5 milliampere, whilst a strong signal will further increase the current. The instrument is therefore a guide as to the strength of the signal being received and is often found of great help when tuning.

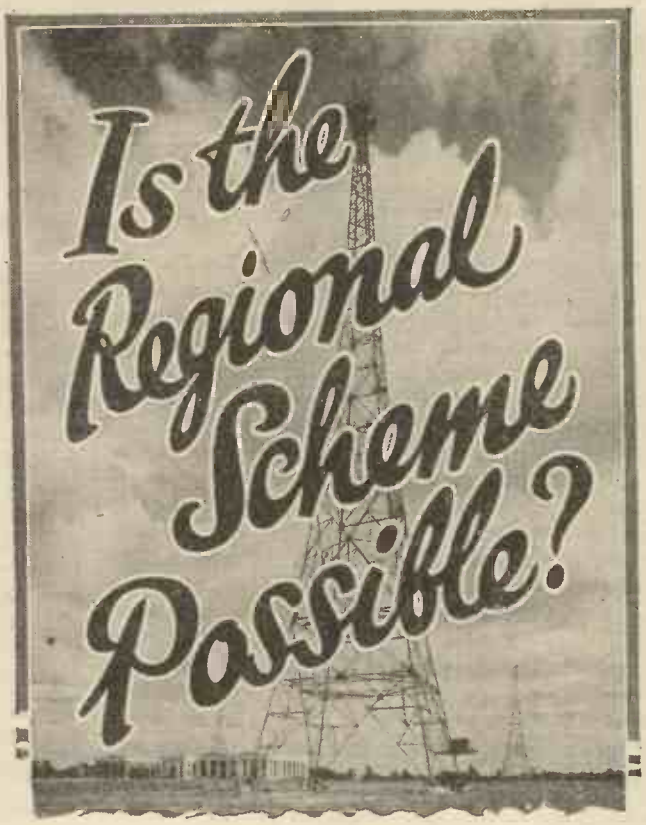
Slight changes in the tuning usually produce noticeable variations in the indications of the instruments in both arrangements. Low-reading instruments ought to be used. A useful range is 0-1.5 milliamperes, as the effect of slight changes in tuning may easily be followed with so sensitive an instrument.

A very strong signal may reduce the anode current of a leaky-grid detector almost to zero, but it will probably be badly distorted. The best results will be obtained when the input is less than a certain amount, depending upon the valve and its high-tension, and experiments will indicate the lowest reading that is safe. In the case of the anode-bend detector the quality is likely to improve as the strength increases, until a certain point is reached, beyond which distortion will be experienced. It will be found that the quality is best when the milliammeter shows a current of about a certain value—less or more than this resulting in distortion.

NEXT WEEK:
W. JAMES on
METHODS OF PROVIDING H.T.

USING AN AEROPLANE TO DETERMINE THE HEIGHT OF THE HEAVISIDE LAYER

MANY experimenters from time to time have endeavoured to obtain an idea of the height of the Heaviside layer. Various methods have been tried, and the latest—that employed by Messrs. Mirick and Hentschel, of the U.S. Naval Research Laboratory—involves the use of an aeroplane. Radio signals from an aeroplane in flight have been observed to show a regular pulsation in field strength. It is thought that this rise and fall in received signal is due to an interference effect between the ground and the high-angle radiation. As the aeroplane moved to or from the recording station a succession of peaks in signal strength were observed and, knowing the velocity of the 'plane, the distance between the peaks of fading and the distance from the recording station, the above-named experts calculated the height of the Heaviside layer. In their calculations they assumed that reflection of the high-angle radiation which caused the interference effect took place from a horizontal 'plane at the height of the layer. By this method an effective height, varying between 60 to 80 miles in daylight, was obtained. These values compare favourably with previous estimates by other experimenters. D.



Considerable doubt continues to be expressed regarding the practicability of the Regional Scheme. Below, R. W. Hallows makes an analysis of the position

THE essence of the regional scheme is that the present eight British main stations and nine relays operating on the medium band (that is, on wavelengths within the 200- and 550-metre limits) shall eventually be replaced by five high-power stations each radiating simultaneously two programmes on different wavelengths. Since each of the new dual stations will be designed to have a service area with a radius of at least a hundred miles, it is hoped in this way to provide every listener in the country, no matter how simple his receiving apparatus, with the choice of two programmes at all seasons of the year. The idea is magnificent, but already many people are beginning to wonder whether the scheme will not have to undergo drastic revision before it can become practicable.

Wavelength Channels

So far as wavelengths—or, rather, "channels"—are concerned, all is plain sailing—on paper, at any rate—for Great Britain has been assigned the necessary ten. Nine of these are at present used as individual channels by London, Cardiff, Manchester, Daventry 5GB, Newcastle, Aberdeen, Glasgow, Belfast, and Leeds, whilst one forms a group-channel for Bournemouth and the nine 130-watt relays. There are, however, many other points to be considered besides this.

Anyone living thirty miles or so north-west of London has now had some kind of opportunity of judging what reception conditions will be like should the regional scheme ever come into operation with the simultaneous broadcasting of dual programmes at high power. He can, at any rate, gauge the wipe-out effect which such stations cause at different ranges, though, for reasons which will be shown in a moment, this does not amount to a full test of reception under the conditions which may obtain in the near future. In my own case I have 5GB some forty miles away to the north-west and Brookmans Park fifteen miles off to the north-east. Imaginary lines drawn from these two stations to my aerial would meet almost at right angles. Using a receiving set designed not so much for selectivity as for good quality, I find that 5GB's wipe-out extends from, roughly, 525 metres down to 440 metres. In frequencies this means that, so far from occupying a channel 9 kilocycles wide, 5GB at forty-five miles covers roughly 108 kilocycles, or twelve times the width of a normal channel. With a similar set the wipe-out from Brookmans Park is much greater. Kattowitz on 408 metres is just clear of him, so that we may take the wipe-out as extending to 403 metres. This corresponds to 99 kilocycles above. The wipe-out below is very much worse. The first station, in fact, that can be obtained absolutely clear of Brookmans Park is Konigsberg on 276 metres. The wipe-out thus seems to extend to 279 metres, which in frequencies works out at 234 kilocycles!

Though not highly selective, this set, with its moderately efficient stage of high-frequency amplification, is very much more so than the two-valver consisting of detector and one note-magnifier or the three-valver with two note-magnifiers, which are so widely used. It is, of course, infinitely more selective than any crystal set.

Nearby Wavelengths

It is proposed, one understands, that when Brookmans Park gets under way with dual transmissions these will take place on the present wavelength of 356 metres and on 261 metres. Assuming that the wipe-outs of the two transmissions are similar, we may expect that upon 261 metres the blanketing effect above will also extend 99 kilocycles, which brings it up to 286 metres and causes it to overlap the lower wipe-out of the 356-metre transmission.

Yet another very important factor comes in here. Instead of coming from directions almost at right angles to one another, the transmissions will reach one's aerial *from the same point*. This will probably increase the difficulty of separating them when an outdoor aerial is used, and it also means that the directional properties of the frame cannot be utilised.

Wipe-out Troubles

The wipe-out is, of course, very much less when a selective receiving set is employed, but even so it is considerable. The highly selective set can bring in Brussels, 36 kilocycles away from 5GB, without any interference; but one has to go dangerously near the point of oscillation in order to receive Milan, which is 27 kilocycles from 5GB, without a background from the British station. The wipe-out on wavelengths below is about the same. But such is the strength of Brookmans Park at short range that the aerial seems to suffer from something like shock excitation, and the blotting out of this station is still very great with the same receiving set. To obtain either Hamburg or Brunn properly a wavetrap must be used.

After making tests with my own set, I went round to the houses of several friends to see what their receiving apparatus would do under similar conditions. The majority of those that I visited use not very up-to-date apparatus so far as the high-frequency side is concerned. Some of the sets were bought ready made; others are home-constructed receivers. Most of the latter have had improvements made in their low-frequency intervalve and output circuits since they were first built, but the high-frequency side, having been found to do all that was necessary up to the present time, has not been altered. Sets of the two types referred to are, I fancy, typical of those used by the average man throughout the country. The state of affairs found when such sets were employed for reception purposes whilst Brookmans Park and 5GB were both working was an eye-opener. Not a few of them could not separate the two transmissions; both of which I must add, in all fairness, are very strongly received in my locality. Of those who could obtain one station without a background from the other, not a single one could tune in any home or Continental station with a wavelength

(*Continued at foot of next page*)

For the Newcomer to Wireless: THE PENTODE VALVE

I AM thinking of using a pentode valve in the next set that I build; can you give me a simple idea of the way in which it works?

The pentode valve is really a development of the screen-grid system. You know that the screen-grid valve gives enormous amplification at high-frequency and possibly you know, too, that it is useless for low-frequency work.

Yes, I have heard that, but I don't think that I know the reason why.

It is quite simply that the characteristic curve of the screen-grid valve has not a sufficiently long straight portion for the purpose. Actually its characteristic is shaped rather like a capital "N" with the lower part of the first stroke and the upper part of the third prolonged.

How is the kink caused?

As the plate potential is raised steadily from quite a low figure the plate current continues to rise as one would expect. When, however, the plate potential is approaching that applied to the screening grid, the velocity of the electrons which pass through the meshes of the latter is sufficient to drive out of the plate further electrons by the force of their impact.

What happens to these?

A proportion of them makes its way to the screening grid. The result is that at this portion of the curve there is a dip in the plate-volts plate-current characteristic since the plate is losing so many of its electrons.

What follows next?

The dip continues as the plate potential is raised until it is a few volts more than that of the screening grid. At this point the secondary emission, as it is called, begins to stop and the characteristic resumes its straight line form until the saturation point is reached.

I think I see what you are driving at; in order to obtain a valve with a straight portion long enough for low-frequency work some means has got to be found of preventing the secondary emission from taking place.

You are on the track. Secondary emission cannot be entirely prevented, but its effects can be eliminated.

How is that done?

A third grid, connected to the middle of the filament, is interposed between the screening grid and the plate. Electrons travelling from the filament pass through this quite easily on account of their enormous speed. On reaching the plate they drive out other electrons as before and these begin to move, at a much lower velocity, towards the screening grid. On their way, however, they encounter the third grid which, on account of the way in which it is connected, contains a crowd of electrons. These exercise a powerful repulsive force on the electrons that have left the plate and serve to drive them back again to their proper place.

I see; then the result is that the flow of plate current is kept up and there are no kinks in the curve.

Exactly.

"IS THE REGIONAL SCHEME POSSIBLE?"

(*Continued from preceding page*)

between 356 and 479 metres without a background of interference, more or less pronounced from either 5GB or Brookmans Park.

Ten High-power Stations at Once

What would be the effect if ten 30-kilowatt transmissions were on the air at the same time in this country? My own belief is that, so far from providing the average listener with a large variety of programmes, it would tie him down entirely to the two provided by his local regional station. Until recently anyone with an efficient three-valve set could receive on most nights at least a dozen alternative programmes from home and foreign stations. We can hardly look upon it as a step forward if Continental stations are completely blotted out and nothing is available but one of two programmes from a near-by source.

And what of our receiving sets? No one can doubt that if the scheme were pushed through something much more selective than the present-day receiver in general use would be required. The public has been assured that the regional scheme is all for its good, but it strikes me that it will be a difficult matter to persuade it that this is really so if the scheme entails, as seems likely, if it goes through in its present form, the scrapping of thousands of sets and the almost complete rebuilding of thousands of others. To take an instance, many portable sets rely for their selectivity very largely upon the directional properties of the frame; these at short range would probably bring in not *one* of the dual programmes, but *both* at once.

Is the Scheme Obsolete?

Like so many things that take a considerable time to work out and develop, the regional scheme was probably obsolete before the finishing touches were put to the Brookmans Park station. It was founded upon the idea that a service area meant a region within which reception could be assured with a crystal receiving set. But crystal receiving sets are nowadays rare—much rarer, I venture to say, than the B.B.C. believes. Cheaper valves, cheaper components, and cheaper forms of current supply have made it possible to build and maintain a valve set at but a fraction of the cost which would have been entailed only a year or two ago. Looking through the advertisement pages of any issue of AMATEUR WIRELESS of 1926, one found numerous offers of crystals and detectors. During 1929 I cannot recall having seen a single advertisement of this kind in AMATEUR WIRELESS. A "crystal service" is no longer required for a transmitting station now that almost everyone has a valve receiving set. Increase the power of the present main stations to 4 kilowatts and there is hardly a soul in this country who will not have all the broadcasting service that he could desire!

A Suicidal Policy

In broadcasting we appear at present to be faced with something very much akin to the race in armaments, of which so much has been said and written. Every country is pursuing the suicidal policy of obtaining a place in the ether by shouting down all the rest. We who have done so much in the past towards straightening out the chaos in the ether on this side of the Atlantic appear to have committed ourselves to this fatal policy with our programme of ten 30-kilowatt transmissions on the medium waves, plus a 25-kilowatt station on the long waves. Continental nations can only follow our unfortunate lead if they wish to save themselves from being blotted out. That is why we find, amongst others, Bordeaux proposing to increase his power to 30 kw., Madrid to 20 kw., Milan to the same figure, Rome to 50 kw., and Prague to 60 kw. If anything like a general increase in power takes place the Prague Plan immediately becomes hopeless, and it will be impossible to find any other scheme which will be satisfactory.

The Real Solution

The only real solution is for all countries to abandon the kilowatt race and to impose an all-round limit of 4 or 5 kilowatts. America is nearly two years ahead of us in the matter of giant stations, and already feeling over there is running high against the super-power transmitter. We are suffering now from an attack of "megawattomania." Let the authorities realise, before it is too late, that what the public wants is a valve-service area, and not a *surfeit* area.

Olympia's Masterpiece!

—and its price is only

£8·15s.

Price includes the three Cossor Valves of the latest type, the handsome one-piece cabinet and all the parts necessary for its rapid assembly.

Also for A.C. Mains operation—works direct from the electric light mains. Supplied complete with three of the latest type Cossor Mains Valves, factory-built and tested A. C. Mains Unit, handsome one-piece cabinet and all parts . . . . . Price **£15.0.0**

One dial Control

The 1930 Cossor Melody Maker is simplicity itself—anyone can use it—no "tricky" tuning—turn only one knob to hear the programme you want.

No coils to change

Coil changing is ended with the 1930 Cossor Melody Maker. When you want to hear Daventry, Paris or any other long-wave station—merely twist a knob.

Only 10 components— only 20 wires

In spite of its wonderful power—its ability to bring you over thirty programmes any evening—even while your local station is working—the Cossor Melody Maker is amazingly simple—only 10 components to mount—only 20 wires to connect—that's all.

NEVER before has any Receiver created such a sensation as did the 1930 Cossor Melody Maker at the Olympia Radio Exhibition. From morning till night huge crowds surged round this wonderful Receiver—eager to view its handsome one-piece cabinet richly lacquered in two-tone blue—eager to examine its three simple controls—one knob for tuning—one knob for volume and one knob for wave-lengths. And then they looked inside and saw the amazing simplicity of its assembly—the Synchronised Control Unit, factory-built and factory-tested—the 9 other components and the 20 connecting wires. In an hour or so anyone—without previous Radio knowledge—can assemble it and obtain results equal to a costly factory-built Receiver. And the same Receiver can be converted to all-electric operation by the simple addition of the factory-built Cossor A.C. Power Unit and three Cossor Mains Valves. Go and see this amazing Receiver at your Dealer's—he'll be glad to tell you all about it or—use the coupon.

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To Messrs. A. C. Cossor Ltd.,
Highbury Grove, London, N.5

Please send me free of charge a Constructor Envelope giving full details of 1930 Cossor Melody Maker (a) A.C. Mains Model (b) Battery Model.

(Please strike out one you do not require)

Name .....

Address .....

A .....

If you are interested in the A.C. Mains Model please give voltage and cycles of your house supply. .....

A. C. Cossor Ltd., Highbury Grove, London N.5.

The 1930 Cossor "Melody Maker"

Britain's Greatest Radio Achievement!

954 CA

On Your Wavelength!

A Curious Experience

I HEARD of a very curious thing the other day in connection with the Show. A friend of mine who was busily engaged on one of the stands observed that the quality of reproduction suddenly appeared to have become slightly thinner than before. His attention was occupied with other matters and he did not think about it very much, but he was conscious of a feeling that the quality did not sound quite as pleasant as before. He dismissed the matter from his mind, assuming that some alteration had been made to the B.B.C. amplifier supplying the loud-speakers throughout the exhibition.

The sub-conscious mind, however, is a strange thing, and in this instance refused to be satisfied. My friend continued to be conscious of a feeling of uneasiness until he suddenly realised that the noise to which he was listening was not coming from the loud-speakers, but from the band itself! I think the less comment I make about this story the better, but I can certainly vouch for its truth.

The Speaker Demonstrations

In my opinion, one of the most remarkable features of the show was the way in which almost every loud-speaker in the exhibition reproduced the music supplied by the B.B.C. from the common amplifier. Quite apart from the fact that some of the loud-speakers will never again produce such wonderful music, owing to lack of proper feeding, when they get into the hands of the average owner, the incredible thing is the manner in which they stood up to the large input without any apparent overloading. I certainly heard one or two rattling rather badly, but the number was surprisingly small, but this appears to me to afford striking proof of the fact that 95 per cent. of the overloading encountered with the average set occurs in the last valve, and not in the loud-speaker.

The fact is that the average user has neither the facilities nor the money to feed his loud-speaker with really good quality reproduction. There is a very large difference between the moderately good quality which can be achieved relatively cheaply and which is satisfactory for all normal purposes and the really super-quality supplied to the exhibition speakers. I think it is encouraging to feel that, provided one has a reasonably good speaker, the quality of reproduction is limited more by what one chooses to put into the amplifier rather than by the loud-speaker itself.

A Dealer's Views on Portables

The other day, while speaking to the sales manager of one of our largest radio manufacturers, I commented on the extraordinary popularity that the portable set was enjoying at the present moment. While I am well aware of both the advantages and the limitations of portables it seems to me that many people buy sets of this type who would be better served, except for a very small percentage of their listening time, by a set using a separate aerial and earth.

Radio dealers prefer to sell portables to the exclusion of sets requiring aerials. The whole thing turns on service. A dealer has only to walk into a probable customer's house, demonstrate the set, possibly sell it, and then walk out again. There are no installation charges. With the other type of set a temporary aerial and earth must be established, which, since it takes a considerable time, represents a dead loss if no sale results. Even when a set is sold the erection of the permanent aerial, for which only a nominal charge can be made, also eats into the dealer's profit; so, taking things all round, dealers push the sale of portables as far as they can. It would appear from this that the installation of a set which enthusiastic amateurs lightheartedly undertake for their friends is a serious problem for the average radio dealer.

Effect of a Moving-coil Speaker on New Listeners

Incidentally, the same informant told me that, in his opinion, a dealer whose principal sale was portable sets was nothing short of a "mug" if he had a moving-coil speaker demonstrating in his showroom. His company had lost a lot of possible purchasers, evidently new to radio, who were disappointed that the reproduction from the portable models was not up to that of the moving-coil speaker and its expensive and bulky amplifier equipment. Had there been no moving-coil to fix a standard of reproduction they would probably have been quite satisfied.

"Regional" Doubts

Of the many people with whom I have chatted on wireless subjects at one time or another of late, very few seem anything like enthusiastic over the future of the regional scheme. Now that we have had a taste of Brookmans Park and a fair experience of 5GB, people are becoming a little doubtful whether high power is really "all jam"—if I may put it so. Perhaps, though, that is a rather unfortunate expression, because some people do maintain that it *will* be "all jam" in the sense that huge local wipe-outs will keep one tied down to the two programmes of the local dual transmitter. What I meant was that the reception of a 30-kilo watt transmission may not be all sweetness and straightforwardness and plain sailing for the man in the street, who uses simple apparatus and wants his fair share of good quality.

The Quality Problem

What I find when either Brookmans Park or 5GB are going full blast at moderate range is that the detector valve begins to start all sorts of little problems of its own. You see, comparatively huge voltage swings arrive upon its grid, and then the band begins to play. The grid-leak-and-condenser rectifier is inclined to pack up if voltage swings are at all on the large side, and very unpleasant distortion can be caused if it is overloaded. We turn, therefore, to anode-bend rectification, hoping that here we shall find a complete solution. But do we? My experience is that we don't, unless we are prepared to use a high plate voltage and a correspondingly large negative grid bias on the detector; otherwise the grid swings from a giant station may be quite sufficient to make this kind of detector indulge in a variety of funny tricks.

Another point is that with its craze for providing the crystal service area, the B.B.C. does not err on the side of under-modulating its transmissions. A deeply modulated transmission is simply fine for the crystal man, though it may cause the valveite, who values purity of reproduction to tear his hair. My own experience certainly is that I obtain much better quality from the Oxford Street transmitter than from either Brookmans Park or 5GB.

Battery Fashions

It is curious to find how battery manufacturers have to cater for the different habits on the part of the user in various countries. I am referring principally to the dry-cell high-tension battery, which still shows signs of being very much alive, though, according to the prophets, the eliminator should have killed it stone dead long ago. The British battery user likes to get the very last ounce of service out of his high-tension battery, and he not infrequently keeps it at work until the voltage has dropped to half what it originally was. He expects to find a fairly rapid fall to about 1.25 volts per cell, and after that he wants a discharge curve showing a nice gentle fall to the neighbourhood of .75 volt per cell. Often he will keep up his plate voltage by wiring a new high-tension battery or a portion of it in series with an old one. In America quite a different state of affairs prevails. The majority of batteries reach the dustbin before their voltage

On Your Wavelength! (continued)

has dropped to 1 volt per cell. Thus it happens that the American maker must provide something with a small initial drop, followed by a gentle curve down to about 1.1 volt per cell, and then a very rapid tail-off.

Adaptable Construction

Though the general public does not realise it, you can do all kinds of amusing things with a dry cell if you have the necessary chemical knowledge. If, for example, you don't mind giving it a rather short shelf life (shelf life means the time that a battery will last if simply stored away and placed under no load), you can enormously increase the capacity; that is, the number of milliampere hours that it will give under a reasonable load. Again, you can put up the initial voltage at the expense of capacity, and so on.

In fact, by carefully adjusting your ingredients, you can give a dry cell almost any kind of discharge curve that you can think of. It is for this reason that the high-quality battery scores so heavily. Not a small part of the price that you pay for it goes into research work of the utmost value to yourself and to all other dry-battery users. Cheap foreign batteries are made by people with neither facilities to conduct research nor the desire to do so. They work, as a rule, simply on a "quack" formula and are quite content with the hit-and-miss principle.

Little Things That Matter

If you buy a battery of reputable make you may have a comfortable feeling of assurance that it will give you a standard performance or that if it doesn't the makers will meet you most fairly on your reporting the matter to them. Buy foreign batteries and you never know quite what is going to happen. You may strike a comparatively good one by a stroke of luck, but the next one of the same make that you buy is more than likely to give quite a different performance. The reason why this kind of unevenness occurs amongst cheap batteries is to be found in the lack of tests applied to the raw materials. One batch of manganese dioxide may look very like another, but laboratory tests may show a heap of difference. There are grades of manganese, just as there are of sal-ammoniac and other chemicals used in dry-battery construction, and zinc is one of the most difficult of metals to deal with, since it is always found in a very impure state, and getting rid of the impurities is no easy business. It is attention to all these small points that makes all the difference to battery performances.

An Historic Relay

The relay of Mr. Ramsay MacDonald's reception on his arrival in America, though carried out under considerable difficulties, was wonderfully well received. A broadcast of this kind is one of those landmarks which show us what a big part wireless is playing first of all in bringing the man in the street into direct contact with events of world importance and, secondly, in promoting much closer union between nations widely separated from one another upon the earth's surface.

A Heterodyne Question

The other day a friend who lives on the south coast was chatting with me, and naturally wireless formed the main topic of our conversation. Knowing him to be a keen long-distance man, I asked how he found the Prague Plan working up to the present. To my astonishment, he said that at his station heterodynes were so appalling that hardly a station was to be received upon the medium band without interference—bad enough completely to spoil one's pleasure in listening to it. Allowing for slight exaggeration (I *think* he must have been missing his little daily dose), I was rather flabbergasted, for my own experience does not bear out his at all. I mentioned Toulouse as being a pretty useful foreign station. "Always heterodyned by Hamburg," he said. I pointed out that Toulouse and Hamburg were 18 kilocycles apart and that if there were any heterodyne it must be caused by Manchester, which is between the two. And then I referred to other stations that I receive pretty well, though he declared that every one of them was completely messed up—at any rate, before it reached *his* aerial. It would be very interesting if readers living in different parts of the country would send in accounts of their experiences of long-distance reception under present conditions.

A Negative Televised Picture

I expect many people were puzzled at one interesting portion of the published reports dealing with the first experimental television transmission by the Baird system. It was stated that the first televised face, which in this instance happened to be Sir John Ambrose Fleming, looked most peculiar, since all the dark portions were light and all the light details black. In other words, Sir John's white hair looked as though it had turned black in a night, while his face resembled that of a nigger minstrel! The reports further stated that this was due to a *negative* picture being received and that the matter was soon rectified. The puzzling feature arises as to how this effect is brought about in television and what steps are taken to rectify it.

A Reversal of Signal Direction

Perhaps some readers have overlooked the fact that if we have a receiver in which the first low-frequency stage is resistance-capacity coupled and the second stage transformer coupled, then the signal on the plate of the detector valve is in the opposite direction to that on the plate of the output valve at the same instant. If both stages are transformer coupled, however, the signal is in the same direction. This reversal of signal direction through each successive low-frequency stage may not have any effect as far as aural reproduction is concerned, but when lookng at a televised picture obviously signal direction must be correct.

Again, turning to the detector stage of a receiver, it is well known that, whereas grid-leak rectification causes a drop in current if a meter is joined in the plate circuit, anode-current rectification causes an increase. Thus, we have two possible signal directions according to the type of rectifier employed, and if one gives a negative picture the other gives a positive.

How to Make the Change

On the day referred to I gather that a pair of line transformer connections had been reversed, and, of course, the normal condition was secured by changing them over as this reversed signal direction. With the tests as now conducted a positive picture is secured with an anode-bend detector, followed by three stages of resistance-capacity coupling. If grid-leak detection is substituted, then it will be necessary at the receiving end to use two stages of R.C. If a transformer is included on the L.F. side, then the change to positive or negative is effected, as mentioned previously, by changing either primary or secondary connections. This is a very important point, and one which readers will do well to bear in mind when the time comes for commercial televisors to be available for public use. Several alternatives present themselves if one should get this negative picture, and the individual can choose that which he prefers or is most convenient; that is, change mode of rectification, add or substract low-frequency stages, or reverse transformer connections.

THERMION.

COMPLETING THE MUSIC-LOVER'S GRAMO-RADIO

This is the fourth and concluding article on the construction of the Gramo-radio Receiver with Linen Speaker that attracted so much attention at Olympia. The first three articles dealt with the receiver and loud-speaker and the present one deals with the general assembly

The complete Music-lover's Gramo-Radio

THIS is the last constructional stage in making up the "Music-lover's Gramo-radio." In previous issues of AMATEUR WIRELESS have been described the receiver section and the "Music-lover's" linen-diaphragm loud-speaker. The receiver section was fully described in AMATEUR WIRELESS Nos. 381 and 382, while the special linen speaker was described in AMATEUR WIRELESS No. 383. This linen speaker is equally suitable, of course, for any receiver, but is designed chiefly for use with this "super" gramo-radio installation, for which it is particularly suitable.

And now we come to the motor board unit, which is the last stage in construction. It is assumed that most constructors of the "Music-lover's Gramo-radio" will have made up the receiver in the special Clarion cabinet illustrated, but full details of the board will be given for the benefit of those who are also making up the cabinet themselves. The board is, of course, included with the Clarion cabinet.

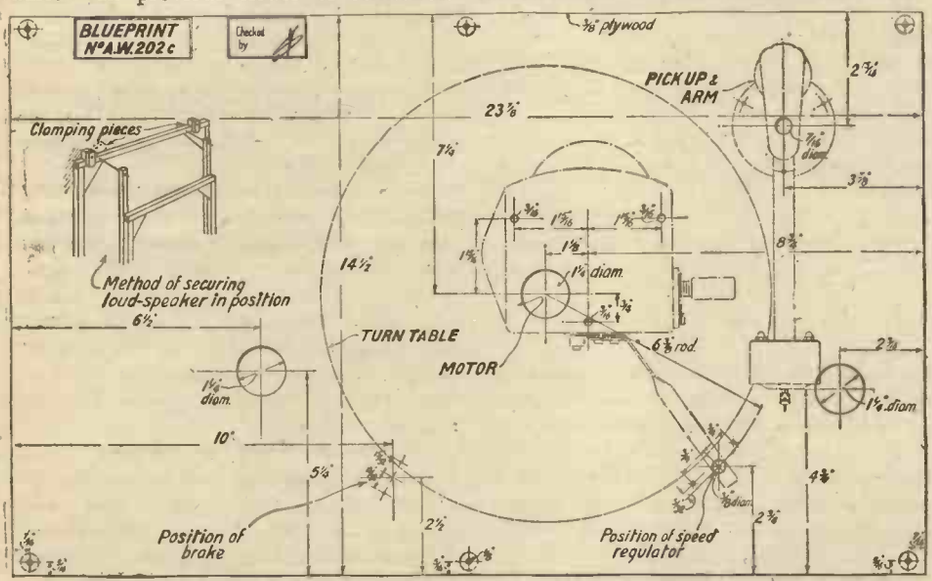


Diagram giving details of motor board. Full-size blueprint available, price 9d.

The overall dimensions are 23⅞ in. by 14½ in., and the wood used should be ⅜ in. in thickness, in order that it shall be of adequate strength. A motor board which bends under the weight, or subsequently warps, is an endless source of trouble.

The motor used is a Peto-Scott, but almost any type of good motor can be used if the constructor has one at hand, or, for instance, is taking a motor out of a mechanical gramophone which is to be discarded in favour of the "Music-lover's" set.

Too much emphasis cannot be placed on the fact that a cheap motor is a stupid economy. It will, perhaps, not run the full length of a 12-in. record without showing a drop in speed, even when new, it will need rewinding after each playing and, what is even worse, it may cause a momentary drop in speed on a large record in deep engravings. Each loud passage on the record will thus cause a noticeable drop in tone. Moreover, the motor itself may be noisy—a fact not so important with an electrical gramophone as with a mechanical job, but nevertheless by no means an advantage!

There is a fair amount of space in the cabinet to accommodate a good-size motor, and if one is going to take pride in the finished "Music-lover's" set, then it is well worth while investing in a really good motor.

The blueprint gives the drilling centres for the Peto-Scott motor used, but all good motors are supplied complete with a template, and no difficulty should be experienced in plotting new drilling centres for a motor of a different make. All dimensions are clearly shown on the blueprint, a small reproduction of which is given herewith. This blueprint is No. 202c, and can be obtained, price 9d., post free. The prices of all blueprints, covering each section of the "Music-lover's" set, are given in an accompanying panel

Pick-up Mounting

The only point which needs to be given particular attention is the drilling of the hole for the winder shaft. This hole has to be drilled in the side of the cabinet to coincide with the threaded winder projection on the motor chassis. Careful measurement and adjustment is needed, because although a very small error is permissible, owing to the fact that a small metal plate surrounds the hole for the handle, a genuine mistake will necessitate a plate being placed over the incorrectly-plotted hole, and a new hole will have to be made.

The pick-up should be mounted in accordance with the blueprint. If a pick-up

Turntable with electric pick-up

"COMPLETING THE MUSIC-LOVER'S GRAMO-RADIO"

(Continued from preceding page)

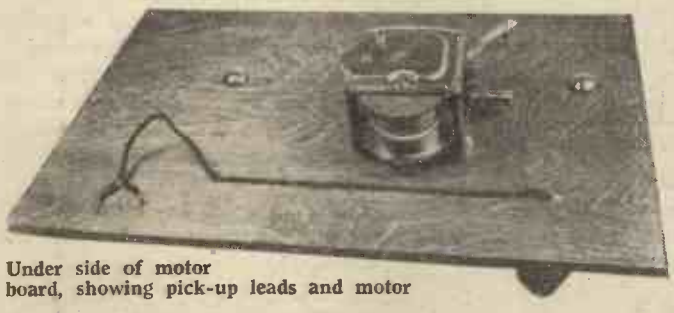
of a different type is used then the greatest care must be taken to see that it is mounted in accordance with the makers' directions. An incorrectly-mounted pick-up will accentuate record wear, and will not allow the most to be obtained from electrical reproduction.

And now for complete assembly. The motor board bearing the motor, pick-up, and needle bowls, is placed in the top of the cabinet and firmly screwed down. A trial should be made to see that the motor runs evenly and winds freely. The speed, too, should be checked over, either with a proper tester as sold by most gramophone dealers, or by the rough-and-ready method of making a mark on the edge of the turntable and counting the number of revolutions a minute.

Loud-speaker Fixing

The loud-speaker fixing deserves special mention. A light wooden frame should be made up from ½ in. by 1 in. wood, and over this a cushion cover of some fancy design should be tightly stretched. The cover should not be of too thick material, or it will have, at least, some effect on the sound output of the linen speaker. This frame complete with the artistic front is slipped in place in the cabinet, and secured with screws.

A narrow batten is then screwed to the base of the loud-speaker compartment, a little distance away from the frame carrying the artistic front. Two wooden clamps are made from four small pieces of wood, and attached to the top of the front frame, as shown by the inset drawing in the blueprint. They should not be screwed tightly to the fancy front, but should be left so that they can turn to allow the loud-speaker to be put in place.



Under side of motor board, showing pick-up leads and motor

The loud-speaker should now be placed against the front frame, so that the bottom edge of the loud-speaker is secured by the narrow batten. The top two clamps can now be turned to secure the speaker front frame, and screwed down fairly tightly.

The set can next be slipped into its compartment in the cabinet, the batteries can be placed at the bottom, at the back of the loud-speaker (or an eliminator can be used if desired; there is ample room), and all connections can be made. The pick-up is wired direct to the two terminals on the set, and the battery connections are made by means of the flexes, which for ease of wiring should have name tags attached

Components for the "Music-lover's Gramo-radio" Receiver

Ebonite panel, 21 in. by 7 in., and two strips, one 7 in. by 2 in., and one 3 in. by 2 in. (Becol, Raymond).
Two .0005-mfd. variable condensers (Cyldon, "Junilog," Lotus, Lissen, Ormond).
.0001-mfd. reaction condenser (Peto-Scott, Bulgin, Polar, Dubilier, Lissen).
1-megohm volume control (Igranic, "Megostat," Gambrell).
Two slow-motion dials (Bowyer-Lowe, Lissen, Brownie, Lotus, Burndept).
Panel brackets (Ready-Radio, Bulgin, Raymond).
Double-pole double-throw switch (Utility, Lotus, Lissen).
Four valve holders (W.B., Lotus, Wearite, Benjamin, Igranic).
Dual-wave aerial coil (Lewcos, D.B.A.).
Dual-wave screened-grid transformer (Lewcos, D.B.G.)
Ganging switch for coils (Lewcos).
Screen (Parex, Ready Radio).
.0002-mfd. fixed condenser (Lissen, Dubilier, T.C.C., Graham-Farish).
.0001-mfd. fixed condenser (Lissen, Dubilier, T.C.C., Graham-Farish).
.005-mfd. fixed condenser (Lissen, Dubilier, T.C.C., Graham-Farish).
1-mfd. fixed condenser (Lissen, Dubilier, T.C.C.).
Two 2-mfd. fixed condensers (Lissen, Dubilier, T.C.C.).
Pre-set aerial condenser (Formodenser type J, Igranic).
Grid leak holder (Lissen, Ediswan, Dubilier).
3-megohm grid leak (Dubilier, Lissen, Ediswan, Graham-Farish).
H.F. choke (Lewcos, Lissen, Tunewell, Ready-Radio).
150,000-ohm anode resistance with holder (Ready-Radio, Ferranti, Lissen).
50,000-ohm anode resistance with holder (Ready-Radio, Lissen, Ferranti).
L.F. transformer, ratio 4 to 1 (Marconiphone "Ideal," Ferranti, Lissen, Varley, Igranic).
L.F. choke (R.I., Ferranti, Igranic, Varley).
Variable resistance 250 ohms to 4 megohms (Regenstat, Clarostat, Volustat).
Six terminals marked, Aerial, Earth, Pick-up (2), L.S. (2), (Belling-Lee, Eastick).
Baseboard, 21 in. by 10 in. (Clarion, Raymond).
Seven yards of thin flex (Lewcoflex).
Six wander plugs, marked, H.T.—, H.T.+, G.B.+, G.B.—1, G.B.—2, G.B.—3 (Belling-Lee, Eastick).
Spade terminals (Clix).
Connecting wire (Glazite).

At this point it is opportune to make a brief *resume* of the object attained by the "Music-lover's Gramo-radio," so that those who have missed the previous instalments can satisfy themselves on any little points that might have arisen, and which might have made them hesitate before "plunging" into the construction of a big set.

Blueprints for the "Music-lover's Gramo-radio"

For the complete Gramo-Radio instrument, three blueprints have been prepared: blueprint for four-valve set (A.W.202a), 1s. 6d.; blueprint for linen-diaphragm loud-speaker (A.W.202b), 1s.; blueprint for motor board (A.W.202c), 9d. Total, 3s. 3d.

Provided all three are ordered at one time they will be sold at an inclusive price of 2s. 6d.

The receiver portion of the "Music-lover's" instrument is a good-quality four-valver, having one H.F. stage, efficient change-over arrangements for "radio" or "gramophone," an R.C. stage and a transformer stage. The tuning arrangements are such as result in a very high degree of selectivity, which is a most important point in view of the Regional scheme. Coupled to this receiver, all in the one handsome cabinet, is a specially-designed linen-diaphragm loud-speaker, and a complete electric pick-up and gramophone drive.

With the complete gramo-radio instrument, at the touch of a switch one can have either radio or gramophone reproduction at its best.

The instructions so far given should enable the average man to have the whole gramo-radio outfit in working order, but for the benefit of those who do not take a deep interest in technicalities, a few notes on operating will be given in next week's issue.

SELENIUM CELLS

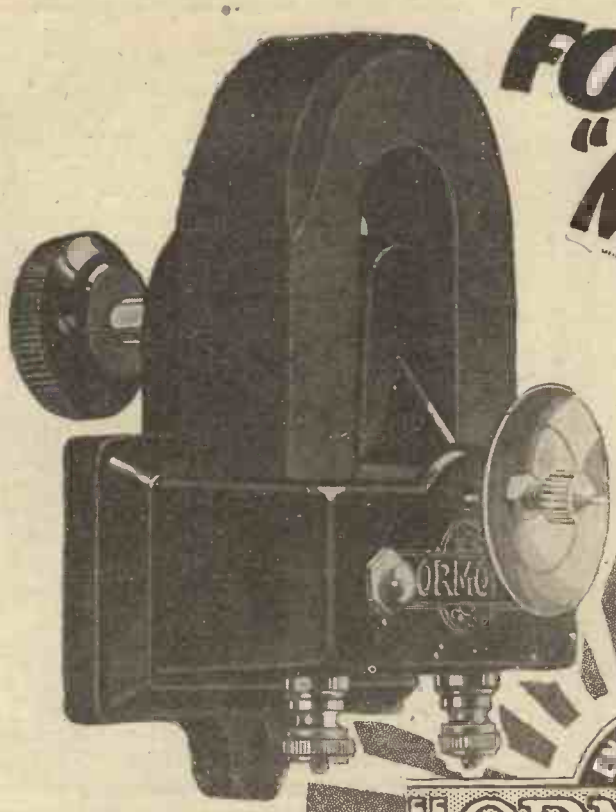
ONE type of selenium cell consists of two strips of nickel spaced about two centimetres apart and cemented on to a ground-glass surface. The selenium is smeared into the space between the two. The current passes from one nickel strip to the other over a path about 2 cm. long and 4 cm. wide. Such a cell will have a normal resistance in the dark of over 100 megohms. On exposure to light the resistance drops to anything between one-fifth and one-tenth of this value.

If, instead of the amorphous variety, a strip of crystalline selenium about one millimetre long and two centimetres wide is used, the normal "dark" resistance is reduced to the neighbourhood of 10,000 ohms. B. A. R.

SHOCKS FROM THE MAINS

BROADLY speaking, the highest voltage used for domestic lighting and heating installations in this country is in the neighbourhood of 225 volts. In some circumstances (for instance, if the live wire is touched with moist hands by a person making a direct earth with the other hand) this voltage is quite sufficient to give a very painful and even fatal shock. If touched with dry fingers when the only "earth" is through dry leather boots the shock is usually only slight, though even here the "reaction" will vary considerably according to the "tolerance" or experience of the individual concerned. Other things being equal, the shock given by alternating current is generally more severe than that from direct current. M. L.

THE UNIT CHOSEN FOR THE "MUSIC LEADER"



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THE TRUTH ABOUT THE SCIENCE MUSEUM SET

By KENNETH ULLYETT

THE AMATEUR WIRELESS correspondence columns have been very active recently about the receiver installed at the South Kensington Science Museum in London. Most of us are agreed that this set should represent radio at its best. But some of the letters from correspondents seem to indicate that the set is not at its best at present. Some, indeed, have been rude enough to hint that the set was designed three years ago and that lots of things have happened in the wireless world since then!

The exponential horn with the Western Electric drive at the South Kensington Science Museum

The Lions' Den

So, when the phone rang recently and a Science Museum official asked me on behalf of AMATEUR WIRELESS to come and learn the truth about the Science Museum set, I felt that it was rather like entering the lions' den.

Anyway, I plucked up my courage and went to South Kensington, there to experience the first shock. One usually imagines museums to be rather dead things, and when I found at South Kensington a most charming official in charge of a well-equipped radio "lab.," complete with a full gamut of testing apparatus, a "squeak," and so on, I was rather surprised. On mentioning my surprise (tactfully, of course) I was told that radio is quite a live thing at South Kensington and a deal of experimenting is always taking place.

Without beating about the bush, the official told me that in his opinion some of the AMATEUR WIRELESS contributors to the correspondence columns have been rather misinformed; secondly, that there are many vague and incorrect rumours about the Museum installation; thirdly, that he himself has been personally responsible for most of the radio installation and any unfair criticism cuts him to the quick!

Not The King's Set

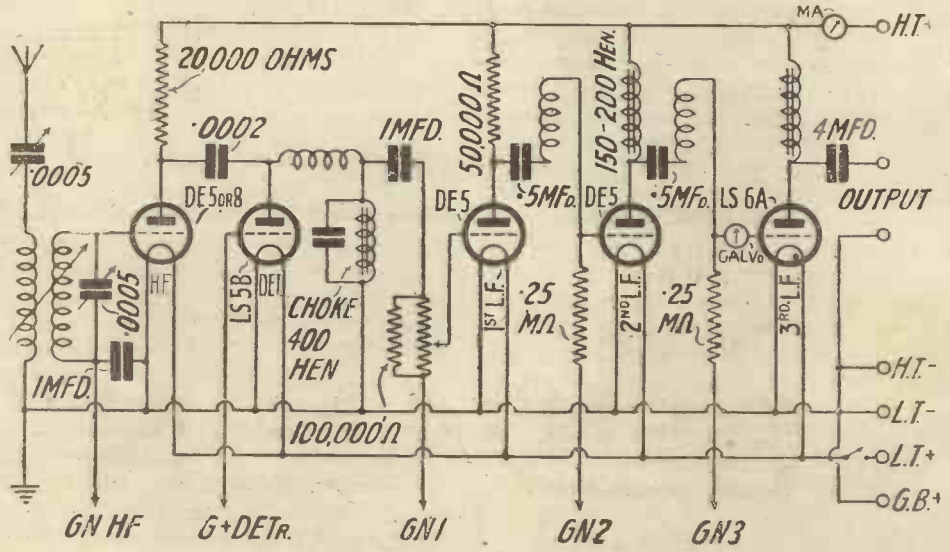
Regarding the set first of all, there is a rumour abroad that it was designed by Captain Eckersley for the use of H.M. the King. Well, this is all wrong. What really happened is that the Museum official approached the B.B.C. when a demonstration was needed, and together the B.B.C and Museum engineers worked out an ideal circuit for the job. Part of the set, too, was made by the B.B.C. and part by the Museum engineers.

The circuit is shown herewith. There is nothing "secret" about it, as has been hinted, and a blueprint was prepared by the Museum authorities and thousands sold. The set is a five-valver. It is not claimed that it is an ideal set for the average man, but it does give absolutely distortionless (or perhaps I should say "rectilinear") reproduction. It is entirely reliable and is switched on by one knob. It has to be worked by the ordinary non-technical Museum warders, and so simplicity is vitally necessary.

H.T. is derived from motor generator and approximately 300 volts is applied to the last stage. "What is this last stage?" will be asked by those correspondents who have disputed the point.

One Output Valve Only

Formally three LS5A's were used in parallel, but these have been replaced by one LS6A, which does the job as well. Of course, this receiver might be "condensed" a little and perhaps one stage cut out, if the whole thing were modernised, but the cost might be as much as £200. It would not be worth it, for a straight-line output is given by the present set, and you cannot



The circuit of the Museum five-valve set

If you care to glance at the circuit you will see that it has loose-coupled tuning (quite selective enough for the regional scheme), an aperiodic H.F. stage, a three-electrode valve acting as a two-electrode Kirkifier detector, a choke-coupled L.F. stage, followed by a resistance-coupled and a further choke-coupled L.F. stage. Interesting points are a volume control preceding the first L.F. stage, a grid-current meter in the grid circuit of the last stage, and a milliammeter showing the total anode current. By watching the milliammeter in conjunction with the grid-current meter it is possible to see any distortion.

very well make a straight line straighter!

And now for the loud-speakers which have been so much discussed. First of all, there is the giant logarithmic horn, hung

(*Continued on page* 607)

RADIO AND G.M.T.

Jottings from my Log. By Jay Coote

ALTHOUGH perhaps many of us reluctantly put back our clocks one hour to coincide with G.M.T., the change over offers many compensations to most listeners to foreign programmes, for it gives us, as one advantage, an undisturbed period after the British stations have closed down.

From the time I adjusted the clocks in my own home, nightly I have searched systematically different sections of the broadcast band, and it is surprising, since the advent of shorter days and more favourable atmospheric conditions, how long-lost transmissions have forced their way through the mush which had blotted them out during the summer months.

Now, in fact, is the time to recast the log of all wavelengths captured, and if this is done, as I suggest, by working carefully over small portions of the wave band at one sitting, a great number of stations will be found which may not have been picked up previously.

The task has been facilitated by the fact that in some cases since last winter a number of transmitters have been endowed with more energy. Such, for instance, is the case of Riga, which now a 3-kilowatt transmitter, can be picked up at great volume on most evenings, and is so sharply tuned that there is no difficulty whatever in separating it from either Vienna or Munich. You will experience no difficulty in identifying this studio, for it possesses a lady announcer who, at the end of every item, clearly gives out the call: "Hallo, Riga!"

Kovno also, which I had lost for some time, has reappeared on my horizon, and on most evenings offers a programme which you will find well worth while to tune in.

Just above Radio Paris and not far short of Huizen—namely, on 1,796 metres—you should search for Lahti. During the past few nights I have been able to realise that *it is* a 40-kilowatt station, for its programmes have been available on my loud-speaker. Searching over the long band, I have also encountered various Russian transmissions which have greatly puzzled me. Leningrad, for instance, on 1,000 metres is an easy capture, and on many occasions would prove a useful addition to the day's wireless fare were it not for the fact that it is being constantly interrupted by those wailing fog beacons. Moscow, on the other hand, is something of an enigma, for, although said to be transmitting on 1,481 metres, its wavelength appears to be very variable, inasmuch as on some evenings I find the station above Eiffel Tower and on others below; on some occasions, too, they heterodyne each other badly. Also, between Kalundborg and Motala, you should hear a very powerful Russian transmission, which at first I took for Moscow, but which later—inasmuch as the latter was transmitting at the same time—proved to be Kharkov on 1,304 metres. It possesses the same peculiarity as that of the big Komintern station, as it drawls out its news items to a very late hour.

Finally, on the long waves well below Leningrad pause for a while with a view to obtaining the signals of what appears to be the new Moscow P.T.T. experimental station on 825 metres.

Apart from some interference from morse on Hilversum, Kalundborg, and Kovno, and the Air Ministry's spasmodic interference on Motala, most of the long-wave stations can be clearly received; in fact, almost nightly I am able to pick up fifteen transmissions in that band, and all at loud-speaker strength.

THE MANCHESTER RADIO EXHIBITION

City Hall, Deansgate, Wednesday, October 16, to Saturday, October 26

SECOND only to Olympia is the Manchester Radio Exhibition. Many wireless enthusiasts who were unable to visit Olympia are now able to make themselves acquainted with the latest radio developments as seen at the Manchester Show.

The exhibition opened at the City Hall, Deansgate, Manchester, on October 16, and will continue until Saturday, October 26. It is organised by the Manchester *Evening Chronicle*, the Radio Manufacturers' Association and Provincial Exhibitions, Ltd. Most of the leading manufacturers who exhibited at Olympia also have stands at the Manchester Exhibition. The show is open daily from 11 a.m.

G.E.C. Plaque Speaker

until 10 p.m. An interesting feature is a number of competitions organised by the Manchester *Evening Chronicle*, which is providing prizes to the value of £250.

Space forbids a lengthy description of individual exhibits, but the following is a brief review.

Prominent Features

A prominent feature on the Watmel stand is a display of Watmel four-pole balanced armature loud-speaker units. A range of two, three, and baby grand receivers and a super-radio-gramophone is also of interest.

On the stand of the London Radio Manufacturing Co. will be found Orphean and standard cone and cabinet loud-speakers. A cone unit selling at 15s. will be of special interest.

Belling & Lee, Ltd., are, of course, showing the full range of Belling-Lee terminals and connectors. The Belling-Lee safety plug and socket is a new line which will be of interest to all set users.

Stand No 12 is the AMATEUR WIRELESS stand. Don't miss it on any account. Current issues of AMATEUR WIRELESS and *Wireless Magazine* and helpful text books.

Lissen, Ltd. are exhibiting a complete range of two-volt valves, which have just been placed on the market. The range of Lissen parts for the home constructor needs no introduction. The remainder of the Lissen exhibits will be occupied by D.C. eliminators, receivers, and radio-gramophones.

The British Ebonite Co., Ltd., is showing moulded ebonite parts for all purposes and a number of panels in various finishes

DO NOT FAIL TO VISIT THE "A.W." STAND No. 12

The "A.C. Screened Seven" is a star receiver on the stand of Burndept Wireless, Ltd., while the "Burndept Portable" receiver, which has earned such a good name for itself, is also on show. Burndept are also exhibiting a number of receivers of the two- and three-valve variety which are very modest in price.

Batteries, of course, form the basis of the display on the stand of the Ever Ready Co (Great Britain), Ltd, H.T. batteries, particularly of the power and super-power capacity type, will be of particular interest to amateurs

Philips is a name which has become well known in connection with a number of simple and efficient A.C.-operated sets. These will be seen on the stand of Philips Lamps, Ltd., together with a display of Philips cone and moving-coil loud-speakers.

Climax Radio Electric, Ltd., are showing the popular Auto-Bat mains units, together with a number of Climax loud-speakers, both in the popular plaque and cabinet forms.

M.P.A. Wireless, Ltd., formerly well known for a number of excellent portable

Exide DHG Accumulator

sets, have added to their laurels with a number of well-tried mains components and complete battery eliminators, all of which are shown.

Formo condensers are of major interest on the stand of Formo Co. The new dual gang condensers and midget reaction jobs are of particular interest, as also is the new vernier dial, priced at only 3s.

Ekco battery eliminators are shown by E. K. Cole, Ltd., together with two interesting mains-driven complete receivers.

Exide batteries for all radio purposes are on show on the stand of the Chloride

Gecophone Transformer

Siemens Grid Cell

M.P.A. Cabinet Speaker

THE MANCHESTER RADIO EXHIBITION *(continued from preceding page)*

Electrical Storage Co., Ltd. An interesting new Exide line is the type WY10 H.T. battery suitable for multi-valve sets. New features of Exide batteries are the non-interchangeable red and blue terminals, and octagonal positive terminals, easily distinguishable from the round negative terminals.

The new range of Amplion receivers and, of course, the Amplion Lion loud-speaker are being shown by Graham Amplion, Ltd.

The Dubilier display consists of fixed and variable condensers for all purposes. The new Dubilier triple condenser, thumb operated, is of particular interest.

Marconiphone Co. Complete receivers, valves, and loud-speakers are the centre of interest on this stand. As it is equally a

A Reed-type Celestion Speaker

transportable as well as a portable, the new Marconi type 55 five-valve portable is of particular interest. This is a complete receiver which can be carried from room to room.

Celestion loud-speakers of all types will be on show on the stand of Celestion, Ltd.

Oldham & Son, Ltd., and C. A. Vandervell & Co., Ltd., are two firms who specialise in accumulator manufacture, and on Stands 43 and 44 respectively will be found the range of radio accumulators offered by these two concerns.

Peto Scott, Ltd., are showing a number of receivers made up according to various

Varley Resistance-capacity Coupler

specifications, and a feature of interest in the Peto Scott range is a novel electric gramophone in which can be fitted many types of popular receiver.

The whole range of Mullard valves is being shown on the stand of the Mullard Radio Valve Co., while descriptions of some of the well-tried Mullard receivers are also of interest.

The Osram "Music Magnet" is the "magnet" of attraction on the General Electric Co. stand, on which also is shown the whole range of Osram valves and complete receivers.

Igranic components for the home constructor are well displayed on the stand of the Igranic Electric Co. Components of particular interest include the popular Igranic condensers and low-frequency transformers.

Ferranti, Ltd., are showing a full range of mains units and components, together with the new Ferranti moving-coil loud-speaker.

The range of McMichael receivers, portable and otherwise, is displayed to advantage on the stand of L. McMichael, Ltd.

Varley components for the home constructor and a number of Varley complete receivers, mains driven, are being shown on the stand of Oliver Pell Control, Ltd. A component of particular interest is the new Varley Nicore L.F. transformer.

The Wates Star speaker unit and three-in-one testing meters are on show on the stand of the Standard Wet Battery Co.

Kolster-Brandes Cabinet Speaker

A new cartridge unit for wet batteries has been introduced which greatly simplifies the task of assembling batteries of this type.

Wearite are specialising in a number of chokes and choke output circuits, and also components for A.C. mains units. In addition, there are the usual Wearite H.F. choke, switches, coils, jacks and plugs, and dual-range tuners.

Kolster-Brandes, Ltd., have just produced an excellent range of receivers and loud-speakers, and these are being shown to advantage on this stand.

Telsen "Ace" and "Radiogrand" transformers are rapidly earning an enviable reputation, and these popular components are being shown on the stand of the Telsen Electric Co., Ltd.

The new Cossor "Melody Maker" and the entirely new range of Cossor valves is

New Amplion Receiver

bound to attract considerable interest, and Cossors have a very convincing display on their stand.

A.C. rectifiers suitable for inclusion in home-built eliminators are to be found on the stand of the Westinghouse Brake and Saxby Signal Co., Ltd.

Siemens Bros. & Co., Ltd., the well-known battery manufacturers, have an excellent display of H.T. batteries for every type of set. A new range of L.T. accumulators on this stand is also of great interest.

Claude Lyons, Ltd., have a display which will be of interest to all home constructors; the chief component of interest is, of course, the Clarostat, the popular variable resistance which has been specified in so many AMATEUR WIRELESS receivers.

The Epoch Radio Manufacturing Co., Ltd., are specialising in a high-quality moving-coil loud-speaker which is shown to advantage on this stand.

A number of moving-coil loud-speakers of all types are being shown by Bakers Selhurst Radio, and all amateurs interested in using the moving-coil type of reproducer will be interested in this display.

The outstanding new line on the stand of Harlie Bros. is the Volustat, an infinitely variable resistance of the graphite-mica type which can be put to so many uses in a receiver.

In the foregoing review it has not, of course, been possible to mention every individual exhibitor at the Manchester Show, which is now open, but enough has been said to show that the exhibition is of outstanding interest, and no amateur in the locality can afford to miss the opportunity.

And don't miss the AMATEUR WIRELESS stand!

Since August 26 the Konigswusterhausen short-wave transmitter has been broadcasting regularly on 31.38 metres (9,560 kilocycles). Its power for the present is 8 kilowatts, but within the next few weeks it is to be increased.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

AGAIN I ask what the B.B.C. is going to do about those self-satisfied parsons who keep a world of listeners waiting while they go on uttering their platitudes.

Those responsible for the relaying of the service from Glasgow Cathedral must have been aware that they delayed the "Week's Good Cause," the news, and the programmes throughout the whole country.

Is this courteous? Is it stupidity or is it an indifference?

◆ ◆ ◆

One is getting tired of the inevitable announcements which follow these services:

Lissenden's idea of Mischa Mots

"I must apologise for being rather late, owing to the service being rather long."

◆ ◆ ◆

Say—just whadya think of the way those Amurricans serenaded our Ramsay Mac.? Bully for you, Premier!

◆ ◆ ◆

But, to get down to English, the relay of the Prime Minister's reception in New York was a great thrill. Technically speaking, the transmission was excellent and, speaking from a programme point of view, the whole thing was a wonderful achievement. It was inspiring to hear the New Yorkers making a first-class fuss of Ramsay.

Interesting, too, was it to hear the American way of putting over a "running commentary." With all due respect to our broadcasting friends across the Pond, I think that the verbal high-speed of our announcing cousins must have sown in every English listener's breast the seed of a new love for our own lucid commentators.

◆ ◆ ◆

Strange how people's opinions have varied regarding the Co-optimists. Some say there wasn't a laugh in the whole broadcast. Others thought their recent show was splendid entertainment.

By the way, why doesn't the B.B.C. take a leaf out of the Co-optimists' book and form a standing troupe of light concert artistes who would be "on the strength," in much the same way as the B.B.C. Dance Band? No charge for this brilliant suggestion!

P.S.—Since writing the above an almost similar suggestion comes from another critic!

◆ ◆ ◆

"Harold" pops up with a criticism of a new dance feature.

"The relay of the Royal Opera House dances is not good," he writes. "The place is too big to do justice to the bands. Instead of being able to pick out and listen to the individual playing of the musicians, we are treated to an echoing jumble of noise."

◆ ◆ ◆

I have pointed out repeatedly that as a solo artiste Tommy Handley is supreme, but when he gets into a sketch or playlet he loses his individuality. Moreover, he always seems to get into shows which are not up to his standard. The latest I have heard him in—*Lost Pearls*—was a rather feeble effort.

◆ ◆ ◆

In the same programme was a duologue by Angela Baddeley and Glen Bryan Shaw. It had a Nihilist flavour and was truly ridiculous. The whole affair was carried out in the cheapest possible "penny-dreadful" manner. The wind howled most of the time (as if we haven't had a surfeit of that particular effect) and the players recited their lines like barnstormers.

◆ ◆ ◆

Those effects which were not overdone were badly underdone. The train smash was absurd—it sounded exactly like a biscuit tin falling off a shelf. Was this a leg-pull on the part of the programme people? Or do they imagine this kind of rubbish is on a level with our intelligence?

◆ ◆ ◆

I made a special note of listening to Leonard Henry's return broadcast. He started off well—his patter being packed with laughs. Then he sang, and slumped badly.

◆ ◆ ◆

The enthusiasm at the last Promenade Concert must have been an eye-opener (or ear-opener) to a good many pessimists who have stated that we were an unmusical race. A mad musical race, my masters.

◆ ◆ ◆

I wonder whether there will be any more suicides reported as a result of the reading of the poems of James Stephens. As for me, I am a strong-minded person, and consequently did nothing worse than burst into tears.

◆ ◆ ◆

I confess I like the pianoforte transcriptions as played by Leslie England, comprising a number of different composers rather than a big chunk from the same composer. This time we had Chopin, Schubert, Schumann, Mozart, and Glinka. A nice basketful.

An Impression of Sid Phillips

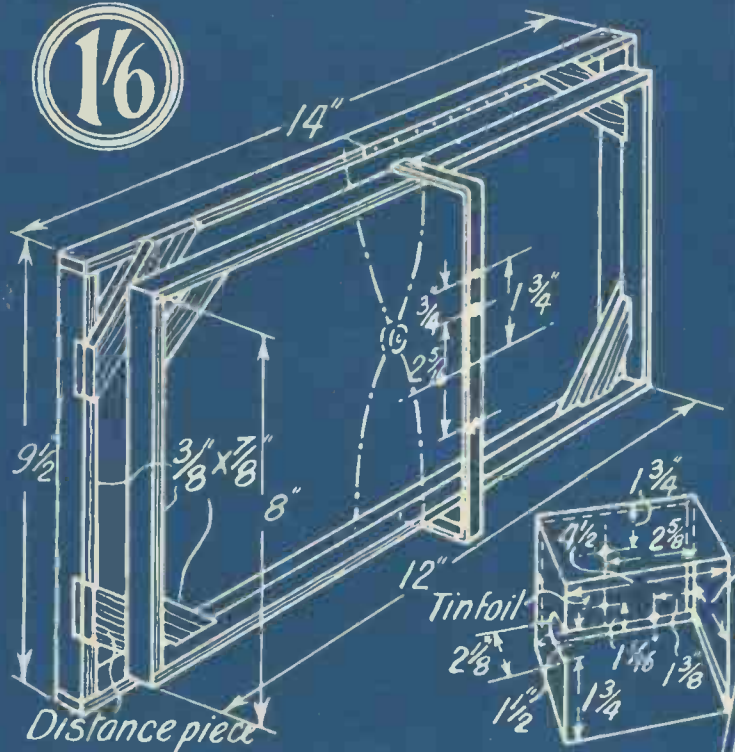
Free Supplement presented with No. 384 of "Amateur Wireless," Oct. 19, 1929

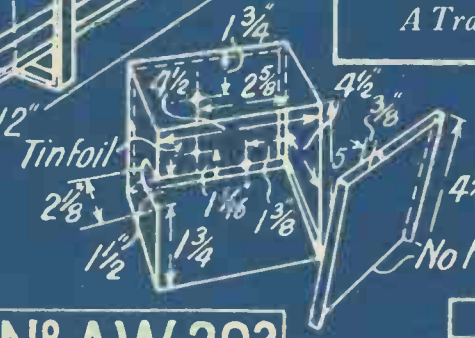
1/6

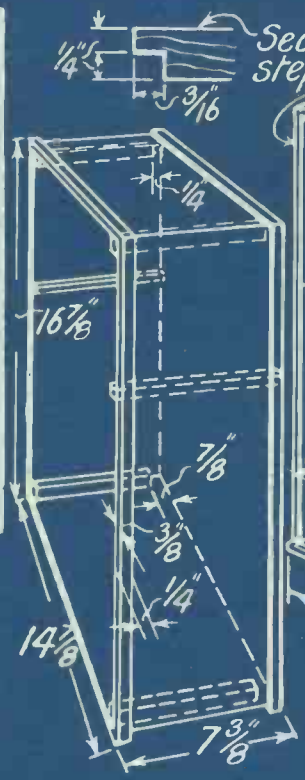
THE MUSIC LEADER

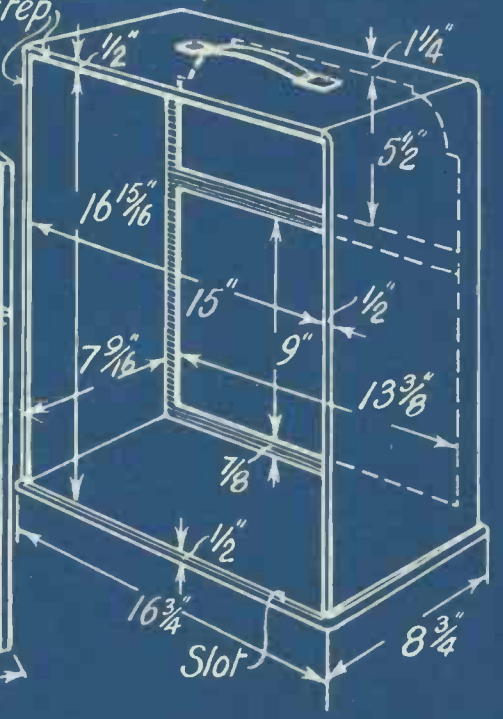
WITH SELF-CONTAINED
LINEN-DIAPHRAGM SPEAKER

No External Aerial: No Earth:
A Transportable "Four" for Home Use









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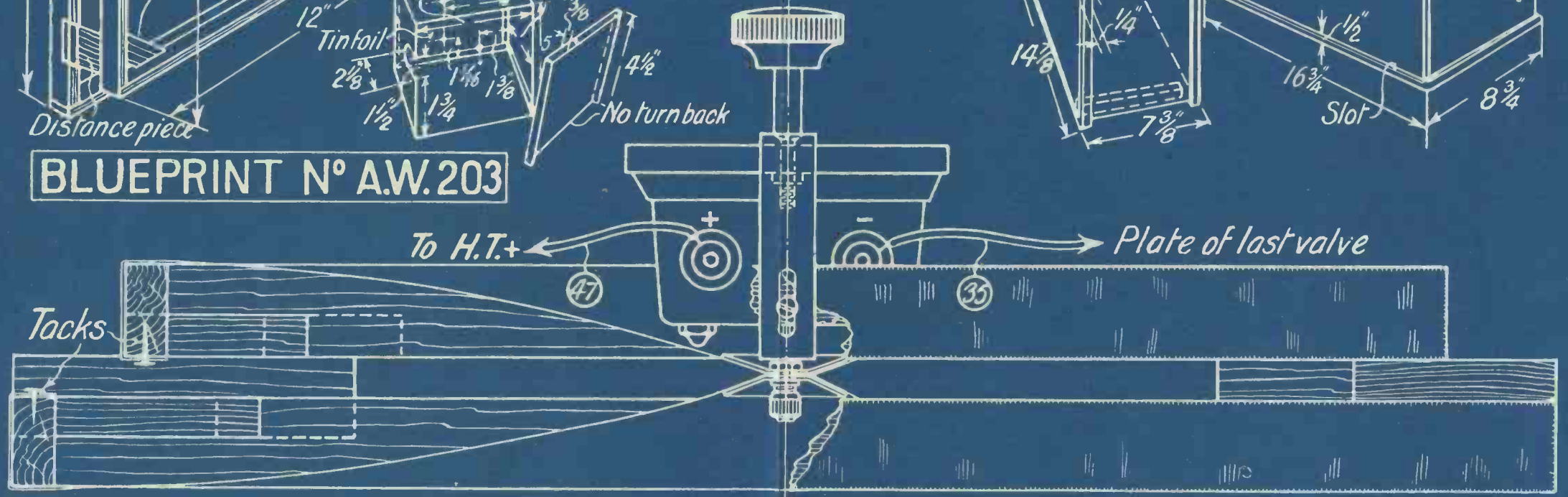

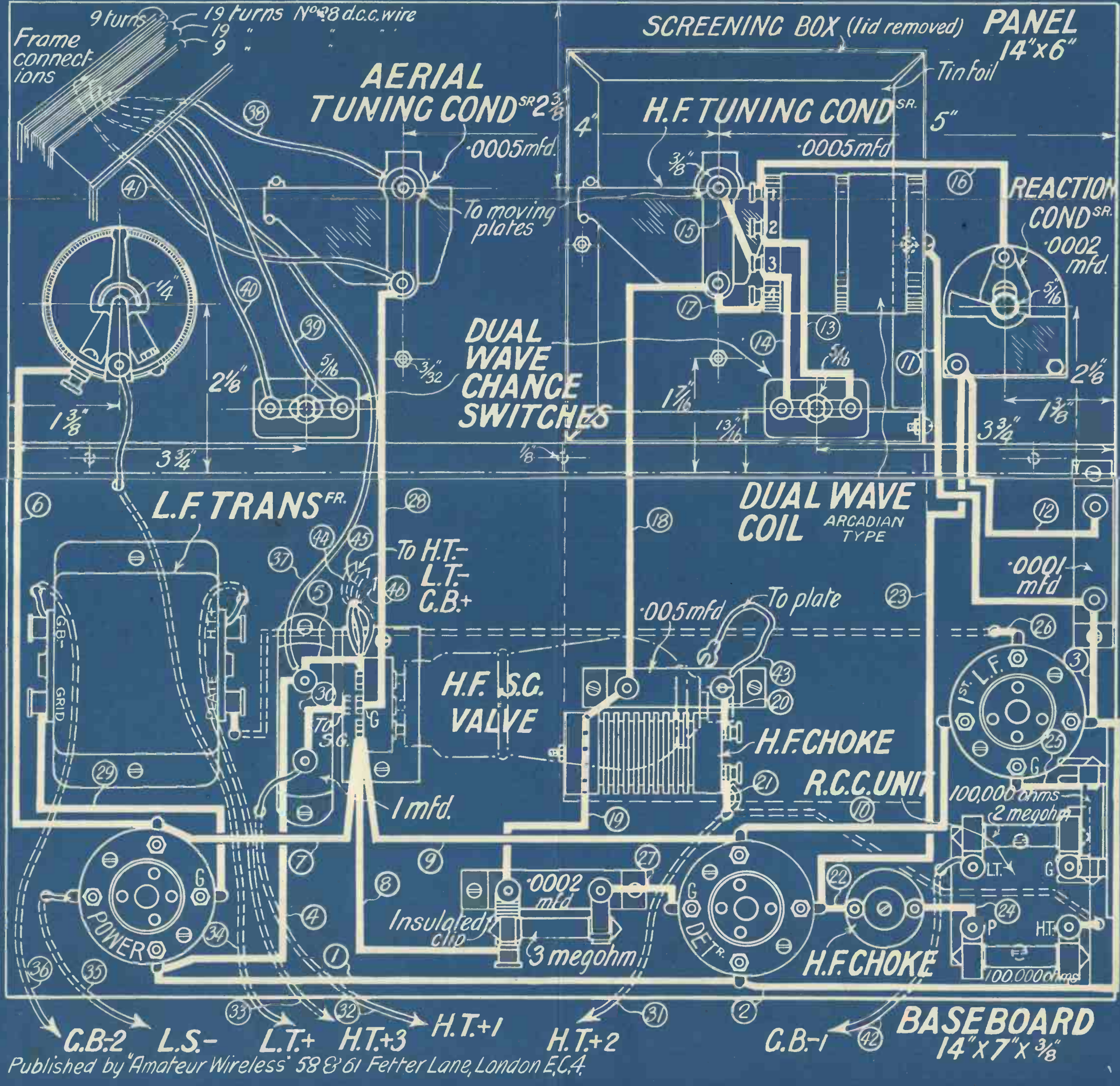

Published by "Amateur Wireless" 58 & 61 Fetter Lane, London E.C.4.

THE UNUSUAL ST

"There is an inte
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"Music Leader."
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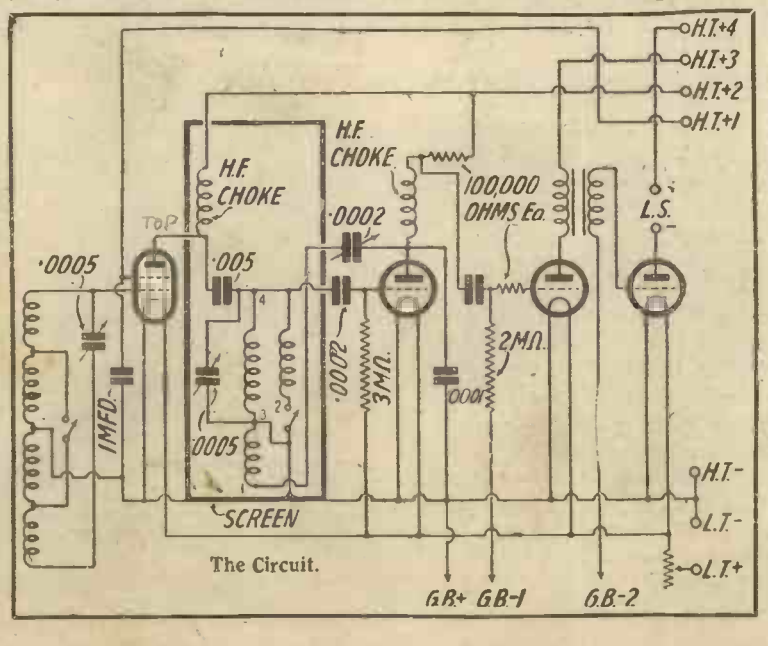
since last May."

LISTENERS are gradually developing a growing distaste for wires hanging about their wireless sets. Once upon a time one thought nothing of a maze of aerial and earth cables, battery leads and loud-speaker cords and what not, and the result was that the corner wherein the receiver was situated was a kind of holy sanctum to be approached only by the expert wireless operator of the family!

Now this is all changed. It is no use having a set which can be worked only by *paterfamilias*, or the radio-enthusiastic boy when he is home from school. The demand is for receivers which can be worked by anybody, and the worst barrier which can be put up is a mass of wires, some of which can give quite an unpleasant shock if not treated with due regard.

True, with the average set nowadays, things are not so bad as they used to be. Quite often a grid-bias battery is enclosed in the cabinet; sometimes, also, a battery eliminator is employed. In any case, the number of battery leads is reduced. But with the exception of "super" sets, one still must have wires for aerial, earth and loud-speaker, even if all the juice is obtained from the mains.

But we are wrong! We have said "we still must have wires." The advent of the "Music Leader," the set now to be described, has changed all this. The "Music Leader" is just the kind of receiver you will be wanting if you have yearned to rid the garden of unsightly wires, poles and other fixings, and if you have more than once tripped over the battery leads.



The Circuit.

NO EXTERNAL BATTER

Entirely Self-contained

In the "Music Leader" everything is self-contained. You won't need any external aerial, earth, loud-speaker, or batteries. The set complete can be carried from room to room.

The "Music Leader" is not an ordinary portable in the ordinary sense of the word, for many portables have had to be designed with weight as the prime factor. This has meant that batteries, accumulators, and so on, have had to be cut down with the consequent reduction in efficiency. This has not been the case with the "Music Leader," for while it is reasonably light in weight, and quite portable so that it can be carried from room to room, it is not meant primarily to be an outdoor portable, and efficiency, rather than extreme lightness of weight, has been the main point aimed at in design.

In brief, the "Music Leader" is a four-valve receiver having one screened-grid H.F. stage, a leaky-grid detector, one R.C. coupled L.F. stage, and a final transformer-coupled power stage. For the benefit of the non-technical it may be explained that this circuit arrangement results in good distance getting, ease of control, and the best possible purity.

In the case there is ample room for the

LEADER

ORY OF THIS SET

resting piece of his- development of the It may be recalled nbers of the "A.W." nited States in the ner. They took with , which was given journey aboard the y cities of Eastern return trip. Obvi- e gained in working country and under was invaluable. on of the "Music ally identical with taken to the States. ver which has per- a trip of approxi- and which has been of the Construction loping and testing

IES, AERIAL OR EARTH

batteries, large enough to operate the set to complete satisfaction, a frame aerial and, finally, a linen-diaphragm loud-speaker The whole set is easy to tune—in fact, it is just as easy to operate as a table grand gramophone, and it is just as portable. The set covers both wavelength bands at the touch of a switch, and the quality of reproduction would please the most fastidious.

There is an interesting piece of history attached to the development of the "Music Leader." It may be recalled that two young and zealous members of the AMATEUR WIRELESS staff visited the United States in the middle of last summer. They took with them a portable set which had been designed by a technical staff member, Mr J Sieger. The set was given ample scope for its capabilities on the journey aboard the *Majestic*, in many cities of Eastern U S.A , and on the return trip.

Guaranteed Performance

Obviously, the experience gained in working the set out of the country and under arduous conditions—strange conditions too, with the wide gamut of American stations—was invaluable. This same experience will be reflected in forthcoming AMATEUR WIRELESS portable receivers, and the receiver portion of the "Music Leader" is practically identical with that of the portable taken to the States

It is this same receiver which performed so well over a trip of approximately 9,000 miles, and which has been occupying the time of the construction department in developing and testing since last May !

As was pointed out in several articles at the conclusion of the American trip, selectivity is the great feature demanded of every receiver to suit U.S. conditions. The same applies from now on in this country, for the coming of the Regional scheme makes selectivity a *sine qua non*.

As a preliminary, for those interested in technicalities, glance at the theoretical circuit diagram It will be seen that the frame aerial is of the dual-range type and is coupled direct to the grid of the screened valve. This valve in turn is coupled in a most efficient manner to the detector, an aperiodic choke in the anode circuit, by-passing the D C. current, but acting as a stopper for H.F.

The tuning portion which consists of a dual-range coil, has one side connected to earth potential, and this results in extremely simple control. The coupling condenser between the H.F valve and the detector has a value of .005 microfarad. The detector circuit does not embrace any special feature, the grid circuit components having the values of .0002 microfarad for the condenser and 3 megohms for the leak. The reaction condenser has a maximum value of 0002 microfarad.

In the anode circuit of the detector is a 100,000-ohm resistance, while a stopper

LIST OF COMPONENTS

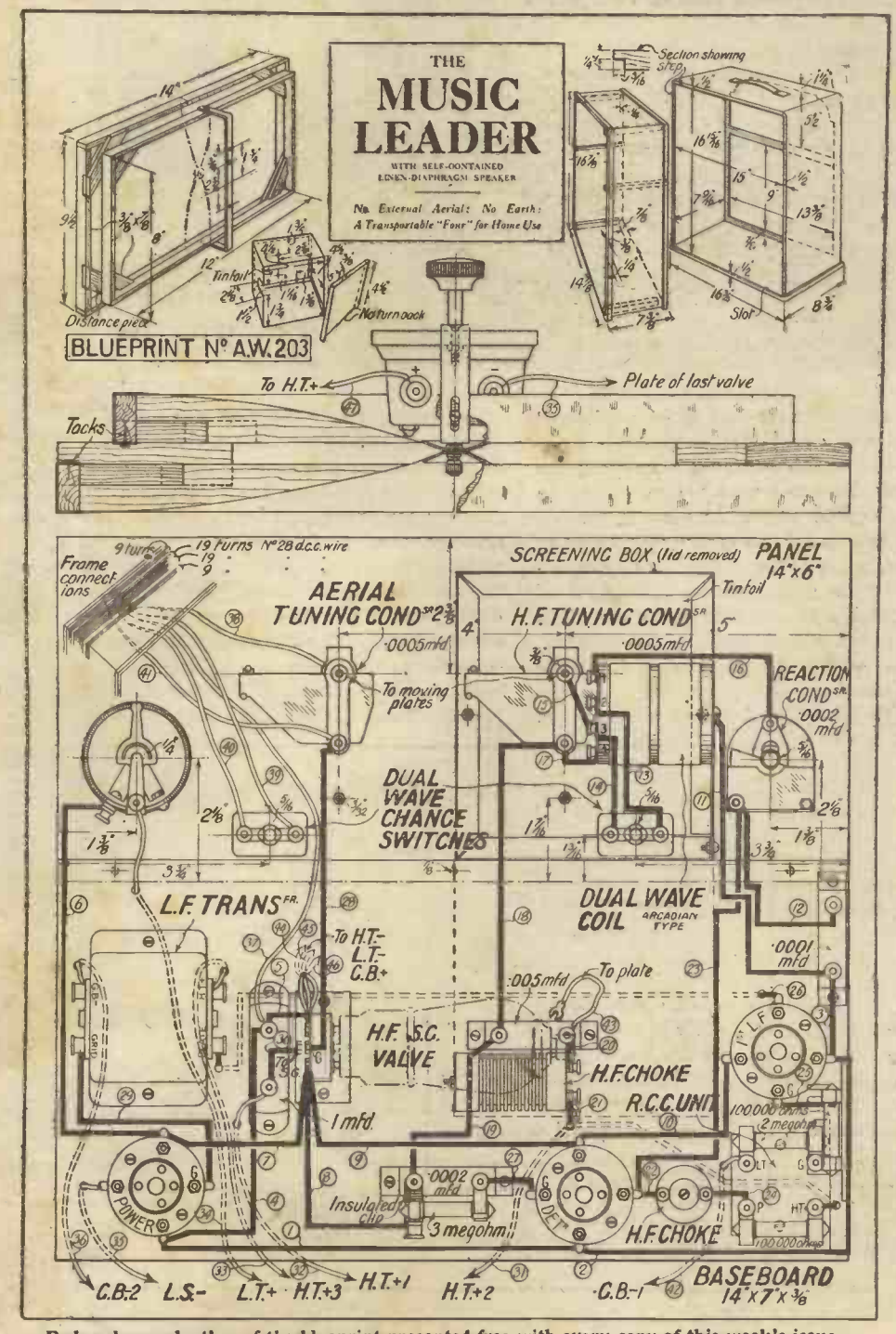
Ebonite panel, 14 in. by 6 in. (Becol, Resiston, Raymond, Ebonart).
Transportable cabinet, complete with 7 in. baseboard and frame (Clarion).
Two .0005-mfd. variable condensers (Formo, Cyldon, Burton).
.0002-mfd. reaction condenser (Bulgin, Peto-Scott).
7-ohm panel-mounting rheostat (Lissen, G.E.C., Burton).
Two "on" and "off" push-pull switches (Bulgin, Lotus).
Special screening box, 4½ in. by 4½ in. by 5 in. (Parex, Ready-Radio).
Screened-grid valve holder (Parex).
Three small valve holders (W.B., Lotus, Formo, Burton).
Special dual-wave coil, Arcadian type (Wearite, Ready-Radio).
Two high-frequency chokes (Peto-Scott, Wearite, Ready-Radio).
3-megohm grid leak (Lissen, Ediswan, Dubilier).
Resistance-capacity coupling unit with 100,000-ohms anode resistance (Lissen, Ashley, Trix).
100,000-ohm grid resistance with holder (Lissen, Ediswan).
.0001-mfd. fixed condenser (Dubilier, Lissen, T.C.C.).
.0002-mfd. fixed condenser with series clip (Dubilier, Lissen, T.C.C., Graham-Farish).
.005-mfd. fixed condenser (Dubilier, Lissen, T.C.C., Graham-Farish).
Low-frequency transformer (Cossor, Varley, R.I., Burton, Telsen).
Connecting wire (Glazite).
Two small slow-motion dials (Brownie, Ormond, Formo).
Four yards of thin flex (Lewcoflex).
Seven wander plugs marked H.T.—, H.T.+1, H.T.+2, H.T.+3, G.B.+, G.B.—1, G.B.—2 (Belling-Lee).
Two spade terminals marked L.T.+, L.T.— (Belling-Lee).
Balanced-armature loud-speaker unit (Ormond, Blue-Spot, G.E.C., Hegra, Lissen, Watmel).
Nine feet of ¾ in. by ⅞ in. wood.
Half yard of fine-weave embroidery linen.
Small piece of art. silk to cover large diaphragm of speaker.
One foot of strip brass, ½ in. by 3/32 in.
Two 4B.A. bolts and nuts, ½ in. long
¼ lb. 28 d c.c. wire (Lewcos).

"THE MUSIC LEADER" *(Continued from preceding page)*

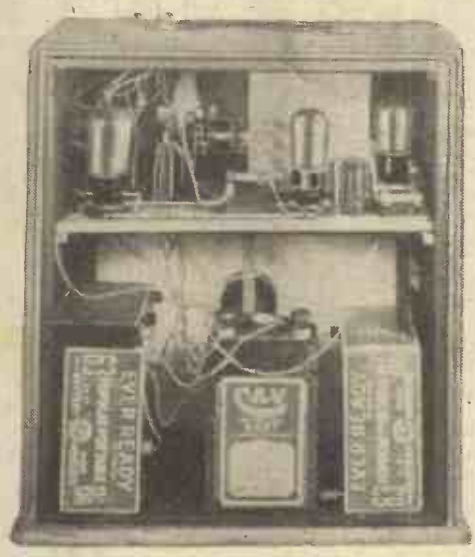
resistance of a similar value is placed in series between the R.C. coupling condenser and the first L.F. valve grid. This is a point which merits special attention.

One of the new small-size super-efficient transformers with a special alloy core is used for coupling between the first and second L.F. valve. The transformer, in this case a Cossor, is the product of one of the foremost radio designers, and has well earned an excellent name for itself.

Further points in the circuit will be dealt with as they arise during construction. In the meantime it may be noted that the receiver section itself is quite conventional. It is made up in the form of a panel at right angles to the baseboard, and there is a completely screened section in which is placed the H.F. side of the screened-grid valve (so far as is possible the valves of the present construction) and the H.F. coupler components, including the dual-range anode coil. The receiver unit slides out from within a wooden frame on which is wound the aerial turns. The construction of the frame will be dealt with later, but, of course, the frame includes turns for both the medium and long wavelengths, and the wave-changing is effected by means of a switch on the panel. A similar switch matched up on the panel changes over the anode coupling coil from one waveband to another.



Reduced reproduction of the blueprint presented free with every copy of this week's issue



A photograph of the interior taken from the back

The controls on the panel are very simply placed as you will see from examination of the photographs. In the centre are two large slow-motion dials, which, of course, are for tuning. The left-hand dial tunes the H.F. section, while the frame-aerial windings are tuned by the right-hand condenser. To the extreme left is a small knob which is the reaction control, while a similar matched knob to the extreme right, is the control for a rheostat regulating the current for all four valves. To the bottom of the panel are the two small wave-changing knobs. The left-hand one controls the anode coil, while the right-hand one is the frame-aerial switch. This point does not need to be remembered however, for both knobs should be pushed in or out simultaneously.

The Free Blueprint

The construction of the receiver section will be described first, and it must be emphasised that this presents no special difficulty.

To assist constructors a special blueprint has been prepared covering the complete receiver, loud-speaker and frame aerial, and this is being *given away free with this issue*. It will be obvious that a great deal of work is entailed in the preparation of these prints—one of which is made for each AMATEUR WIRELESS receiver. The usual charge for this present blueprint for the "Music Leader," would be 1s. 6d.

But as a special gift to AMATEUR WIRELESS readers, and in view of the popularity which the "Music Leader" will undoubtedly attain, the blueprint is being given entirely

(Continued on page 602)

My Wireless Den

Weekly Tips—Constructional and Theoretical—by W. JAMES

A "Safety" Connector

ONE of the most useful of the little gadgets introduced recently is a "safety" connector for joining the anode of a shielded valve and its circuit.

This connecting wire carries high-tension current, and I know that a large number of valves have been destroyed as the result of the anode end of the connecting wire touching a shield or wire in the set. The end of the wire has been allowed to fall whilst changing or adjusting the screened-grid valve with disastrous results.

One of the safety connectors comprises a shell of insulating material and a spring contact which is so placed in the recessed part of the holder that it cannot touch a shield or wire. It is therefore quite safe to use, the spring contacts gripping the screwed part of the anode terminal quite firmly.

Another type has a small connecting tag and a large ebonite bush. This, too, is satisfactory in practice.

A Strange Whistle

Some of the new transformers having cores of special steel seem particularly sensitive to stray capacities, and may cause a high-pitched whistle to be heard with the broadcast.

This may be avoided, as a rule, by reversing the wires connected to the terminals of the secondary, and this should therefore be tried in the event of trouble arising.

Particular attention should be paid to the wiring. Keep connecting wires short, especially grid and anode wires. Also keep other wires away from them, in an endeavour to avoid capacity effects.

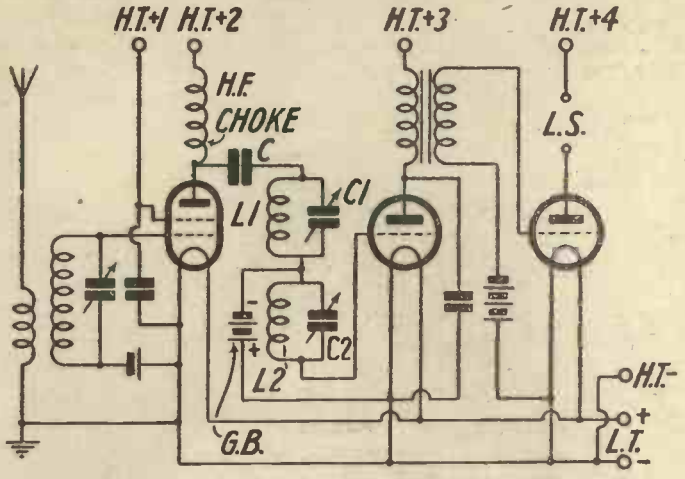
Getting Selectivity

I am sometimes asked for the circuit of a set having rather better selectivity than is usual in three-valve arrangements, and also one which provides rather better quality.

The accompanying diagram shows the connections. It will be seen that a coupled circuit is used between the anode of the shielded valve and the grid of the detector. This, by the way, works as an anode-bend type, a grid-bias battery being used.

The special feature of the set is the arrangement of the couplings. There is an H.F. choke and a stopping condenser C. These prevent high-tension from passing to the tuned circuits. Condensers C1 and C2 are ganged, and should therefore be alike. The two tuning coils L1 and L2 should also be alike.

Selectivity is dependent to an extent upon the construction of the coils, but it may be adjusted by altering their coupling.



A very selective three-valve arrangement which provides good quality

When testing, therefore, one of the coils should be moved with respect to the other until the selectivity is sufficient over the whole tuning range.

Coils having windings of fairly fine wire should be used, or the high-frequency stage may oscillate, and it would also be advisable to wind the coils astatically or, at all events, so as to minimise their stray field. If this is not attended to the aerial coil may couple with the anode coils and spoil the stability and magnification of the set.

There is sometimes a little difficulty in balancing the circuits, and it is therefore advisable to employ a small condenser across C1 or C2 in order to balance the two tuned circuits.

Those Bad Earths

A frequent cause of instability in a set having a shielded-grid stage is, I find, a poor earth connection. This is usually particularly noticeable when receiving the longer wavelengths.

It cannot be too strongly emphasised that a good earth is essential when a high-frequency stage that is providing considerable magnification is used. The earth wire should be as short as possible and the actual earth a good one. Use a good earthing clip when a water-pipe is conveniently situated or buy a sheet of metal two or three feet square so as to have a short connection.

Leaky Grids!

Some tests that I have lately been making have served once more to bring out the importance of not using too low a voltage in the anode circuit of a leaky-grid detector.

The tendency of such a detector to distort is greatly increased when the voltage is low. I am aware that the sensitivity is improved by lowering the voltage, but when there is only one low-frequency stage, as in most modern sets, distortion must be considered.

I prefer a high-tension of about 90 volts as a rule, and use more when possible. The signal strength that may be handled by a detector without overloading, and therefore distorting, is dependent upon the anode voltage, and for safety it should be made as high as possible.

Night concerts are to be broadcast from the German stations between 12.30 and 1.30 a.m. on the following dates Munich, September 10; Breslau, 12; Stuttgart, 16; Frankfurt, 20; Leipzig, 24; and Konigsberg, 28.

The Chinese Posts and Telegraphs will open in January, 1930, a short-wave wireless telegraphy service with the United States.

With the extension to Milan of the Transatlantic telephony service, on short waves, the American Telegraph and Telephone Company have enabled their subscribers to communicate with twenty-one different countries.

"A.W." TESTS OF APPARATUS

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

Bulgin Remote Control

REMOTE control for wireless apparatus used to be considered a luxury beyond the means of the average wireless user. Times have changed, however, and now it is customary for a single set to operate a large number of speakers placed in different rooms in the house. It is by no means uncommon for a set to be installed in a room other than the main sitting-room and under such circumstances, switching on and off necessitates unnecessary labour It is here that remote control proves invaluable for it can be operated from a number of different points in the house by simply withdrawing the loud-speaker from a wall jack.

The new Bulgin remote control apparatus is both inexpensive and practical The relay with indicating light may be obtained with wall jacks for switching on and off the set and plugging in loud-speakers.

The remote control apparatus consists essentially of an electro-magnet with swinging armature. When the control switch is operated, a small current flows through the magnet winding and constrains the armature to close two contacts, thereby switching on the set. The normal filament-heating accumulator, whether it is 2, 4, or 6 volts, will operate the relay effectively. The current is passed through a flash lamp which automatically lights up and indicates when the set is on. The consumption from the accumulator to operate the relay varied from 50 to 96 milliamps, according to whether a 2-, 4-, or 6-volt accumulator was used; thus the additional load on the filament heating accumulator is less than that of a single valve. This device, which is mounted in a black oxidised-finished

Bulgin Remote Control

circular metal container, has a diameter of 4 in. and is approximately 1¾ in. high. It may be installed with any accumulator operating set without any internal alteration to the wiring.

On test, the contacts closed with unfailing reliability even when only a two-volt accumulator was employed. This device should prove of practical use to readers.

Rosin-core Solder

OFTEN one of the greatest difficulties an amateur experiences when building his set, is the making of sound and neat soldered connections The process of soldering correctly is an art only to be acquired after much practice; at least, it was an art, but new materials and methods of joining two metal surfaces together have greatly facilitated the work.

We have tested this week, a radio solder, known as Kester Rosin-core. This material is manufactured by the Chicago Solder Co., and marketed in this country by the Rothermel Radio Corp., of Maddox Street, Regent Street, London, W. It is sold in the form of a coil in small tins or, if desired, in considerably larger quantities. In the core of each coil, a quantity of rosin is placed, and is only liberated on the application of sufficient heat to melt the solder. Thus, in making a joint, one has merely to clean the surfaces, apply the iron and solder, when a

Handy Rosin-core Solder

perfect joint should result. Further, one is assured of utilising just the correct amount of flux.

We tested this solder with quite satisfactory results. A piece of thick wire was cut in half and the insulation stripped from either end. A hot iron was applied to the newly-bared wire and caused the solder to adhere freely to the two ends. Further tests were carried out, such as joining an old soldering tag to a lead, with quite satisfactory results.

There is no doubt from our experience with this solder, that it is both simple and practical to use and, provided sufficient heat is applied, makes an excellent joint

OUR SECOND GIFT OFFER APPEARS ON PAGE 580!

The Rotor-ohm

VARIABLE high resistances are in much demand at the present time, particularly for use as volume controls in conjunction with wireless and gramophone amplifiers.

The problem has always been with

Rotor-ohm Variable Resistances

variable high resistances to obtain reliability and silence in use without gradual deterioration of the resistance element, which must often stand the continual friction of a sliding contact. In the Rotor-ohm, marketed by Messrs. Rotor Electric Ltd., of 2-3 Upper Rathbone Place, W.1., the problem has been ingeniously tackled by allowing the rotating contact arm to bear on a circular coil of wire wound in the form of a variable filament resistance. Each turn of the coil is separately insulated and arranged to make contact with the resistance element. In consequence, each turn forms a tapping point of the resistance and may be selected by rotating the control knob. No damage whatsoever is caused to the resistance by the rotation of the arm.

On test, we found the resistance varied from a few ohms up to 700,000; by so proportioning the element it is arranged that the variation of resistance at values below 50,000 ohms is less for a given movement of the control. Either end of the resistance is connected to a terminal, whilst the central terminal is in contact with the rotating arm. The component makes an admirable volume control, especially when connected across the secondary of a low-frequency transformer.

The military section of the Eiffel Tower wireless station has placed at the disposal of the Paris police a service of picture transmission on the Belin system. This broadcast is carried out on short waves, and destined to the police organisations in London and Berlin. By international agreement it is proposed to transmit, when necessary, from either of the three capitals, finger prints of wanted criminals.

Measuring LOUD-SPEAKER VOLUME

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

IN order to take the response curve of a loud-speaker, it is necessary to have some means of measuring the intensity of the sound radiated from the particular instrument. A rough check can, of course, be obtained by applying varying frequencies to the loud-speaker and noting the aural effect. This will, of course, enable any serious resonances, either in the amplifier or in the speaker, to be noted, and often a good indication of the performance of the speaker can be obtained in this manner In order to obtain a definite measurement, however, more accurate methods are required than mere aural observation. One method employed is to utilise a microphone situated at a suitable distance away from the loud-speaker. This will then respond to the sound waves and will give an indication of the radiation in terms of actual voltage.

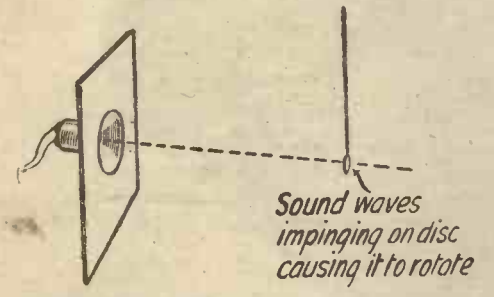


Fig. 1. Arrangement of the Rayleigh disc

It is, of course, necessary to calibrate the various parts of the system other than the speaker in order to correct it for any deviations from the ideal. For example, the oscillator itself must be calibrated as regards its output, for this will not necessarily be constant at all frequencies, and a correction must be applied or an adjustment made to allow for any discrepancy. The beat-frequency oscillator in use at the Furzehill Laboratories, for example, gives a constant output for all frequencies from 10 to 3,000 cycles per second. Beyond this point it begins to fall off slightly, the amplitude being reduced to approximately one-half at 8,000 cycles. If this fact is known it is possible to correct the falling-off either before the voltage is applied to the test apparatus or by making suitable allowance in the interpretation of the results afterwards.

From the oscillator we pass to the amplifier, if any, applying the voltage to the loud-speaker. For ordinary purposes the output from the oscillator is sufficient, but in some cases it is necessary to amplify still further and a correction must be allowed for this portion of the apparatus. The loud-speaker correction is, of course, what we are endeavouring to find, and we can only do this by knowing the theoretical voltage developed in every other part of the circuit. The deviation from the ideal is then due to the loud-speaker, and in this way we obtain our response curve.

Now, if we use the simplest method —that of the microphone—we have two further calibrations to make. First of all, the microphone itself is not uniformly responsive to various frequencies and, secondly, the amplifier following the microphone (for nearly every reasonably uniform microphone is relatively insensitive and must have an amplifier following it), must also be calibrated. For this reason it is sometimes preferable to get away from a microphone measurement at all and use an absolute measurement of the sound pressure, thereby reducing the number of corrections necessary.

HAVE YOU NOTICED

—how popular are the restaurant programmes broadcast during lunchtime?

—how Cologne, Nurnberg and Kaiserslautern penetrate even in daytime? Regular "shouters." Why?

—that the German stations conclude the sections of their programmes with "Auf wiederhoeren," which has a similar meaning to "Au revoir," but with the sense of "entendre" (to hear) rather than "voir" (to see)?

—how the gramophone records of dance bands over the ether have a much more marked and regular time than the actual dance band itself?

For this purpose a Rayleigh disc may be employed. This apparatus, which is called after Lord Rayleigh, who first suggested its use, consists of a very thin disc suspended in the field of the sound vibrations. The suspension is by a single very fine hair or piece of unspun silk, as indicated in Fig. 1, and it will be found on switching on the loud-speaker that the disc rotates slightly on its axis as a result of the sound pressure.

It can be shown from the theory of the action that the deflection produced by a given sound wave is greatest if the disc is initially suspended at an angle of 45

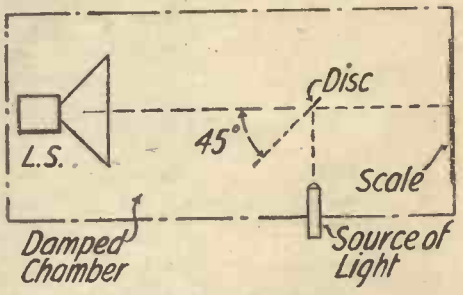


Fig. 2. Deflection is greatest if the disc is suspended at an angle of 45°

degrees with the direction of the sound as indicated in Fig. 2.

The disc must, of course, be very light and the suspension must have practically no stiffness, so that the very slightest breath of air is capable of causing the disc to rotate. The deflection of the disc is proportionate to the cube of the diameter, so that if we double the diameter of the disc we obtain eight times the deflection. On the other hand, the possibility of interference by draughts and other extraneous influences is increased, while it is difficult to make a disc light and perfectly plane if the diameter is increased beyond a certain amount. Generally a disc of between 1 in. and 2 in. in diameter is sufficient to give a good deflection on normal loud-speaker strength.

It must be remembered, of course that over those portions where one is particularly interested in a loud-speaker characteristic the sound pressure is likely to be small. Such points, for example, as the

(*Continued on page* 606)

MODERN VALVES A USEFUL GUIDE

A list that will enable you to see at a glance suitable types for your set

TWO-VOLT, THREE-ELECTRODE

Make	Type	Impedance	Amp. Factor	Make	Type	Impedance	Amp. Factor	Make	Type	Impedance	Amp. Factor
Dario ...	Resist.	60,000	30	Cossor ...	210HF	20,000	20	Osram ...	P215	5,000	7
Mazda ...	H210	59,000	47	Triotron ...	T10	20,000	9	Six-Sixty ...	220P	4,800	7.2
Lissen ...	H210	58,000	35	Triotron ...	HD2	20,000	16	Lissen ...	P220	4,700	7
Six-Sixty ...	210RC	55,500	39	Six-Sixty ...	210LF	12,500	10.6	Dario ...	SP	4,500	9
Mullard ...	PM1A	51,000	36	Cossor ...	210LF	12,000	10	Mullard ...	PM2	4,400	7.5
Cossor ...	210RC	50,000	36	Marconi ...	L210	12,000	11	Cossor ...	220P	4,000	8
Marconi ...	H210	50,000	35	Mullard ...	PM1LF	12,000	11	Triotron ...	UD2	3,750	6
Osram ...	H210	50,000	35	Osram ...	L210	12,000	11	Mazda ...	P220	3,700	12.5
Triotron ...	WD2	46,000	46	Triotron ...	TD2	11,400	8.5	Six-Sixty ...	230SP	2,750	5.5
Six-Sixty ...	210HF	25,000	19	Six-Sixty ...	225D	11,000	13.5	Dario ...	Hyper	2,700	5
Marconi ...	HL210	23,000	20	Mullard ...	PM2DX	10,700	13.5	Mullard ...	PM252	2,600	5.4
Osram ...	HL210	23,000	20	Dario ...	Univ.	10,000	9	Marconi ...	P240	2,500	4
Mullard ...	PM1HF	22,500	18	Lissen ...	L210	10,000	10	Osram ...	P240	2,500	4
Dario ...	Super HF	21,000	25	Mazda ...	L210	10,000	15.5	Cossor ...	230XP	2,000	4
Lissen ...	HL210	21,000	18	Triotron ...	SD2	6,250	5	Mazda ...	P240	1,900	7
Mazda ...	HL210	21,000	26	Marconi ...	P215	5,000	7				

TWO-VOLT, FOUR-ELECTRODE (SCREENED-GRID)

Dario ...	SG	250,000	250	Six-Sixty ...	215SG	220,000	190	Osram ...	S215	200,000	170
Mullard ...	PM12	230,000	200	Cossor ...	220SG	200,000	200	Mazda ...	215SG	400,000	400
				Marconi ...	S215	200,000	170				

TWO-VOLT, FIVE-ELECTRODE (PENTODE)

Lissen ...	PT225	64,000	90	Dario ...	Pent.	55,000	100	Osram ...	PT240	55,000	90
Six-Sixty ...	230PP	64,000	80	Marconi ...	PT240	55,000	90	Cossor ...	230PT	20,000	40
Mullard ...	PM22	62,500	82					Mazda ...	230Pen	—	—

FOUR-VOLT, THREE-ELECTRODE

Cossor ...	410RC	60,000	40	Dario ...	Univ.	10,000	10	Six-Sixty ...	410P	4,200	7.7
Dario ...	Resist.	60,000	30	Triotron ...	RD4	9,000	9	Cossor ...	410P	4,000	8
Marconi ...	H410	60,000	40	Cossor ...	410LF	8,500	15	Triotron ...	UD4	3,750	6
Osram ...	H410	60,000	40	Marconi ...	L410	8,500	15	Dario ...	Hyper P	2,700	5
Six-Sixty ...	4075RC	58,000	37	Osram ...	L410	8,500	15	Triotron ...	SD4	2,500	4.5
Mullard ...	PM3A	55,000	38	Triotron ...	SD4	7,700	15.5	Marconi ...	P425	2,300	4.5
Triotron ...	WD4	46,000	46	Mullard ...	PM4DX	7,500	15	Osram ...	P425	2,300	4.5
Dario ...	Super HF	21,000	25	Six-Sixty ...	410D	7,250	14.5	Triotron ...	XD4	2,200	6
Cossor ...	410HF	20,000	20	Marconi ...	P410	5,000	7.5	Cossor ...	415XP	2,000	4
Mullard ...	PM3	13,000	14	Osram ...	P410	5,000	7.5	Mullard ...	PM254	2,000	4.2
Triotron ...	AD4	13,000	13	Dario ...	SP	4,500	9	Six-Sixty ...	420SP	2,000	4
Six-Sixty ...	4075HF	12,500	13.5	Mullard ...	PM4	4,450	8	Mazda ...	P425	1,950	3.5

FOUR-VOLT, FOUR-ELECTRODE (SCREENED-GRID)

Dario ...	SG	250,000	250	Six-Sixty ...	4075HF	220,000	190	Osram ...	S410	200,000	180
Mullard ...	PM14	230,000	200	Cossor ...	410SG	200,000	200	Mazda ...	410SG	—	—
				Marconi ...	S410	200,000	180				

FOUR-VOLT, FIVE-ELECTRODE (PENTODE)

Dario ...	Pent.	55,000	100	Osram ...	PT425	50,000	100	Six-Sixty ...	415PP	27,000	60
Mullard ...	PM24A	53,000	83	Mullard ...	PM24	28,000	62	Cossor ...	415PT	20,000	40
Marconi ...	PT425	50,000	100					Mazda ...	425Pen	—	—

SIX-VOLT, THREE-ELECTRODE

Mazda ...	H607	90,000	40	Mullard ...	PM5B	33,000	40	Cossor ...	610HF	20,000	20
Cossor ...	610RC	60,000	50	Marconi ...	HL610	30,000	30	Mazda ...	HL607	20,000	20
Marconi ...	H610	60,000	40	Marconi ...	DE5B	30,000	20	Six-Sixty ...	6075HF	15,200	17
Osram ...	H610	60,000	40	Osram ...	HL610	30,000	30	Mullard ...	PM5X	14,700	17.5
Six-Sixty ...	6075RC	58,000	42	Marconi ...	LS5B	25,000	20	Six-Sixty ...	D610	9,250	18.5

(*Continued on page 596*)

SIX-VOLT, THREE-ELECTRODE (Continued)

Make	Type	Imped-ance	Amp. Factor	Make	Type	Imped-ance	Amp. Factor	Make	Type	Imped-ance	Amp. Factor
Mullard ...	PM6D	9,000	18	Mullard ...	PM6	3,550	8	Cossor ...	610 XP	2,000	5
Cossor ...	610LF	7,500	15	Cossor ...	610P	3,500	8	Mullard ..	PM256	1,850	6
Marconi ...	L610	7,500	15	Marconi ...	P610	3,500	8	Six-Sixty ...	625SP	1,780	5.8
Osram ...	L610	7,500	15	Osram ...	DEP610	3,500	8	Mazda ...	P650	1,750	3.5
Marconi ...	DE5	7,000	7	Marconi ...	LS5A	2,750	2.5	Marconi ...	P625A	1,600	3.7
Marconi ...	LS5	6,000	5	Mazda ...	P625B	2,500	7	Mazda ...	P625A	1,600	4
Osram ...	LS5	6,000	5	Marconi ...	P625	2,400	6	Osram ...	P625A	1,600	3.7
Six-Sixty ...	610P	6,000	7.2	Osram ...	P625	2,400	6	Marconi ...	LS6A	1,300	3
Marconi ...	DE5A	4,000	3.5					Osram ...	LS6A	1,300	3

SIX-VOLT, FOUR-ELECTRODE (SCREENED-GRID)

Cossor ...	610SG	200,000	200	Marconi ...	S610	200,000	210	Marconi ...	S625	175,000	110
Mullard ...	PM16	200,000	200	Osram ...	S610	200,000	210	Osram ...	S625	175,000	110

SIX-VOLT, FIVE-ELECTRODE (PENTODE)

Mullard ...	PM26	25,000	50

MAINS VALVES, 8 VOLT (DIRECTLY HEATED)

Marconi ...	S.8	200,000	160	Osram ...	H.8	55,000	40	Osram ...	HL.8	17,000	17
Osram ...	S.8	200,000	160	Marconi ...	D.8	21,000	14	Marconi ...	P.8	6,000	6
Marconi ...	H.8	55,000	40	Osram ...	D.8	21,000	14	Osram ..	P.8	6,000	6
				Marconi ..	HL.8	17,000	17				

MAINS VALVES, 4 VOLT, 1 AMPERE (INDIRECTLY HEATED)

Mullard	S4V	1,330,000	1,000	Mullard ...	354V	14,000	35	Cossor ..	M41P	5,000	10
Mazda ...	AC/SG	600,000	1,200	Mazda ...	AC/HL	13,500	35	Six-Sixty ..	SS4P	3,000	10
Cossor ...	MSG41	200,000	400	Cossor ...	M41LF	7,900	15	Mullard ...	104V	2,850	10
Cossor ...	M41RC	20,000	35	Six-Sixty ...	SS4Det	7,000	16	Mazda ...	AC/P	2,650	10
Six-Sixty ...	SS4GP	14,500	35	Mullard ...	164V	6,650	16	Cossor	M41 XP	2,000	4
Cossor ...	M41HF	14,000	25					Mazda ..	AC/P1	2,000	5

OUR INFORMATION BUREAU

RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. See announcement below. Address Queries—AMATEUR WIRELESS Information Bureau, 58/61 Fetter Lane, London, E.C.4

Chattering Cone Loud-speaker

Q.—*I have constructed the "Best-Yet" cone loud-speaker, and find that when dealing with heavy passages of music the speaker is inclined to chatter.—T. L. (Stratford).*

A.—The quality of the material for the cone diaphragm has much to do with the reproduction from the speaker, and it is quite possible that the material you have used is the cause of your trouble. You do not say whether you have used the unit we specify, but if you have used any other, the chattering may be caused by the reed inside the unit. The material with which the diaphragm is suspended has also a decided effect on reproduction.—C. B.

Screen-grid Valve Set

Q.—*I have constructed a screen-grid valve receiver to fit into a special cabinet, and now I find that it is almost impossible to prevent the set from oscillating. Are there any special features that must be given more consideration than is normally required when designing a screen-grid valve set?—F. U. (Brighton).*

A.—There are certain very important points that must be given special consideration in the design of a set such as yours, and the screening of the H.F. stages is not the most important. If there are any two wires parallel that belong to different H.F. circuits, then these will cause sufficient interaction to make the receiver oscillate. We suggest you go over the wiring of your set with the above points in mind and, above all, see that your screening is sound between the various circuits. An incomplete screen may account for considerable trouble. Do not allow the aerial lead-in wire to run anywhere near the H.F. circuits or tuning coils.—A. L.

When Asking Technical Queries

PLEASE write briefly and to the point

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped addressed envelope and the coupon which will be found on the last page. Rough sketches and circuit diagrams can be provided for the usual query fee. Any drawings submitted should be sent on a separate sheet of paper. Wiring plans and layouts cannot be supplied.

Screened Wavetraps

Q.—*I have been in the habit of using a wavetrap to cut out interfering signals, but having read of a screened wavetrap, I am wondering whether such an instrument would be an improvement.—F.O. (Rye).*

A.—There is little point in using a screened wavetrap unless it is needed to obviate interference due to "shock-effect" reception from some powerful near-by station. When shock-effect reception is experienced, it is usually necessary to screen the whole receiver, so that a screened wavetrap holds no advantages over the ordinary unscreened type unless the receiver itself is also screened. If you reside within a mile or so of your local station and you wish to get other stations farther afield, then, provided your receiving set is screened, a screened wavetrap will be useful.—A. D.

BROADCAST TELEPHONY

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

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
		GREAT BRITAIN	
25.53	11,751	Chelmsford (5SW)	15.0
*200	1,500	Leeds (2LS)	0.13
*242	1,238	Belfast (2BE)	1.0
*261	1,148	Newcastle (5NO)	1.0
288.5	1,040	Swansea (5SX)	0.13
288.5	1,040	Stoke-on-Trent (6ST)	0.13
288.5	1,040	Sheffield (6LF)	0.13
288.5	1,040	Plymouth (5PY)	0.13
288.5	1,040	Liverpool (6LV)	0.13
288.5	1,040	Hull (6KH)	0.13
288.5	1,040	Edinburgh (2EH)	0.35
288.5	1,040	Dundee (2DE)	0.13
288.5	1,040	Bournemouth (6BM)	1.0
288.5	1,040	Bradford (2LS)	0.13
*301	995	Aberdeen (2BD)	1.0
*310	968	Cardiff (5WA)	1.0
*356	842	London (2LO)	2.0
356	842	Brookman's Park	20 0
*377	797	Manchester (2ZY)	1.0
*399	753	Glasgow (5SC)	1.0
*479	626	Daventry (5GB)	25.0
*1,554	193	Daventry (5XX)	25.0
		AUSTRIA	
*246	1,220	Linz	0.5
*283	1,058	Innsbruck	0.5
*352	851	Graz	7.0
*453	666	Klagenturt	0.5
*517	581	Vienna	15.0
		BELGIUM	
216	1,391	Charleroy (LL)	0.25
250	1,202	Schaerbeek-Brussels	0.25
250	1,200	Ghent	0.5
280	1,071	Liége	0.1
312	961.4	Arlon	0.25
339	887	Louvain	8.0
*509	590	Brussels	1.0
		CZECHO-SLOVAKIA	
*263	1,139	Morava-Ostrava	10.0
*279	1,076	Bratislava	12.5
*293	1,022	Kosice	2.0
*342	878	Brunn (Brno)	2.4
*487	617	Prague (Praha)	5.0
		DENMARK	
*281	1,067	Copenhagen (Kjobenhavn)	0 75
1,153	260	Kalundborg	7.5
		ESTHONIA	
*297	1,010	Reval (Tallinn)	0.7
		FINLAND	
*221	1,355	Helsingfors	0.9
*1,796	167	Lahti	40.0
		FRANCE	
211.3	1,420	Béziers	0.1
224	1,364	Fecamp (Radio Normanie)	0.5
238	1,260	Bordeaux (Radio Sud-Ouest)	1.0
280	1,256	Radio Nimes	0.25
*255	1,175	Toulouse (PTT)	1.5
*265	1,130	Lille (PTT)	0.7
268	1,121	Casablanca	0 5
*272	1,103	Rennes (PTT)	0 5
277	1,083	Pic du Midi de Bigorre (weather forecasts 9 p.m.)	
*280		Montpelier (PTT)	0.2
288.5	1,040	Mont de Marsan	0.3
202	1,026	Radio Lyons	0 5
*294	1,020	Limoges (PTT)	0.5
304	986	Bordeaux (PTT)	1.0
305.6	981.7	Agen	0.25
309	970	Radio Vitus	1 0
*316	950	Marseilles (PTT)	0.5
326.5	918.9	Grenoble (PTT)	0.5
331.4	905	Petit Parisien	0.5
345	869	Strasbourg	0.1
364	824	Algiers	2.0
368	815	Radio LL (Paris)	0.5
*381	788	Radio Toulouse	8.0
411	729	Radio Maroc (Rabat)	2.0
436	687	Radio Flandre (Lille)	0.1
447	671	Paris (Ecole Sup. PTT)	1 5
468	640	Lyons (PTT)	5.0
1,350	222	Tunis (Kasbah)	0.6
1,444	207.5	Eiffel Tower	12.0
*1,725	174	Radio Paris	12 0
		GERMANY	
*218	1,373	Flensburg	0 5
*227	1,319	Cologne	4.0
*234	1,283	Muenster	3.0
*239	1,256	Nurnberg	2.0
*246	1,220	Kiel	0.35
*246	1,220	Cassel	0.25
*253	1,184	Gleiwitz	2.0
*259	1,157	Leipzig	1.5
*270	1,112	Kaiserslautern	0 25
*276	1,085	Koenigsberg	2 5
*283	1,058	Magdeburg	0.5
*283	1,058	Berlin (E.)	0.5
*283	1,058	Stettin	0.5
*319	941	Dresden	0.25
*325	923	Breslau	1 5
*339	887	Bremen	0.35
*360	833	Stuttgart	1 5
*372	806	Hamburg	1 5
*390	770	Frankfurt	1.5
*418	716	Berlin	1.5
*453	662	Danzig	0.25
*456	657	Aachen	0.35
*473	635	Langenberg	13.0
*533	563	Munich	1 5
*560	536	Augsburg	0.25
*560	536	Hanover	0.35
570	527	Freiburg	0.35
*1,635	183.5	Zeesen	30.0
2,100 / 2,290	142 / 131	Norddeich	10.0
		GRAND DUCHY	
223	1,346	Luxembourg	3.0
		HOLLAND	
31.4	9,554	Eindhoven (PCJ	25.0
*298	1,004	Hilversum (until 5.40 p.m. G.M.T.)	6.5
*1,071	280	Hilversum	6.5
*1,079	280	Scheveningen-Haven (from 10.30 a.m. to 5.40 p.m. B.S.T.)	5.0
*1,875	160	Huizen (after 5.40 p.m. G.M.T.)	6.5
		HUNGARY	
550	545	Budapest	20 0
		ICELAND	
*1,200	250	Reykjavik	1.0
		IRISH FREE STATE	
*225	1,337	Cork (1FS)	1 0
*413	725	Dublin (2RN)	1.0
		ITALY	
248	1,209	Trieste (testing)	1.0
*274	1,094	Turin (Torino)	7.0
*320.3	908	Naples (Napoli)	1.5
*385	779	Genoa (IGE)	1.0
*441	680	Rome (Roma)	3.0
453	662	Bolzano (IBZ)	0.3
*501	599	Milan (Milano)	7.0
		YUGOSLAVIA	
*321.4	977.3	Zagreb (Agram)	0 7
*429	698	Belgrade	2.5
575	521.7	Ljubljana	2.5
		LATVIA	
*525	572	Riga	3.0
		LITHUANIA	
*1,935	155	Kovno	7.0
		NORWAY	
240	1,250	*Rjukan	0.18
*283	1,058	Notodden	0.5
*365	820	Bergen	1.0
*394	761	Frederiksstad	0.7
453	662	Tromsoe	0.1
453	662	Aalesund	0.3
453	662	Porsgrund	0.7
*493	608	Oslo	1.5
		POLAND	
*313	959	Cracow	0.5
*335	896	Posen	1.2
385	779	Wilno	0.5
*408	734	Kattowitz	10.0
*1,411	212.5	Warsaw	8.0
		ROUMANIA	
*394	761	Bucharest	0.12
		RUSSIA	
*351	855.5	Leningrad	1.0
*427	702.5	Kharkov (NKO)	4.0
*483	621.5	Homel	1.2
*825	364	Moscow (PTT)	20.0
1,060	283	Tiflis	10.0
1,000	300	Leningrad	20.0
1,103	272.7	Moscow Popoff	40.0
*1,304	230	Kharkov	4.0
		SPAIN	
251	1,193	Almeria (EAJ18)	1.0
268	1,121	Barcelona (EAJ13)	10.0
314	956	Oviedo (EAJ19)	0.5
*349	860	Barcelona (EAJ1)	8.0
*368	815	Seville (EAJ5)	1.5
403	743	San Sebastian (EAJ8)	0.5
*424	707	Madrid (EAJ7)	2.0
453	662	Salamanca (EAJ22)	1.0
		SWEDEN	
231	1,301	Malmo	0.6
*257	1,166	Hoerby	10.0
270	1,112	Trollhattan	0.45
*322	932	Goeteborg	10.0
322	932	Falun	0.5
*436	689	Stockholm	1.5
*542	554	Sundsvall	0.6
*770	389	Ostersund	0.6
1,200	250	Boden	0.6
*1,348	222.5	Motala	30.0
		SWITZERLAND	
*403	743	Berne	1.0
*459	653	Zurich	0.63
466	644	Zurich (during afternoon)	0.63
680	442	Lausanne	0.6
760	395	Geneva	0.25
1,010	297	Basle	0.25
		TURKEY	
*1,200	250	Stamboul	5.0

All wavelengths marked with an asterisk have been allotted according to the *Plan de Prague*.

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY

Oct. 21 "Points of View" (4), by Mr. H. G. Wells.
„ 22 A vaudeville programme.
„ 25 An orchestral concert from the Queen's Hall.
„ 26 An old-time vaudeville programme.

DAVENTRY EXPERIMENTAL (5GB)

Oct. 22 *The Monkey's Paw*, a story by W. W. Jacobs dramatised by Louis N. Parker.
„ 24 An Edward German programme.
„ 25 A vaudeville programme.

NEWCASTLE

Oct. 22 A local revue.

GLASGOW

Oct. 24 A programme of musical comedy and light opera.
„ 26 Running commentary on Wales v. Scotland International Association Football Match.

BELFAST

Oct. 24 *The Faithful Sentinel*, an opera: music by Franz Schubert.

Address Wanted.—Will the Rev. M. McDonnell, of St. Mary's Cathedral, send his full address to the Regent Radio Supply Co., to whom he sent an order with cheque.

"THE MUSIC LEADER" (Continued from page 586)

free. As usual, however, a small reproduction of the print is given on page 586, and this will be a further aid to construction.

Components

A list on page 585 shows the parts needed for making up the receiving section of the "Music Leader." As usual, after each component, a number of alternative makes are mentioned. The first mentioned make is that actually used in the original receiver, and illustrated by the accompanying photograph. Following, are a number of alternatives which can be used if the constructor prefers, and only minor alteration will be necessary, but it is most unwise to deviate from the list of alternatives given.

The blueprint is most useful in that it is full size, and thus can be used as a template for panel drilling and the mounting of the components. It shows each wire in its correct position (though not in every case is it possible to give each wire in its correct length), and can be used as a helpful final check when all the wiring is done and it remains only to see that each wire is correctly put in place. Here is the blueprint free for your benefit, so make the most use of it in the construction of the "Music Leader."

Follow closely the list of components in conjunction with the components' list and blueprint, so that everything will be ready for the simple constructional details which will be given next week.

Details will be given for making up the receiver section only, and when this is complete, it can be tried out as a unit when the frame aerial is wound, and before the linen-diaphragm loud-speaker is finished, if desired. The construction of the complete receiver "chassis" and cabinet will be given in easy stages.

On View in London

In the meantime, it should be noted that the "Music Leader" is being shown in the Somerset Street windows of Messrs. Selfridge & Co., Ltd., wherein each week a current AMATEUR WIRELESS receiver is displayed. All London readers should take advantage of the opportunity to see the "Music Leader," for the appearance of the complete self-contained set, ready to work, is more convincing than many photographs or pages of written matter.

And make sure of next week's issue, for further constructional details.

The free blueprint gives full particulars and dimensions of each part of the "Music Leader." On the extreme left will be seen the linen-diaphragm loud-speaker, the two frames and back batten being clearly shown. Next the screening box shown in detail, every dimension being given and the box shown in perspective so that no difficulty whatsoever should be experienced in making it. The frame aerial is wound on a rectangular frame, particulars of which are given in a small drawing at the top right-hand side of the print. Inside the frame are two fillets upon which the receiver itself is supported. To the extreme right is shown the cabinet of the "Music Leader." All dimensions are given so that no difficulty will be experienced in making it up. Below, in the main portion of the print, is shown the receiver section, full size. Dotted lines show the connections to the frame aerial. Receiver, cabinet, frame aerial, and loud-speaker all on one *free* blueprint.

FULL arrangements have already been made by the B.B.C. for the broadcast of the Cenotaph Service on Armistice Day (November 11), the transmission being almost exactly the same as last year. The broadcast will be carried out by all B.B.C. stations, including 5SW. Although no general authority can be given for its re-diffusion, it is not felt that objection should or would be raised if the service is rebroadcast in a church. The responsibility for any questions of copyright, however, must be left to the person or persons undertaking the re-diffusion of the broadcast.

A special revue of a humorous character dealing with the North-east Coast Exhibition will be broadcast from the Newcastle station on October 22. Councillor Arthur Lambert, the Lord Mayor of Newcastle, is taking part in the performance, in which he will sing a song, "Northumberland," specially composed by the Lady Mayoress.

On November 7 listeners to 2LO and 5XX will be given the thrills of the speedway, as the B.B.C. will convey them on that evening to a contest at the Wembley Stadium.

Michael, a Russian play in three scenes, by Miles Malleson, and based on one of Leo Tolstoi's tales, will be presented through 5GB on October 29.

Airy Nothings, a burlesque from the pen of Gordon McConnel, has been brought up to date in a second edition. Amongst other "hits" at the B.B.C. programmes, it makes fun of the Schneider Trophy commentary and the weekly "surprise items." It will be heard from 2LO and 5XX on October 21.

On October 18 the Freedom of the City of London is to be presented to Lieut.-General Lord Baden-Powell. The proceedings will be relayed from the Guildhall to 2LO and 5XX.

London and Daventry, and all stations taking the London programme, on November 14 will broadcast the speeches made at the Peace Commemoration Dinner organised by the League of Nations Union. The speakers will be Lord Cecil, Mr. Philip Snowden, M.P., and Mr. J. C. Smuts. In the course of the broadcast the manuscript of *Journey's End* will be auctioned by Sir Herbert Morgan.

On November 14 the B.B.C. will celebrate the anniversary of its seventh birthday by the usual staff concert. It will be broadcast at the end of the evening's transmission, namely, towards 10 p.m. Listeners will be compelled to guess the names of the authors and of those assisting in the performance, for they are being kept a closely-guarded secret.

On October 6 another change-over in wavelengths took place between the Dutch transmitters; Hilversum, until 5.40 p.m. G.M.T. now broadcasts on 298 metres, and from that hour until closing time on 1,075 metres. Huizen, on the other hand, works on 1,875 metres throughout the day. Scheveningen-Haven, the commercial telephony transmitter, broadcasts from early morning until 5.40 p.m. on 1,071 metres.

With the coming of winter-time, listeners should bear in mind that France, Belgium, and Spain have simultaneously returned to G.M.T. Holland, however, is still twenty minutes in advance of Great Britain, and countries working on Central

(*Continued on next page*).

"RADIOGRAMS" (*Continued*)

European Time—e.g., Scandinavia, Germany, Austria, Italy, and so on—one full hour.

On October 31, until the opening of the Moorside Edge (Huddersfield) North Regional transmitter, Newcastle will be compelled to broadcast on the national common wavelength of 288.5 metres, and during that period will not be able to transmit its own programmes. Later, however, when the new regional station takes over the north of England service, a wavelength will be allotted to the Newcastle transmitter when local entertainments can again be given.

The Rome broadcasting station now regularly transmits photographs on the Fulton system on Fridays, Saturdays, and Sundays between 10 and 10.18 p.m. G.M.T., and again on Fridays at 6.30 p.m. G.M.T.

Tests emanating from Radio Luxemburg (Grand Duchy) on 223 metres are best heard between 9 and 10 p.m. G.M.T.

French wireless papers report that Brockmans Park announces itself as "London *Bridge* calling!" They do not say whether other bridges have protested, but we are inclined to believe that this favouritism might make Charing Cross!

The Canadian National Railways has adopted broadcasting as one of its chief aids in attracting settlers to the 240,000,000 acres of good farming land yet to be cultivated. The Canadian Northern Railway has established thirteen broadcasting stations to offset the lack of entertainment on isolated Canadian farms.

One of the features of the recent New York radio show was the release of a large silver balloon flown from the roof of the building. A radio valve and a letter was attached, and a cheque of one hundred dollars will be sent to whoever picks it up when the balloon finally completes its flight.

It is understood that the stay of the Post Office detection van in Glasgow and district may extend to six months or longer. Glasgow alone has a population estimated at round 1¼ millions, while there are very populous areas outside the city, yet the district only boasts some 60,000 receiving licences. One in every four houses is believed to be equipped for wireless reception, and the officials accompanying the van are armed with lists of suspected houses. Much interest is being taken by the populace in the results of this "big push" against pirates.

With the disbanding of the Glasgow station orchestra, the B.B.C. has entered into contracts with the Scottish Orchestra and the Reid Orchestra. Seven concerts by the former will be broadcast from St. Andrew's Hall, Glasgow, and five by the latter from the Usher Hall, Edinburgh. Of these, 60 per cent. will include works by Scottish composers.

"MEASURING LOUD-SPEAKER VOLUME"

(*Continued from page* 592)

bass and treble registers where a cut-off is beginning to occur are points which require investigation, and the Rayleigh disc must therefore be sufficiently sensitive to respond to these frequencies. This means that during the middle registers the deflection may be quite large.

It is certainly an interesting experiment to try fitting up a disc in one's home where it is not necessary to take the elaborate precautions for measuring the deflections and for ensuring absolute accuracy. A disc 1 in. diameter placed 2 ft. away from a loud-speaker giving normal strength will rotate 10 or 15 degrees. It is necessary to enclose the apparatus to some extent in order to shield the apparatus from draughts, and, of course, care must be taken to avoid reflections from the side if an accurate measurement is being taken. For a rough test as a home experiment this is not necessary. Thin mica or white card is quite satisfactory.

Where an actual measurement has to be taken it is necessary to devise means of measuring the actual deflection. One method of doing this is to stick very small mirrors on the centre of the disc and to reflect light from a suitable source on to a scale. A spot of light appears at a certain part of the scale when the apparatus is at rest, and this moves along the scale a certain distance when the sound is applied from the loud-speaker. In some cases it is possible to dispense with the use of mirrors by using a highly polished mica disc which has sufficient reflective power to act as a mirror in itself.

If, of course, one places the disc closer to the loud-speaker than 2 ft., then quite large deflections can be obtained. The disadvantage of placing the disc so close is that it accentuates the unevenness of the radiation from an average loud-speaker.

This was brought out by a recent experiment which I conducted by the method just described The radiation of the loud-speaker was measured on the axis, and it was tolerably uniform up to about 3,000 cycles, when a very sharp cut-off occurred. At first sight, therefore, one would say that the loud-speaker was very poor, whereas actually it was known to radiate quite efficiently at frequencies over 8,000 cycles per second. The reason for the apparent difference was, of course, that the higher frequencies were not radiated axially, but were shot out at an angle, and therefore, listening some distance away, it was possible to hear all the frequencies more or less rendered together. Any measurement, therefore, made on a loud-speaker must take into account this discrepancy between the radiations at different angles, and it is indeed largely due to this source of error that loud-speaker curves are not more frequently published than at present.

"THE TRUTH ABOUT THE SCIENCE MUSEUM SET"

(*Continued from page 579*)

from the roof. This is 27 ft. long, is made of lead-covered sheet iron, coated over for a thickness of ¼ in. with pitch. This is attached to a Western Electric drive of the type used for "talkies." I heard this instrument working with the set properly controlled, and my own frank opinion is that it is as good as anything I have ever heard; but if the volume is too great, then it is certainly not perfect. Worked properly, the reproduction is entirely natural, although a frequency curve shows that some of the bass is missing. I do not think that the Museum authorities will be able to improve on this loud-speaker's reproduction, at least for another five years.

The other loud-speaker is the original McLachlan moving-coil instrument. Frankly, I do not think it is so good as the horn speaker. On the one hand, it is the original model, and is therefore fairly old, and has earned museum status; on the other hand, it is every bit as good as many other moving coils I have heard. A third loud-speaker demonstrated is the Amplion Lion. This is shown because it is the type of speaker an average man can have, as distinct from the 27-ft. horn and the original McLachlan. A simple change-over switch brings each loud-speaker into circuit in turn.

The hall in which the loud-speakers are installed is far from ideal. It is comparatively bare and full of echo. But a triple-thickness of canvas put up as a screen at one end of the hall, and facing the orifice of the horn speaker, has done much to alleviate the echo.

A few weeks ago the horn speaker started to "buzz" very badly, and it did not at first seem obvious how this could happen. Then they took the giant horn down from its hangings, separated the unit, and located the culprit—a fly! This must have crawled up the horn when the set was not working, and must have been killed at once by the vibration when the set was switched on.

The set is in operation on most afternoons, including Sundays, and the opportunity to hear it makes an interesting experience for Londoners. It is not an "everyman" set, but it is a wonderful demonstration set, and it has *never broken down*. That is more than most of us can claim!

In connection with the new Leningrad high power broadcasting station, the Soviet Authorities in that city have installed a Dramatic Studio, capable of seating some 2,000 spectators. Built to serve as a theatre, it will be used for the relay of musical and other plays. Arrangements are also being made for the demonstration of television transmissions.

LETTERS TO THE EDITOR

The Editor does not necessarily agree with the views expressed by correspondents.

H.T. Battery Wastage

SIR,—I am interested in the letters *re* this bugbear. One correspondent says he has not had 42 days' service. I have had six batteries between May 1 and September 20. The last two batteries ran out in about 8 hours' service. By this I mean 1½ hours on Sunday, 3 hours on Monday, 3 hours on Tuesday, and a dead stop on Wednesday. These were 108-volt batteries. The valves were 2-volt, three HL210's, DEH210, DEP215. The set has been returned to the makers twice for overhaul on their suggestion. As I paid carriage both ways, the cost for carriage has been about 30s., and the cost for new batteries, 108-volt at 15s. 6d. each, about £3 17s. 6d. When I mention six batteries used up, I am including the original one in the set when purchased complete. I have paid for five new batteries in less than five months. In an effort to save wastage, I have taken out the plugs from H.T., L.T., and grid-bias battery when not in use, even for a quarter of an hour. If any reader can beat this or can suggest what is wrong I will bless him. B. (Birkdale).

Faulty Components

SIR,—I am an old reader of your paper, having taken it in since No. 1. I feel I would like to comment upon the article by "Thermion" in a recent issue *re* faulty components and the general willingness of the trade to rectify same. The following are my recent experiences. About a month ago I made up "Britain's Favourite Three" of nearly all new components, and although I got this set to work, all I could get was 5XX, and I could not get the slightest reaction.

My slight knowledge as to the reason soon being exhausted, I took this set to where I purchased the parts (one of the largest dealers in Birmingham), who assured me they would soon be able to put it right; anything faulty they would replace. A few days later I called for the set, and was assured that it was working perfectly.

You can imagine my surprise, upon reaching home, to find the set whistled frightfully and no reaction. I complained to this firm, who said it was all right at their shop. Not being able to improve matters, I wrote to AMATEUR WIRELESS "Information Bureau," explaining matters, and was advised to try a new H.F. choke. This I purchased locally, expecting to cure matters, but upon fitting same *I could not get a sound.* Testing this with phones and battery, I found it was no good; so I took it back, but they would not change it

(*Continued on page* 611)

FULL-SIZE BLUEPRINTS

Each blueprint shows the position of each component and every wire, and makes construction a simple matter. Copies of "Amateur Wireless" and of "Wireless Magazine" containing descriptions of all these sets can be obtained at 4d. and 1s. 3d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets.

CRYSTAL SETS

All these 6d. each, post free.

A Daventry-local Crystal Set	AW185
Centre-tap Set	WM50

ONE-VALVE SETS

All these 1s. each, post free.

Hartley DX	AW27
Ultra-sensitive Hartley One	AW103
Super Reinartz One	AW127
Long-range Hartley	WM54
Special One	WM110
Reinartz One	WM127
The A.1	WM153

TWO-VALVE SETS

All these 1s. each, post free.

Wide-World Short-wave (D, Trans)	AW11
Rover 2 (HF, D)	AW53
General-purpose 2 (D, Trans)	AW55
DX Headphone Two (HF, D)	AW134
Ace of Twos (D, Pentode)	AW143
Home Two (D, Trans)	AW146
Globe DX Two (SG, D)	AW157
East to West Short-wave Two (D, Trans)	AW159
Auto Two (D, Trans)	AW174
All Mains Two (D, Trans)	AW180
Loud-speaker America Two (D, Pentode)	AW190
Talisman Two (D, Trans)	AW194
Hyper-selective Two (D, Pentode)	AW198
Q-coil 2 (D, Trans)	WM62
Crusader (D, Trans)	WM69
Flat-dweller's 2 (HF, D)	WM76
Two-Daventry Two (D, Trans)	WM97
Tetrode Short-wave Two (SG, D)	WM99
Key-to-the-Ether Two (D, Pentode)	WM107
Meteor Two (D, Trans)	WM114
Clipper Two (D. Trans)	WM135
Twinflex (Reflex)	WM138
Continental Two (D, Trans)	WM143
Stay-put Two (All AC, D, Trans)	WM155
Ether Ranger (D, Trans)	WM156
A.B.C. 2 (D, Trans) with copy "W.M."	WM160 1s. 3d.

THREE-VALVE SETS

All these 1s. each, post free.

Hartley DX (D, RC, Trans)	AW63
Miniature Hartley Three	AW101
Three-valve Mains Receiver (HF, D, Trans)	AW109
British Station Three (HF, D, Trans)	AW122
Simplicity Screen-grid Three (HF, D, Trans)	AW132
Adaptable Three (D, 2 Trans)	AW139
New-style Baffle Three (D, RC, Push-pull—Price 1/6)	AW141
All-purpose Short-wave Three (D, RC, Trans)	AW147
All-Round Three (D, RC, Trans)	AW155
All Britain Three (HF, D, Trans)	AW158
Bantam Three (D, RC, Trans)	AW160
Listener's Three (HF, D, Trans) Price 4d. free with copy of "A.W."	AW169
Binowave Three (D, RC, Trans)	AW172
Clarion Three (SG, D, Trans)	AW175
1929 Favourite Three (D, RC. Trans)	AW179
Local and Continental Three (HF, D, Trans or D, RC, Trans)	AW189
Broadcast Three (SG, D, Trans)	AW192
James dual-range Three (HF, D, Trans)	AW196
All-wave High-Mag Three (Det. 2 Trans)	AW199
Knife-edge Three (D, RC, Trans)	AW201
Talisman Two-three (D, RC, Trans)	AW203
Five-guinea 3 (HF, D, Trans)	WM29
Britannia (D, RC, Trans)	WM67
Pole-to-Pole Short-waver (D, RC, Trans)	WM89
Glee-singer Three (D, 2 RC)	WM92
Aladdin Three (HF, D, LF)	WM95
All-wave Screened-grid Three (HF, D, Pentode)	WM110
Gramophone Three (D, 2RC)	WM115
Standard Coil Three (HF, D, Trans)	WM117
Festival Three (D, 2 LF-Dual Imp)	WM118
Wide-world Short-waver (SG, D, Trans)	WM120
New Year Three (SG, D, Pentode)	WM123
The Q3 (D, RC, Trans)	WM124
Lodestone Three (HF, D, Trans)	WM129
Simple Screen Three (HF, D, Trans)	WM131
Dynamic Three (A.C.—SG, D, Trans)	WM136
At Home Three (D, 2RC)	WM141
Short Wave Link (D, RC, Trans)	WM142
Binowave S.G. Three (SG, D, Trans)	WM152
Fanfare (D, Trans)	WM157
Brookman's Three (SG, D. Trans)	WM161

FOUR-VALVE SETS

All these 1s. 6d. each, post free.

Explorer Four (HF, D, RC, Trans)	AW120
Overseas Shortwaver (HF, D, 2 Trans)	AW133
Facility Four (HF, D, 2 RC—Q-coil)	AW154
Broadcast Picture Four (HF, D, 2RC)	AW163
The Orchestra Four (D, RC, Push-pull)	AW167
All Europe Four (2HF, D. Trans)	AW173
Stability Four (HF, D, RC, Trans)	AW182
Clarion All-electric Three (SG, D, Trans A,C, Rectifier)	AW200
*Music-lover's Gramo-radio (SG, D, RC, Trans.)—1s. 6d.	AW202a
*Music-lover's Gramo-radio (Loud-speaker)—1s.	AW202b
*Music-lover's Gramo-radio (Motor-board)—9d.	AW202c
Simplicity (HF, D, 2 Trans)	WM49
Trapped 3–4 (D, 2RC Paralleled)	WM61
Q-coil 4 (HF, D, Trans, RC)	WM71
Screened grid 4 (HF, D, 2RC)	WM77
Five-pounder Four (HF, D, RC, Trans)	WM91
Frame-aerial Four (HF, D, 2RC)	WM85
Touchstone (HF, D, RC, Trans)	WM109
Reyner's Furzehill Four (SG, D, 2 Trans)	WM112
Economy Screen-grid Four (SG, D, RC, Trans)	WM113
Binowave Four (SG, D, RC, Trans)	WM119
Standard-coil Four (HF, D, 2RC)	WM122
Dominions Four (2SG, D. Trans)	WM134
Short-wave Adaptor for Dominions Four	WM140
The Drum Major (HF, D, RC, Trans.	WM137
Music Player (HF, D, RC, Trans)	WM144
Arrow (SG, HF, D, Trans)	WM154
1930 Monodial (2SG, D. Trans)	WM158
All-electric Four (All AC.—SG, D, RC, Trans)	WM162

FIVE-VALVE SETS

All these 1s. 6d. each, post free.

School 5 (HF, D, 2RC)	AW85
1928 Five (2HF, D, 2 Trans)	WM46
Cataract 5 (HF, D, RC, Push-pull)	WM79
Fidelity Five (HF, D, RC)	WM130
All-wave Lodestone Five (HF, D, RC, Push-pull)	WM146

SIX-VALVE SETS

1s. 6d. each, post free.

Short-wave Super-6 (Super-het, Trans)	AW67
Adaptor for above (see miscellaneous list	AW67a
Connoisseur's Six (2HF, D, RC, Push-pull)	WM88

PORTABLE SETS

Daventry Loud-speaker Portable (2HF, D, RC, Trans)	AW107	1/6
Town and Country (HF, D, RC, Trans)	AW111	1/6
"Best-yet" Portable (SG, D, 2 Trans)	AW136	1/6
House Portable (SG, D, RC, Trans)	AW163	1/6
Arcadian Portable with Linen-diaphragm Loud-speaker (half-scale)	AW177	1/6
£5.5.0 Portable (D, Trans)	AW181	1/–
Talisman Portable (SG, D, 2 Trans)	AW184	1/6
Holiday Portable Three (D, RC, Trans)	AW188	1/–
Chummy 4 (HF, D, RC, Trans)	WM80	1/6
Chummy 4 (with modification for LS and HT)	WM80a	1/6
Pilgrim Portable (D. Trans)	WM94	1/–
Wayfarer Portable (Super-het)	WM139	1/6
1929 Chummy (SG, D, Trans, RC)	WM145	1/6
Picnic Portable (D, RC, Trans)	WM148	1/–
Enchanter Portable (2HF, D, RC, Trans)	WM150	1/6

AMPLIFIERS

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Utility (RC, Trans)	AW68
One-valve LF Unit	AW79
Super-power Push-pull	AW80
Hook on Short-wave	AW108
Purity Amplifier	AW108
Add-on Distance-getter	AW117
Screened-grid HF Amplifier	AW138
"A.W." Gramophone Amplifier (3RC)	AW162
Searcher Unit (HF)	AW176
Gramophone Amplifier (3-v.)	AW187
Super-power Unit (2 v.)	WM103
Signal Booster (HF Unit)	WM128
Auditrol Amplifier	WM132

MISCELLANEOUS

Adaptor for Short-wave Super 6	AW671	–/6
H.T. from A.C. Mains	AW73	1/–
H.T. Eliminator for A.C. (200 v. output)	AW102	1/–
L.T. and H.T. Mains Unit (DC)	AW123	1/–
Knife-edge Wavetrap	AW131	–/6
All-metal Eliminator for H.T.	AW135	1/–
Pedestal Cone Loud-speaker	AW164	1/–
Arcadian Linen-diaphragm Loud-speaker (full-size)	AW177a	1/–
D.C. Unit (H.T.)	AW178	1/–
Short-wave Adaptor (1 v.)	AW183	1/–
Gramophone Amplifier (3-v.)	AW187	1/–
High-tension Battery Charger	AW191	1/–
Mains Unit for S 8 Valves	AW193	1/–
Scratch filter	AW195	–/6
Simplest H.T. Unit	AW197	1/–
Portable Cone Loud-speaker	WM73	1/–
Simple Cone	WM111	1/–
Buzzer Wavemeter	WM121	–/6
James H.T. Unit for A.C. Mains	WM125	1/–
Lodestone Loud-speaker	WM126	1/–
James H.T. Unit for D.C. Mains	WM133	1/–
Two Ampere Low-tension Unit	WM147	1/–
A.C. Mains Amplifier	WM149	1/–
A.C. Mains Unit for All-wave Lodestone Five	WM151	1/–
H.T. Unit for A.C. Mains	WM159	1/–

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Amateur Wireless

Blueprint Dept., 58/61 Fetter Lane - E.C.4

"LETTERS TO THE EDITOR"

(*Continued from page 608*)

However, they discovered a break under the base and promptly mended it while I waited, but still it did not give any reaction. I was getting a bit fed up; so as a last resort I took this set to another local dealer.

Well, to cut matters short, a further fee—no reaction. This set was improved a little—two faulty components, a valve holder and condenser useless. I had not been able to use this! I had decided to scrap the set when a friend suggested trying his six-pin coil, and I was surprised to find that it then worked beautifully and plenty of reaction. I wrote to the makers of my coil, and they very kindly said they would replace it. F. (Birmingham).

P.S.—These faulty components have cost me about £2 more than necessary, which I can ill-afford

An Excellent Receiver

SIR,—Some time ago I sent you an inquiry with regard to the "House Portable." I had not written again, because I decided to use the unit recommended.

I am writing now to tell you that I have made up the circuit, and am delighted with it. For loudness and clearness I think it could not be beaten.

You might like to know of the following slight alterations :—

(*a*) I have made the cabinet front to open, which is a great convenience.

(*b*) Blue Spot speaker in the lid, with silk-covered fret.

(*c*) An extra lead to H.T. from power valve. I found this made a big difference.

I am greatly obliged to you for an excellent receiver. S. (Gravesend).

Hard to Beat

SIR,—I am writing to let you know of further results with "Britain's Favourite Three," 1928 design, which, as regards long-distance reception on all wavelengths, would, in my opinion, be hard to beat. On the ultra-short waves I am able to pull in W2XAF, W2XAD, W8XK, PGJ., and Zeesen on the loud-speaker, weather conditions permitting. Other stations on this waveband received and verified are 3LO, CJRX, 7LO, 2NM, Monte Grande, and a great many amateurs.

On the medium waveband I have received well over 100 different stations. With a 50CT coil and 75 for reaction I can pull 33 stations in on the loud-speaker almost any Sunday evening. On the long waves I can at least pull in another eight stations. F. (Glasgow).

GKT, the short-wave C.W. transmitter of the well-known coastal station at Portishead which handles messages to and from the big ocean-going liners, will use henceforth the wavelength of 26.5 metres in addition to the other wavelengths already adopted.

A new short-wave telegraphy station is under construction at Singora, in Siam. This station, which has been allotted the call-sign HSJ, is intended for communication with New York and Yacuiba, Bolivia, and will be equipped for C.W. transmission on the wavelengths of 12.9, 15.7, 25, and 37.4 metres.

"Modern Gramophones and Electrical Reproducers," by A. Wilson, M.A., and G. W. Webb (Cassell & Co., Ltd., London, 10s. 6d. net). To the best of our knowledge, this is the only book published up to the present which deals with gramophone technique in a scientific manner. This is not surprising when it is remembered that until a couple of years ago the gramophone was developed entirely by trial and error and that it is only since the advent of electrical recording and the application of electrical impedance methods to acoustical problems that it has been possible to put it on a scientific basis. The book covers the whole range of modern gramophone technique in a manner that is easily understandable by the average reader. It will be invaluable to the designer, and the ordinary gramophone enthusiast will find in it much practical advice to enable him to get the best out of his instrument and remedy any defects. The latter part deals very fully with pick-ups, loud-speakers, and amplifiers, and includes a section of miscellaneous hints on mechanical and gramo-radio upkeep.

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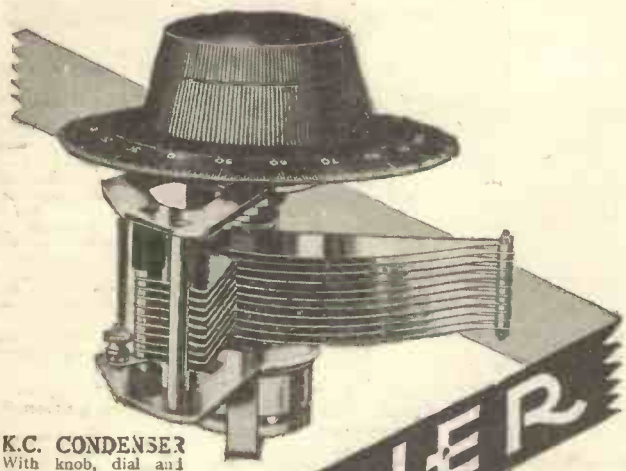

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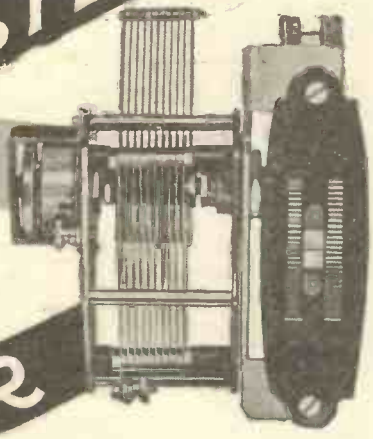

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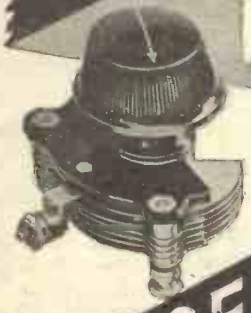

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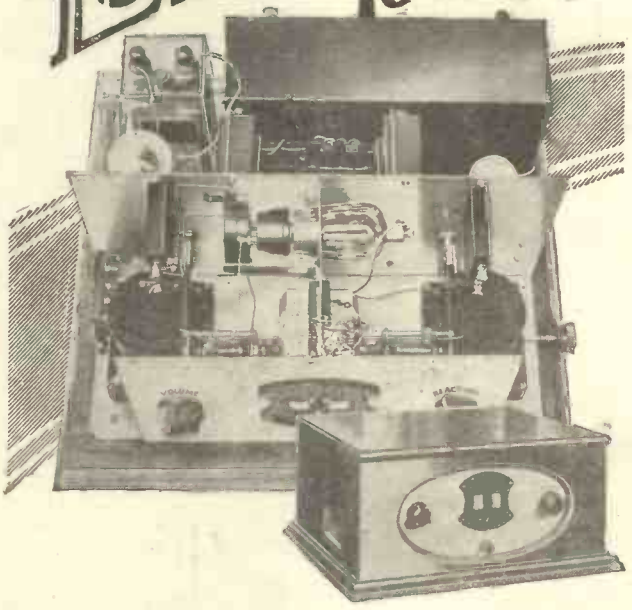

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Start building the new Lotus S.G.P. to-day. The kit contains every unit you need except valves, cabinet and batteries and can be bought at your nearest retailer's for the modest sum of £7 12s. 6d. . . . Diagrams and instructions enclosed.

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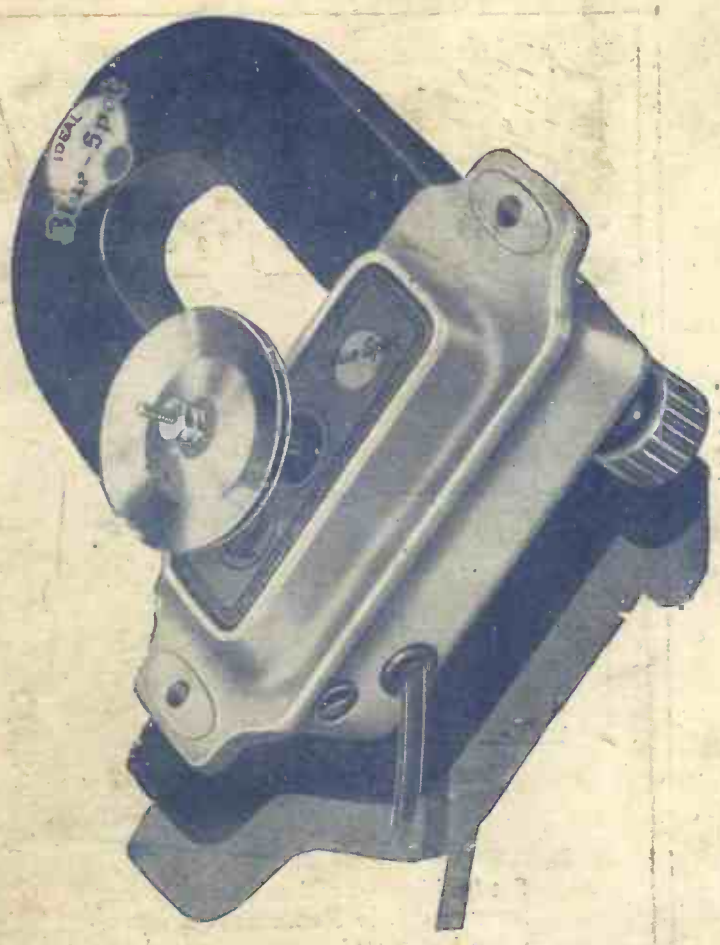

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1102

FREE BOOKLET "KIT SETS" INSIDE

Amateur Wireless

and Radiovision

Every Thursday 3d

Vol. XV. No. 385 Saturday, October 26, 1929

FREE 32-PAGE BOOK IN THIS ISSUE

Registered at the G.P.O. as a Newspaper

FOUND!

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HERE, at last, is a loud speaker that does not cheat you of half the broadcast! It finds the missing artistes! It reveals instruments hitherto silent. It gives you notes you've never heard before. It is the new Brown Duplex Loud Speaker.

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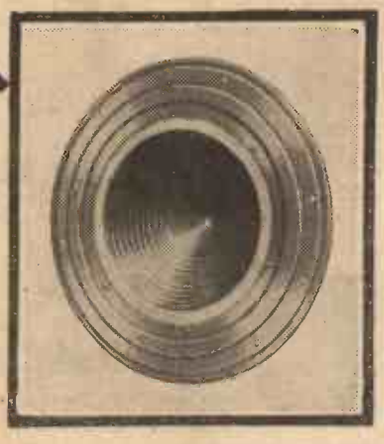

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This cone unit and assembly now permits the amateur designer to construct a super-sensitive loudspeaker which is cheaper than a factory built model whilst at the same time allowing him to use his own ideas as to the type of cabinet or baffle to be used.

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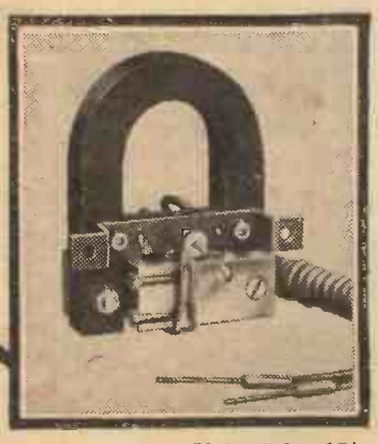

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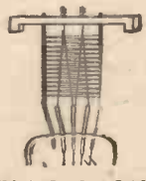
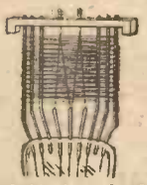


1. This is the first Grid and the double length Cossor filament. Note the seonite bridge piece.

2. Now comes the second grid locked securely in position. Every joint in this wonderful Valve is electrically welded.



3. And this shows the third grid automatically spaced at its correct distance by the seonite insulator.

4. Finally, the Anode completes the assembly and interlocks the whole unit immovable and rigid.

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OCTOBER 26, 1929 No. 385 Vol. XV

Amateur Wireless and Radiovision

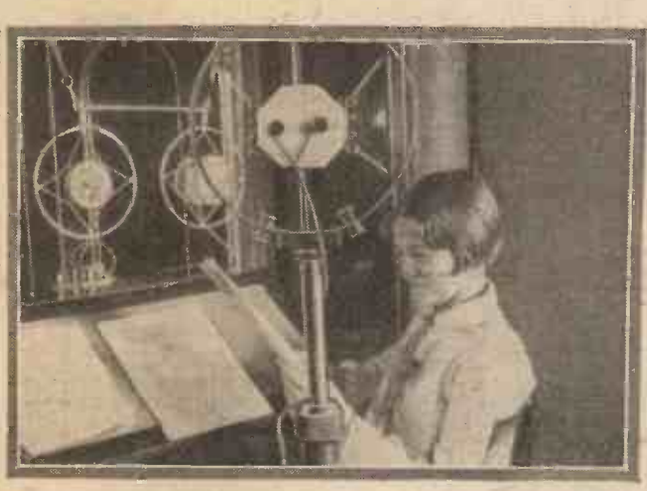
The Leading Radio Weekly for the Constructor, Listener and Experimenter

Editor: BERNARD E. JONES

Technical Editor: J. H. REYNER, B.Sc., A.M.I.E.E. :: Research Consultant: W. JAMES :: Assistant Editor: H. CORBISHLEY

Scotland Yard's Radio—The Premier in the States—A Giant S.B.—The Museum Set—Big Public Address—The Claque—B.B.C. Crystal Sets

Scotland Yard's Radio—Some time ago we had reason to comment on Scotland Yard's radio installation, which is still kept a very dark secret so far as details are concerned, and it is refreshing to note that the radio-equipped Flying Squad cars are still doing good work. Only last week a stolen car, with the thieves in it, was traced by a radio message flashed from headquarters to one of the Flying Squad sports cars. Within an hour of the car being stolen details were wirelessed to the whole Squad, and two hours later the "capture" was made.



The lady announcer of a popular Continental broadcaster—Bratislava. Only one "mike" is used at a time, of course!

The Premier in the States—From a radio "fan's" point of view, two things are noticeable in the Premier's visit to the United States. First, a big part in politics was played by the transatlantic radio 'phone service: the Premier himself made 'phone calls to the Foreign Office in London and to relatives in another part of the country. And he expressed himself very pleased with this latest radio development.

A Giant S.B.—Second, when Mr. MacDonald spoke at a big political dinner in the United States, his speech was relayed through a network of *fifty stations* throughout the United States and Canada. All other programmes at the time fixed for the speech were cancelled. This shows that our transatlantic friends are not slow to take advantage of what they think to be an epoch-making broadcast.

The Museum Set—Last week we gave details of the demonstration receiver at the South Kensington Science Museum in London, the set about which our correspondents have been writing so freely recently. And now, as we go to press, we learn that before the end of the year there is the possibility of the Museum set being entirely redesigned and arranged to work from an A.C. supply.

Big Public Address—These are the days of giant public-address events, and radio amplifiers, "mikes," and loud-speakers, all of a wireless interest, are taking the place of the man with the tin trumpet. When Prince George opened Hull's new aerodrome, for instance, Philips brought into action one of their new giant loud-speaker vans, and a crowd of over 50,000 heard every word of the opening speech. For this event a 500-watt amplifier was used, and the plate voltage of 4,000 was derived from a motor generator on the van.

The Claque—Really there is no excuse for studio audiences. Our own radio critic, Mr. Sydney Moseley, has often rated against the claque set up by studio audiences, and it is certainly very annoying to hear the folk in the studio clapping heartily at an item to which you yourself might like to "give the bird." Studio audiences admit, too, of an element of distrust. It is well-known that for the stage a "claque" is often employed to clap and cheer if a play is going badly. Barbers and newspaper boys are given free tickets for the cheaper parts of the house, on condition that they applaud "as per agreement." The claque is now very much in evidence in boosting American variety turns.

A Radio Pastor—The pastor of the village church at Kleinow, in Germany, has just been "sacked" by the congregation, and a wireless set is tuned in on Sundays to the Berlin broadcast service. The wireless set has been subscribed for! To what base uses. . . . But perhaps they don't anticipate having any collection!

Next Week—The advent of Brookmans Park (which by now should be doing the whole of the London transmission) is giving many folk "furiously to think," as the French say! "B.P." will certainly increase the interest in crystal sets, and the B.B.C. has gone so far as to publish a number of suitable circuits. These have been picked on for a special feature in next week's issue—"Crystal Sets for Brookmans Park." This is a *constructional* article telling you just how to make up the circuits advocated by the B.B.C. Old-fashioned crystal sets are not selective enough for "B.P."

PRINCIPAL CONTENTS

BROADCAST ARTISTES IN PICTURE

LILIAN KEYES.—This clever young soprano has appeared many times before the microphone and was heard most recently from 5GB on October 23. Her special forte is diction.

JOCK WALKER.—Scottish comedians are usually noted for their dry humour. Jock Walker has a wide repertoire of stories. He has broadcast on many occasions, and lately from 5GB.

THELMA PETERSEN.—Miss Petersen is equally at home in ballad or folk song. She has also a wide repertoire of classical songs and has broadcast in nearly every type of concert.

HAROLD MILLS.—A clever violinist most frequently heard from Birmingham studios. He has played at most of the big provincial concerts, as well as in London.

LINDA SEYMOUR.—Another popular vocalist, there is hardly any type of song in which Miss Seymour does not excel. She has figured prominently in the programmes of 2LO.

HALBERT TATLOCK.—A well-known dramatist of the Glasgow and Edinburgh stations. He is closely connected with the Golden Eagle Dramatic Society.

ELSIE CHAMBERS.—A young contralto, with an exceptionally wide range of repertoire, Miss Chambers figures prominently in 2LO's programme on the 24th.

FRANK CANTELL.—The leader and deputy conductor of the Birmingham studio orchestra, Mr. Cantell has also established himself as a soloist and is best known to listeners through 5GB.

ISOLDE MENGES.—One of the most famous of our women violinists Miss Menges hails from Brighton, where she made her debut with the Municipal Orchestra under Lyell Taylor.

H.T. "JUICE"—

AND SOME UNUSUAL SOURCES

In this article W. JAMES reviews the methods available of obtaining H.T. current. Many listeners will not be aware of some of the systems described which offer an interesting field for experiment

THE voltage of the high tension supplied to the anode circuits of a receiver ought to be direct and constant, or without fluctuations. Further, the supply ought to be such that the current taken by the set may increase or decrease according to the signal being received.

Distortion will be introduced if the current is limited or restricted in any way, and also if the voltage of the supply varies with the current.

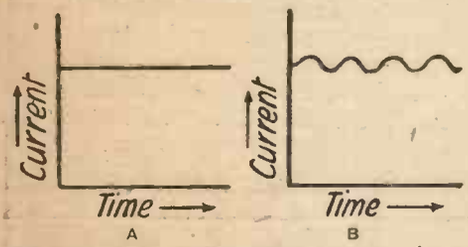


Fig. 1 (A and B). A steady direct current and a direct current with ripple

The reason for using a non-fluctuating supply is fairly obvious, for a hum or noise will be heard with the broadcast if a ripple or varying voltage is present. The diaphragm of a loud-speaker vibrates according to the current passing, and it will, therefore, produce sounds when the current varies because the supply is not suitable as well as when the variations are due to the signal being received.

Therefore the supply must be uniform, as illustrated in Fig. 1, which represents a perfectly steady current and one having a small ripple or fluctuating current superimposed. The ripple is shown as a small alternating current, and it would produce a hum according to its frequency.

Comparatively slow variations of a few per cent. will not affect the quality of the reproduction or the volume, and therefore do not matter, but large changes will affect the results. Thus a set having valves supplied from the mains will usually function as well at night as during the day time, although the voltage of the mains may not be quite the same at both periods.

Rapid fluctuations produce noise, the current variations being so rapid that audible vibrations are set up by the loud-speaker.

These points are easily understood, but there is a little difficulty, I find, in following why it is so essential that the actual voltage of the supply shall not vary as the result of a signal and, similarly, why the current shall not be restricted.

Effect of Resistance

When either of these effects are present there is resistance in the supply. This is represented in Fig. 2, which shows a supply having no resistance and another with resistance. If the first H.T. supply is feeding a receiver it will obviously supply all the current required. As the incoming signal affects the valves, and so alters the amount of the current flowing through their anode circuits, the voltage of the supply remains quite steady. This is not the case when the supply has resistance, for as the current tends to increase, for instance, the resistance acts to limit it.

Actually the voltage of the supply is varying all the time with the signal. It falls a little as the current increases above normal, therefore limiting the current.

The presence of resistance in the supply is therefore harmful, as distortion is introduced. But there is a further and, in certain respects, a more serious effect. It is this: that the voltage fluctuations are applied to all anode circuits. Thus it is that when the resistance of the supply is sufficient the circuits oscillate.

The point to notice, however, is that long before the oscillation stage is reached the signals are being distorted and either weakened or strengthened according to the arrangement of the set.

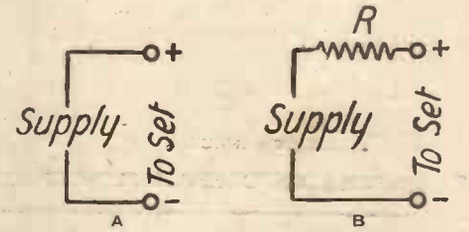


Fig. 2 (A and B). H.T. supply with and without resistance

In practice, filters may be employed to minimise the effect of resistance in the supply, and when they are well designed, resistance, if not too great, will not affect the reproduction. The filters act, in the first place, to stop low-frequency currents passing through the supply, and therefore minimise reaction effects and, secondly, help to meet current demands.

This second point is one frequently overlooked, and it means that condensers having capacities rather greater than is strictly necessary for good filtering have often to be employed.

High-tension filter circuits are indicated in Fig. 3. In Fig. 3A chokes and condensers are indicated, but because chokes are relatively expensive they are not often

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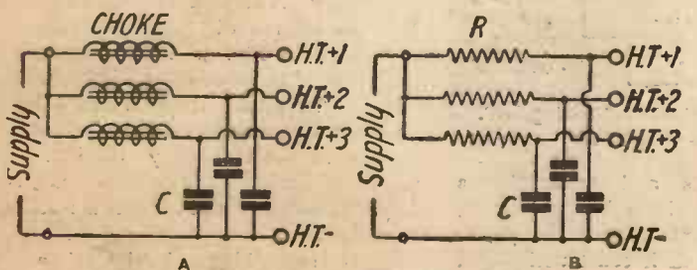


Fig. 3 (A and B). Two types of filter circuit

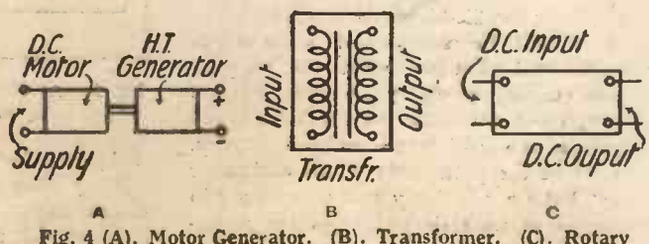


Fig. 4 (A). Motor Generator. (B). Transformer. (C). Rotary Transformer

For the Newcomer to Wireless: SHOCK EXCITATION

I HAVE often heard the expression "shock excitation" lately, and I am not quite sure what it means.

You have heard it used of atmospherics, I suppose?

Yes.

You will remember that we saw some time ago that a tuning fork could be made to vibrate if its natural pitch were produced upon another instrument at no great distance away?

Yes, I recollect that.

We said then, if you remember, that, supposing that there were a dozen tuning forks of different natural pitches, the only one that would be set vibrating when a note was sounded would be that whose pitch corresponded to the note. Well, that wasn't absolutely correct.

How do you mean?

Suppose that we have a row of tuning forks arranged in a semitone scale. If we produce at moderate strength a note equivalent to the pitch of the middle one, this fork, and no other, will "sing." But supposing that we produce the note with tremendous volume very big sound waves will be set up in the air.

That seems natural.

These waves, striking the tuning forks, will force them into vibration by sheer shock and the whole row—or, at any rate, several on either side of that whose pitch we have sounded—may begin to sing, each at its own natural pitch. That is an example of shock excitation produced by air waves. I can give you a still more striking one.

What is that?

Just go over to the piano, open the lid, and let it fall with rather a bang. . . . Well, what do you notice?

Why, a perfect medley of sound from the strings.

They were all shock excited by the crash. Don't you notice anything else? Do it again with your foot on the loud pedal.

Yes, I hear much more of the bass than of the treble strings.

Exactly. What you have produced with the piano lid is something very like an atmospheric.

How do you mean?

Well, a musical note is caused by a succession of waves of perfectly regular form—what are called sine waves. Mere noise, such as the slamming of the piano lid, occurs when sound waves have irregular shapes.

How does that apply to atmospherics?

An atmospheric—which, of course, is caused by an electrical discharge in the atmosphere—sets up wireless waves of irregular form. It has therefore no genuine note, but is heard as a crackle or a tearing noise, or something of the kind. These waves may have considerable amplitude, and when they reach the aerial the shock sets it oscillating at its natural frequency.

What is meant by natural frequency?

Well, this happens to be the frequency to which it is tuned at the time. Hence when atmospherics are about you hear them on all wavelengths.

But aren't they generally worse on the long waves?

They are. If you remember, long waves correspond to low frequencies. The long waves are, in fact, the bass notes of the wireless scale. Just as the slamming of the piano lid evoked a bigger response from the bass strings, so an atmospheric sets the aerial in more violent oscillation if its natural frequency happens to be a low one.

"H.T. 'JUICE' AND SOME UNUSUAL SOURCES"

(*Continued from preceding page*)

used in the filters for anode circuits. Resistances are much cheaper and, further, may be so chosen that they reduce the voltage of the supply to one suitable for the particular circuit to which they are connected.

Fig. 3B shows resistances and condensers. A separate feed should be used for each anode circuit when necessary, and also one for the shields of shielded valves and the extra grids of pentode valves.

When the resistance of a filter is relatively low the capacity of the condenser associated with it must be greater than normal, or the filtering action will be poor.

This will be understood when it is remembered that we want the varying anode current set up by the signal to pass through the condenser to earth, and not through the resistance to the supply. Therefore the path through the condenser must have a relatively low impedance in comparison with that through the resistance. At the same time, the capacity of the condenser ought to be such that it will hold sufficient electricity to supply sudden demands.

Fortunately, a large condenser is required for good filtering and for levelling the supply, and should therefore be used, more especially in the low-frequency or power stage. Large condensers and suitable resistances become of more importance as the frequency is reduced. Thus, if the set deals with notes having a frequency as low as 50 cycles, the filter must have a larger condenser or resistance than when the lowest note amplified is of, say, 100 cycles.

From these remarks it will be understood that for good quality the supply must have a low resistance, or when the resistance is considerable filters must be used. The

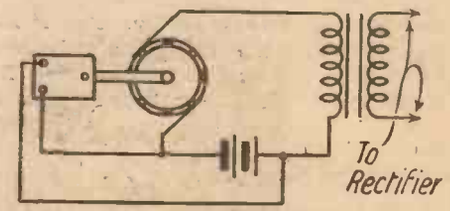


Fig. 5. Another method of obtaining H.T. from an L.T. supply

usual dry batteries and accumulators normally have a relatively low resistance, but one cannot be sure of this always, as much depends upon their construction and conditions.

Other supplies of direct current, such as D.C. mains, and the output from rotating or static machines or appliances usually have so much resistance, or are otherwise so constituted that filters must be used.

The supply must be at a suitable voltage. This is easily obtained when batteries are used by connecting a sufficient number in series. But when the source is of a fixed and unsuitable voltage it must be increased or decreased by suitable apparatus. Thus a transformer is used to provide the desired voltage when the supply is of alternating current, and a rotating machine when the supply is direct. The machine may be a motor-generator, the motor being wound for the supply so that it will drive the generator, or it may be a rotary transformer or other type.

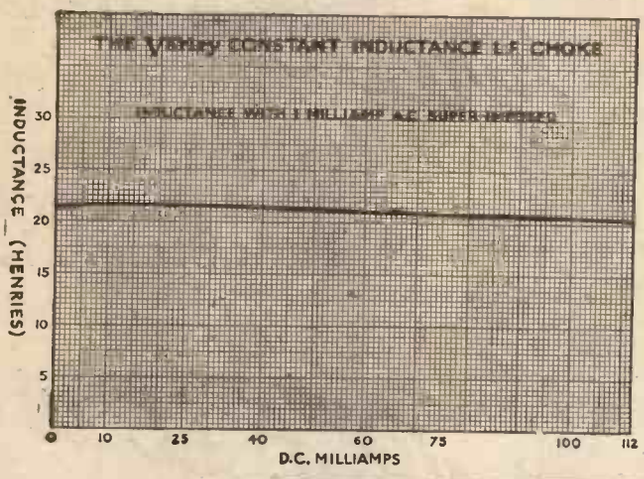
As a rule, the output from a D.C. machine is not suitable for the high-tension circuits without filtering, and a rectifier must, of course, be used with an A.C. supply. A further method of obtaining H.T. from a direct-current source is represented in Fig. 5. Here a make and break is used to interrupt a direct current. This current passes through the primary coil of a transformer, and therefore sets up voltages in the secondary winding. The current approximates to an alternating one, and must be rectified in the usual manner and smoothed.

Better smoothing circuits than are normally required for A.C. circuits must be used, however, but the method is satisfactory. The efficiency is low. Other forms of make and break may, of course, be used instead of the special commutator, and the transformer should be constructed to suit the particular method employed.

(*To be continued*)

Pages 621 and 622 are missing

THIS IS THE CURVE !



Proof—not merely possibility—that's what this curve, taken from the Varley Constant Inductance Choke, means to you.

It shows that the inductance value remains constant whatever the value of the current passing, up to the maximum of 100 m/a—quite unlike the majority of L.F. Chokes, whose inductance falls rapidly as the current is increased.

Proved results—not guess work—can be expected. The possibility of decreased inductance from increased current is entirely excluded.

And, of course, the VARLEY L.F. Choke fully complies with I.E.E. recommendations regarding apparatus used on supply mains.

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Standard L.F. Choke, 20 Henries - - - -	£1 : 0 : 0
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Exterior view of Varley Works.

For RADIO

OLIVER PELL MANUFACTURE

Varley

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

LISSEN'S NEW
POWER PENTODE
— *battery driven!*

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ANY 3-VALVE SET NOW
CAPABLE OF ALL THE VOLUME YOUR LOUD-SPEAKER WILL TAKE

ANY PORTABLE SET NOW A POWER SET

Lissen have succeeded where others have failed—Lissen have overcome the difficulties and shortcomings of the Pentode Valve and give you now a Power Pentode that takes only 7 milliamps of H.T. current and therefore can be worked off any H.T. batteries.

If you have a 2-valve receiver, replace the second valve with this new Lissen Power Pentode and you will be surprised at the volume you get. The local station will come in at double strength—distant stations that were once but a whisper come in at good loud-speaker strength.

This is something new that Lissen have given to radio—a valve that justifies Lissen's effort to develop a new and original valve.

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Simply make a connection from the terminal of the Lissen Power Pentode Valve with a piece of ordinary flex and a wander plug to the highest H.T.+ tapping in use, or to + 120 volts (whichever is the lower). Then take out your ordinary valve and put the Lissen Power Pentode in its place and listen to the amazing improvement in volume and tone.

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LISSEN

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On Your Wavelength!

Valve Design

THE past year or so have seen startling changes in the general design of valves; first came the screen-grid valve and then the pentode. This year has shown no further radical changes, apart from a general improvement in efficiency. The efficiency of a valve, whatever the type may be, is almost wholely dependent on the filament, and it is the filament of the valve which has occupied the attention of the manufacturers' research departments during the last few months. The sole function of the valve filament is, of course, the supplying of a stream of electrons which are attracted, via the grid, to the plate. In modern radio this is the only way in which electrons are provided.

Soft Valves

The all-important electron can be supplied by other means, apart from emission from the filament. In the soft valve of the early days of radio the electron supply was obtained largely by the ionisation of the gas present. The soft valve was effective and especially sensitive as a detector, but its effectiveness naturally depended on the somewhat critical amount of gas left after the vacuum process had been completed. Some valves were good sometimes, and their behaviour was irregular in comparison with modern standards. The high-vacuum valve of the period was much more reliable, but less sensitive as a detector. Filaments have been improved and improved, and the modern valve has an enormous emission at the expense of little filament current which is expended in a very high vacuum. The high vacuum makes the life of the valve much longer, and so improves the efficiency in the matter of "maintenance" expenses.

The Good Old Days

Going back further than the days of the soft valve, old-stagers will remember the early Round valves, in which the degree of vacuum was regulated by the heating up of an absorbent in the stem of the valve. You switched on the filament and the H.T., and if the valve glowed blue you knew it was too soft and required further "exhaustion." And so you switched off, struck a match, and held it gingerly against the all-to-fragile valve stem. Then you switched on the H.T. and L.T., and if the valve didn't glow, all was well. If it did, you repeated the process of "exhausting" the gases!

Reminiscences

I seem to be waxing reminiscent good and strong this week! Upon a back shelf I have a magnetic detector, an instrument which was considered to be a "marvellous advance" in radio quite a few years ago. Signals were impressed on an evenly moving band of iron wire and rectified by some kind of hysterisis effect in a magnetic field. The sensitivity was about two-thirds as good as that of a modern crystal receiver! One of these days I must take the old "Maggy" down and try it on broadcasting, connected up with my latest effort in distortionless amplifiers and a Lodestone moving-coil speaker. This will surely show up the distorting effect of an iron detecting circuit. I tried it on broadcasting some years ago with fairly satisfactory results the distortion not being very noticeable. But at that time loud-speakers and L.F. transformers were terrible, to say the least.

Gramophone Growth

In the early days of broadcasting the gramophone companies regarded the B.B.C. and its programmes with suspicion. Many people openly stated that broadcast concerts would mean the end of gramophones, whereas time has shown that broadcasting has created a stronger demand for mechanical music and, moreover, a demand for *good* mechanical music as an additional service to that supplied through the ether. The result has been that gramophone recording has improved out of all recognition, after a period of nearly twenty years of stagnation, and the design of mechanical and electrical record reproducers has progressed by leaps and bounds. Four years ago the research staff of the Columbia Gramophone Company consisted of four men, who also put in a good deal of time at "straight" recording. Now, that research staff numbers no less than one hundred and sixty!

Research

Not to be outdone, Columbia's great rival, H.M.V., have built a magnificent research building at Hayes, complete with large auditorium for acoustic experiments. H.M.V. are doing a great deal of experimental talking film work here, in addition to working out new designs of gramophones, gramo-radios, and the like. The Vocalian Company and Parlophone are going ahead, too, and a comparative newcomer, Metropole, has given us some excellent recordings. All of these companies are dabbling in talking films in one way or another. Everywhere there seems to be a spirit of optimism which may not be unconnected with a marked atmosphere of prosperity. These are great days for the gramophone companies!

Sanabria's Television Activities

After a period of seeming inactivity—at least, as far as public demonstrations are concerned—U. A. Sanabria, a young American television enthusiast, collaborating with a group of engineers interested in the development of television from a mechanical as well as the valve angle, has come into the limelight again. This worker has been engaged on television problems for quite a time now, and his original crude apparatus is being improved considerably, both mechanically and electrically, while it is claimed that he is now able experimentally to show pictures of reasonable detail on a screen 7 in. or 8 in. square. He uses a disc of 45 holes with a triple spiral. In a recent demonstration by wireless on a 200-metre wavelength, recognisable images of artistes were seen in the receiver, and it was noticed that a good deal of progress had taken place in the "lamp" used for reproducing the images in conjunction with the exploring disc.

A Neon Arc

What is known as a neon arc is now employed, as this lends itself to enlargements through a lens system, whereas such a performance was impracticable with the old type of neon tube. While the major portion of the demonstration was confined to transmitting and receiving the facial features of the artistes, a change in focusing and lens network was made towards the end and a view obtained of a boxing match staged by members of the staff. It is not stated definitely with what clarity this item was received, but one was led to infer that the movements of the men in the ring could be followed reasonably well.

Scanning and Eye Tolerance

I was very interested in the opinion expressed by a German doctor of science on the question of eye tolerance when it comes to observing "hunting" in a television image; that is, the to and fro movement of the picture for horizontal scanning and the up and down movement for vertical scanning. He apparently agreed that the vertical scanning as now used by Baird was preferable to horizontal scanning, and put forward the following novel point. We are fairly well accustomed to moving our heads from side to side somewhat quickly; indeed, most of our movements in everyday life take place in a horizontal plane. We are not accustomed to any rapid or continual movement in a vertical plane, and, as a result, hunting in a horizontally explored television image tends to become a more noticeable feature than is the case with vertical scanning. Anyone who has had the opportunity of witnessing both methods of exploring can prove this peculiar feature for himself.

On Your Wavelength! (continued)

When the Talkies Go Wrong

I came across a most amusing instance the other day of the way the public is becoming educated in talkie films. I don't know quite what had happened to the operator at the particular theatre, but he was exhibiting a wonderful colour talkie which was arranged in the form of a ballet of sorts. The colouring was exceptionally crude, but the reproduction was even worse. Never, since Elwell gave his first demonstration of the De Forrest Phonofilm system five or six years ago, have I heard such execrable speech and reproduction. Indeed, in fairness to the De Forrest system, I must say my recollection of the original demonstration is that it was distinctly better than this awful atrocity which was put up the other night.

The audience received the picture at first in silence of the variety usually referred to as "stony." Gradually, as it became evident that the picture was continuing, and was not a very short exhibit of how it ought not to be done, subdued talking became evident, and various members of the audience explained to their best girls or other encumbrances that this was not really a sample of the whole performance, and that something must have gone wrong with the works. It was not very long before somebody tittered, and, of course, this started the audience off. Laughter began to trickle about from all over the house, and in the end the whole audience was rocking with mirth. The picture was intended to be serious, and the whole thing was so thoroughly grotesque that it appealed to everyone as howlingly funny.

Sound "Pictures" on Steel

The demonstration given last week at Elstree of the wonderful possibilities of the new steel-ribbon sound-recorder marks another instance of the debt which the gramophone industry owes to radio. In the "ribbon" record the spoken word is stored up in the form of a succession of invisible magnetic "images," which become audible when the prepared ribbon is passed under an electro-magnet attached to the input of a valve amplifier. In one form the device is described as a "speaking book," and is used for reproducing a novel in the author's own words. It is also being applied for synchronising "talking" pictures.

The underlying idea is, of course, the same as that first used by Poulsen, many years ago, for recording wireless signals. It was then called the Telegraphone, and has since been used for "bottling" broadcast programmes. Poulsen probably owed his inspiration to a still older laboratory experiment. I remember quite well, in my early days, writing my name with a bar magnet on the blade of a steel saw, and then throwing the signature into visible relief by sprinkling on some iron filings which adhered to the trace of the magnet. One can never tell, in these times, when a laboratory curiosity will become a small gold mine in the hands of the modern inventor.

The Critics Criticised

Another of those little storms involving the B.B.C. and the theatre managers has raged of late. This time it concerns not the broadcasting of plays or bits of them, but the criticisms made by the B.B.C.'s dramatic critic. He rather slated one play, whereupon the manager concerned said that he never asked for a criticism to be broadcast, that he did not want a criticism to be broadcast, and would the B.B.C. kindly refrain, etc. The B.B.C. rightly replied that it wouldn't. Then the managers rose in a body and said that they would not send invitations to first nights to the B.B.C. critic as such. In fact, they went further. On their invitation tickets sent to newspapers they printed a request that steps should be taken to ensure that the user of the ticket did not broadcast a criticism. The B.B.C.'s natural report was to hand its critic man a note when the next play was due, saying "Here, buy yourself a nice seat and then come back and tell the world all about it." So, unless the theatres install chuckers-out who can spot and eject anything like a B.B.C. dramatic critic, I really don't know what they are going to do about it now.

Is It Necessary?

But the question rather is: do we want dramatic criticisms by wireless? Personally, I don't think that we do. Most of us take perfectly good newspapers which provide us with all the theatre critiques that we want. It seems to me that in giving dramatic criticisms the B.B.C. is to some extent usurping one of the rightful functions of the newspaper. I cannot, somehow, see that it is the business of one provider of entertainment to criticise other providers of entertainment. How, for instance, would the B.B.C. feel about it if every theatre and music-hall put on some fellow every night to give a five minutes' criticism of the B.B.C.'s programmes. My own idea is that the B.B.C.'s real job, though it is apt to lose sight of the fact, is to furnish entertainment for our leisure hours, and it would probably be to everyone's advantage if the cobbler did a little more sticking to his last.

NEXT WEEK:

The B.B.C.'s Recommended Crystal Circuits as Practical Sets

Caught Napping

In summer-time I am most punctilious about earthing my aerial whenever the set is out of use, for you never know how quickly a thunderstorm may blow up on a hot day. But, really, you don't expect that kind of thing to happen when it is cold enough for fires, and probably you leave the aerial and earth connected up to the set more or less permanently. At any rate, that's what I do in cold weather. I was horrified the other afternoon to hear a sudden clap of not very distant thunder and, rushing out, I saw that a storm was blowing up. I turned the earthing switch over with a broomstick, thanking my stars that I had been at hand to do it. That reminds me, by the way, that if you should be caught napping in the same way, it is rather unwise to turn the switch over with your hand or, as I once saw a fellow do, disconnect the aerial and earth leads from their terminals and hold one in each hand whilst twisting them together.

Aerial Pruning

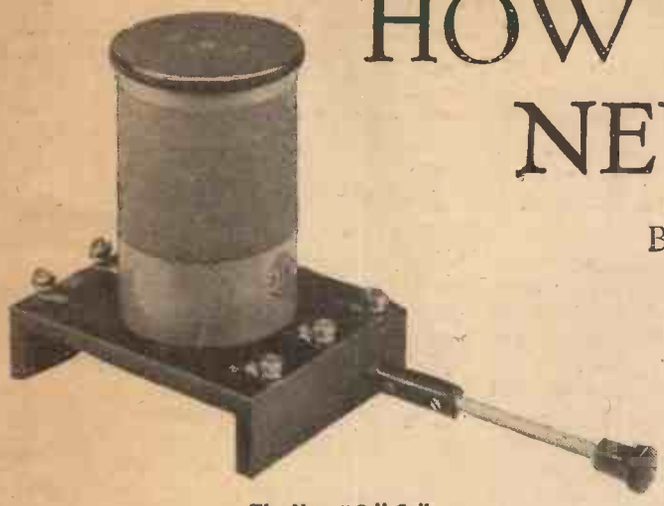
Since Brookmans Park has got to work, I find a considerable amount of moaning amongst such friends of mine who possess either old-fashioned receiving sets or long, high aerials, or both. Some of them tell me that it is a case of Brookmans Park or nothing, since the tuning condensers appear to have gone completely out of action, there being very little difference in signal strength, whether you set them at zero or at a hundred degrees. What used to be called the P.M.G. aerial is nowadays something of a back number. Before broadcasting began, a regulation was made limiting the total length of private receiving aerials to 100 ft., and, so far as I know, this regulation still obtains. There were not many stations in those days, and those that then existed came in with no great punch. Hence all of us who had receiving sets rigged up aerials containing the last permissible inch of wire.

But with the modern valve receiver the big aerial is actually undesirable, since it is apt to ruin selectivity. Years ago I reduced mine to a single wire and cut its total length, including the lead-in, down to a little over 50 ft. Now I have hardly any "roof" at all. I can strongly recommend aerial pruning of this kind to those who are being swamped by Brookmans Park. It is also well worth trying an indoor aerial. I find that with a wire stretched round three sides of a first-floor room I obtain greatly increased selectivity. Further, I can receive pretty well every station that is receivable on the outdoor wire and the diminution in signal strength is surprisingly small.

THERMION.

HOW TO MAKE THE NEW "Q" COIL

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



The New "Q" Coil

THE popularity of the new "Q" coil has led to a number of inquiries for constructional details. In response to this request, therefore, we are giving particulars this week. It should, however, be emphasised at the outset that this improved type of coil is somewhat more difficult to construct than the older pattern, and it is particularly necessary to see that the

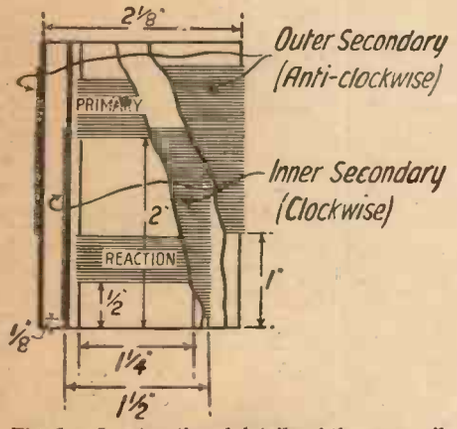


Fig. 1. Constructional details of the new coil

dimensions are correct if the best results are to be obtained.

As was pointed out in the description of the new type of coil which appeared in an earlier issue, the switching arrangement has been greatly simplified, the outer section being placed in parallel and in opposition with the inner section for the short wave band, as before, but the inner section is used alone for the long waves instead of placing the two sections in series. By doing this, a simple push-pull switch is all that is necessary instead of the three-point switch previously required.

Coupling

With this new arrangement it is somewhat more difficult to arrange the coupling on both wave bands, which is a feature of the "Q" coil. After considerable experiment, it was found that the only position in which these could be placed was immediately inside the inner section. It is therefore necessary to have three formers—an outer and an inner secondary, and a primary former fixed just inside the inner section.

These constructional details are as shown in Fig. 1. First of all, it is necessary to take a tube 2⅛ in. diameter and 3 in. long. A winding of 100 turns 38 d.s.c. wire must be put on this former, starting at 1 in. from the end. This must be in an anti-clockwise direction. Now take a 1½-in. tube and place on this 310 turns of 38 s.w.g. enamel-covered wire, starting this at ⅛ in. from the end of the tube. This winding is clockwise, i.e., in the opposite direction to the other. These two formers constitute the secondary and are placed one inside the other in the position shown in the diagram (Fig. 1.) The bottom ends are connected together, while the two top ends are connected to the switch. Terminals 1 and 2 are connected directly to the inner winding, No. 2 terminal going to the switch end and No. 1 terminal to the bottom end.

Primary and Reaction Windings

Now comes the question of the primary and reaction windings. These are all wound in a clockwise direction and, as has already been pointed out, are placed on a separate 1¼-in. former pushed just inside the inner secondary tube. The windings on this former depend upon the type of coil to be used, but in all cases there is a reaction winding which consists of 60 turns of 40 d.s.c. wire wound in a clockwise direction and starting ½ in. from the bottom end of the tube. The primary winding is placed towards the top end and is started at a distance of 2 in. from the bottom end of the tube. The number of turns and method of construction of the winding depends entirely upon the type of coil, and, as a matter of fact, considerable experiment is possible in the actual number of turns and also, to a smaller extent, in the position of the winding. The details already given will serve to give the best all-round position, but a movement of ⅛ in. up or down will have quite an appreciable effect upon the performance of the coil.

For the aerial coil 120 turns of 40 d.s.c. should be placed on the former in a *double layer*. This is to make the winding occupy a slightly less space and give a somewhat tighter coupling, so that 60 turns are wound on first and then a small layer of insulating tape, after which a further 60 turns are wound on. For the screen-grid winding 100 turns of 40 d.s.c. wire are wound on, also in a double layer, in exactly the same manner as before. For the split-primary coil there are 40 turns in both primary and neutralising windings, and, as is customary in the case of the split-primary form of coil, it is necessary for these two windings to be placed one over the other and both wound in the same direction.

First of all, place on 40 turns wound in a clockwise direction. Then place on a layer of insulating tape, and then, going back to the starting point, place on a further 40 turns wound in exactly the same direction and exactly over the first coil. The end of the first coil is connected to the beginning of the second coil, and these two points are taken to terminal No. 4. The beginning of the first coil is taken to terminal No. 5 and the end of the second coil is taken to terminal No. 3.

The reaction winding in this case is connected between terminals Nos. 2 and 6, while the secondary coils are connected to Nos. 2 and 1, as already described, so that

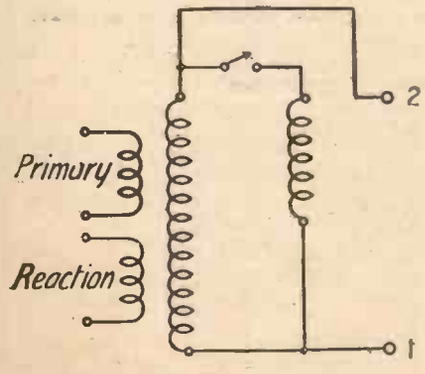


Fig. 2. Scheme of connections

one end of the reaction coil in this instance is connected to one end of the secondary. In both the other coils the reaction winding is entirely separate.

It will be seen that the construction of the new type of "Q" coil is a distinctly more difficult business than before, it having, unfortunately, been found necessary to make the coil slightly more complicated in order to obtain better results. The coils can be obtained from Messrs.

(*Continued in third column of next page*)

OPERATING THE MUSIC-LOVER'S GRAMO-RADIO

INSTRUCTIONS were given last week for assembling the various units of the "Music Lover's Gramo-Radio" receiver. In the special Clarion cabinet, designed for this receiver, the units are assembled in the following manner.

The gramophone motor is mounted on the turntable board at the top of the cabinet. The receiver unit slides into its compartment from the back of the case, the loud-speaker is fixed in clamps at the bottom of the cabinet, and the H.T. and L.T. batteries, or mains eliminator, are housed in the space at the back of the loud-speaker. If the receiver is made up as in the description given fully in "A.W." Nos. 381 and 382, no difficulty should be experienced in operating the "Music Lover's Gramo-Radio" immediately the gramophone, receiver, loud-speaker and battery units are assembled.

For Newcomers

There are just one or two points in connection with the set itself which may be of interest, particularly to those who are primarily gramophone enthusiasts and who have taken over the "Music Lover's Gramo-Radio" owing to the extra advantages given by electrical reproduction. To these folk, the operation of a radio receiver may not be as an open book, and the following hints may prove useful.

First, so far as switching on the set is concerned, it should be noted that the large throw-over switch operated from the front of the panel, changes over the receiver from "radio" to "gramophone," and switches off the whole installation in the mid position. The contacts of this switch are self-cleaning and no trouble should be experienced.

When making a preliminary test switch the amplifier over to "gramophone" and turn the volume control full on. The full H.T. and L.T. voltages should be applied and the grid bias should be adjusted according to the H.T. voltage and L.F. valves used. As much as 18 volts G.B. may be advisable. Then use the volume control to make sure that the variation is satisfactory and that as the input strength is reduced the quality does not suffer. It should not do so, of course, but if the set has not been wired up strictly according to the circuit diagram then it is only natural to expect snags.

If the pick-up works well and the low-frequency side of the amplifier appears to be in order then it is opportune to test the installation on radio reception.

Tuning is carried out in the normal way, the left-hand condenser controlling the aerial circuit and the right-hand condenser tuning the secondary of the anode coil. This latter condenser will be found to give a slightly finer setting, but both knobs should be more or less turned degree by degree.

Tuning

It is always the best plan to tune in the local station first and to get purity and stability right, before trying to get the more distant stations. It has been said that the "Music Lover's Gramo-Radio" is very selective. This is due to the somewhat unusual connections of the anode and aerial tuning coils.

To assist selectivity in the aerial circuit a small pre-set condenser is used, having a maximum value of .0003-mfd. For a preliminary test this condenser should be screwed right in. But when the set is working nicely, however, and it is desired to tune in distant stations to the exclusion of the local broadcaster, then the pre-set knob may be slacked off a little to increase selectivity.

The only other control which needs to be considered in a preliminary test is the variable resistance in series with the screening grid. This should be adjusted so that the voltage on the screening grid is in accordance with the maker's published characteristic curve. There is no need to test this voltage and a trial and error adjustment of the knob is quite sufficient. This adjustment should be made when the receiver is tuned in to a fairly distant station.

A final word of emphasis regarding the battery supply is advisable. To get the most out of electrical gramophone reproduction it is essential to use large power valves and plenty of H.T. The H.T. current consumption is consequently high. Generally speaking, it is advisable to use a mains eliminator whenever the public supply is available.

"HOW TO MAKE THE NEW 'Q' COIL"

(*Continued from preceding page*)

Lewcos, Ready Radio, and Wright and Weaire.

I have been asked several times whether the older pattern of "Q" coil, as in use last season, can be used in the newer designs. This is quite feasible, for in nearly every case the connections to the terminals are the same. The only alteration which has been made is that the switch has been placed at right angles to its former position, and therefore if the coils are so placed that the terminal numbers correspond, then the switches will run at right angles in the old type to what they do in the new type. Thus, if the switch at present runs through the panel, then with the old type of coil it will run parallel to the panel. The constructor can either operate the switch in this position or he can rotate the coils through 90 degrees, so that the switch rod comes through the panel again, and then wire up the coils to the correct terminals.

As far as the QSG and QSP coils are concerned, the connections are exactly the same, and the older pattern of coil may be used, although it is not so efficient as the new one. The aerial coil (QAT) is slightly different, for none of the old aerial coils were anything like as satisfactory as the new type. Those who have the QAA coil, however, can employ this, the connections being practically the same. The aerial is connected to terminal No. 4 through a .0001 condenser instead of being connected directly, as in the case of the new QAT coil. Nos. 1 and 2 go to grid, as at present, but the reaction winding on the QAA is not a separate coil. It is connected between terminals 2 and 6, terminal 6 going to the reaction condenser, the other side of which goes to the anode of the valve. With the new coil, of course, terminal No. 5 goes to the anode of the valve, terminal 6 goes to the reaction condenser, the other side of which is connected to L.T.—. With this minor alteration, however, the "Q" coils may both be considered interchangeable.

What Is — A Good Power Valve

The loud-speaker requires definite power to drive it. It is not merely a matter of putting a loud-speaker in the anode circuit of a valve, applying a voltage to the grid and hoping for the best. In this article our Technical Editor shows just what are the necessary conditions

THE last stage in an amplifier is entirely different from all the preceding stages in that the anode circuit has to handle a definite amount of power.

The conditions for power amplification are therefore distinct from those which apply to voltage amplification. In the latter case our object is to obtain the greatest possible voltage in the anode circuit of the valve with a given voltage applied to the input. Our principal worry is that of maintaining this voltage at a maximum over the greatest possible musical range, and if we can do this, and also keep the grid voltage within the limits of the straight portion of the characteristic, then we have achieved our object.

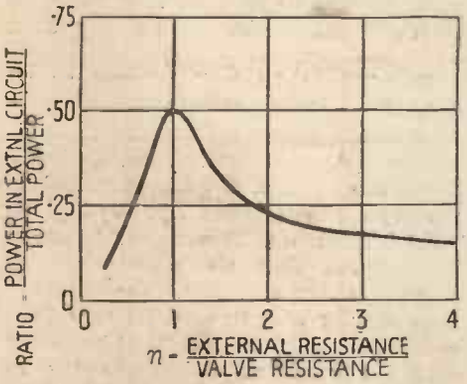
Last Stage Demands

The principles underlying this phase of the amplification (which is applicable to all the early stages of the receiver) have been explained many times, and it is not proposed to deal with them here. When we come to the last valve, however, the conditions are somewhat different, for here we are not interested in obtaining only the maximum voltage, but we have to obtain this with the greatest current; so that the power output, which is proportional to the product of these two, is a maximum also. Indeed, it may pay us not to obtain the greatest possible voltage variation, but to be content with something less than the maximum if we can obtain a relatively greater current so that the product of the two is greater.

How are we to determine the best operating conditions and, having discussed these, how are we to compare two valves, both operating under their best conditions, to see which will give us the greater power output? It is possible, for example, to obtain the same power output as is produced by a B12 valve operating at 400 volts H.T. as from a P650 operating at only 200 volts? Numerous questions of this nature will arise, and although they can only be answered fully as a result of rather careful calculation, yet it is possible to obtain a rapid indication of the order of the results to be expected.

Let us consider that the power developed in the anode circuit is m Eg where Eg is the grid voltage and m is the amplification factor. The anode current therefore is this voltage divided by the valve resistance and the speaker resistance in series. The speaker resistance here, by the way, includes the effective resistance due to the work converted into sound energy, and we assume a loud-speaker operating effectively to be virtually a pure resistance.

In order to obtain the external power we have to multiply this anode current by the proportion of the total anode voltage which is developed across the circuit. This



Graph showing proportion of power through loud-speaker

is the voltage m Eg multiplied by the ratio of the external impedance to the total impedance. If we multiply these two factors together we obtain the expression for the external power, which is

$$P=\frac{m^2Eg^2R}{(R+r)^2}$$

where m and Eg are as before

R=external resistance in anode circuit.

r=internal resistance of valve.

We can put the expression into a slightly more useful form by assuming that the external resistance is n times the valve resistance. The expression for power output then becomes

$$P=\frac{m^2Eg^2}{r}+\frac{n}{(n+1)^2}$$

where n=R/r

the other terms being as before.

Here we have our basis of comparison. The actual power output, of course, depends upon the value which we give to the quantity n. The power output itself is a maximum if n=1. But this is not permissible in practice, because the anode swing involved sweeps off the straight part of the characteristic, and it is necessary to limit the grid swing to the portion of the curve which is substantially straight. The value of external impedance which complies with this condition varies with different valves.

For small power valves the best condition usually obtains when the external impedance is twice the valve resistance so that n=2. In the case of valves of the LS5A type, however, the lower ends of the characteristics curve gradually for some considerable distance, and it is not possible for real distortionless working to utilise such a big anode swing. The factor n in these cases is nearer 3 or 3½. The actual value of n can really only be chosen by plotting the characteristic and discovering graphically the maximum anode swing permissible without running into undue curvature of the characteristic.

For purposes of ready comparison, however, we can utilise the formula already quoted, and we can assume as a first approximation that both valves are operating under the same conditions, so that the anode-circuit impedance is a definite number of times greater than the valve itself. In such circumstances the second

(*Continued at foot of next page*)

WIRELESS WIT

Answers to Correspondents

"Worried," Brookmans Park.—Now you have moved to Potters Bar, all you will need is a piece of cheese and a damp clothes line.

"H.A.M.," Wigan.—To stop grunts and squealing noises in your speaker disconnect the speaker from the set.

A MEEK, absent-minded little man was on trial for failing to take out a wireless licence.

"Were you ever in trouble before?" asked the judge.

"Well—er—er—once I kept a library book too long, and was fined fourpence."

THE MUSIC LEADER

(OUR SPECIAL FREE BLUEPRINT SET)

IN AMERICA

By ALAN S. HUNTER

The "Music Leader" in its present form

IN a form not greatly different from that first disclosed in last week's AMATEUR WIRELESS, the "Music Leader" had its first official try-out one bright morning last June, as the ocean express drew out from Waterloo. Anxious to gain some idea of the set's capabilities under the varying conditions it would encounter during its imminent trip across the Atlantic, my AMATEUR WIRELESS colleague, Mr. J. Sieger, made an attempt to pick up the morning service from 5XX. By this time the train was well on its way and, as luck would have it, our carriage seat was exactly above the lighting dynamo. So that, although we were able to hear 5XX perfectly clearly, we suffered from a good deal of electrical disturbance.

On the Voyage Out

On the s.s. *Majestic* that evening, somewhere near Land's End, the "Music Leader" was able to prove its metal to an admiring group of passengers. In addition to 5XX, which was not broadcasting anything particularly appropriate to an ocean voyage, I myself picked up the Eiffel Tower and Radio Paris at excellent strength.

On the second night out, Daventry was the only station that could be heard, and although the strength had considerably diminished it could still be regarded as of loud-speaker intensity. Followed an interval, until two days from New York, or roughly a thousand miles from it, we shared a great thrill when the nasal accents from the New York stations, WJZ and WOR, were faintly, though clearly, audible on the loud-speaker. Mr. Sieger was particularly pleased with himself when he logged Kansas City the same evening. We thought then how good a set we had in store for AMATEUR WIRELESS readers.

Neither of us will soon forget the last morning on the s.s. *Majestic*, when the set brought in no less than twelve American stations at really enormous loud-speaker strength. During that morning hundreds of passengers were able to dance to real American jazz bands through the medium of the "Music Leader." It certainly led all the way that morning!

New York Reception

In the hotel in New York, we thought that possibly the immense steel building would prevent signals from reaching our diminutive frame aerial; but our fears were unjustified, and it was not long before at least ten stations were consecutively tuned in.

The "Music Leader" followed us all round the eastern and middle-west States of America; it was seldom out of arms' reach of my colleague. Thus, during a traffic block in Philadelphia we picked up the three local stations and WJZ as we waited for our taxi to move on. It was in Philadelphia that we gave our most impressive demonstration. The hotel we were staying at generated its own light and power, which made normal broadcast reception somewhat difficult, owing to interference. The frame aerial, which is not so common in America as might be thought, once again proved that as an eliminator of interference it has few equals.

Much more could be written of varied experiences with the "Music Leader" in America; but it will be sufficient to conclude this brief account by recalling a night journey by train from Washington to Pittsburg. In our sleeping berth the "Music Leader" prevented sleep for half an hour by giving the delighted passengers a concert from station WRC in Washington. Early next morning KDKA woke us up in the train by announcing the morning physical jerks instructions. The wild-eyed look on the face of our black porter, when he heard this, still stands out in my mind.

Few sets can have had such a wonderful preliminary test as the "Music Leader" had in its 9,000 mile tour. But if we have ensured that AMATEUR WIRELESS readers have been given a set that will give them half as much pleasure as it has given us, we shall be well satisfied.

"WHAT IS A GOOD POWER VALVE?"

(*Continued from preceding page*)

term in the formula is the same in all cases, and we are simply left with the first term which will be seen to involve the square of the amplification factor, the square of the grid voltage and to be inversely proportional to the valve resistance.

It should be pointed out at this stage that the grid voltage specified is the R.M.S. value which is 0.7 times the grid swing. To estimate this latter quantity we can take the value of grid bias recommended by the manufacturers as a satisfactory indication, but we must multiply this by .7 in order to convert it to the R.M.S. voltage.

Let us now make a comparison between two valves, both of the super-power class, to see what the different power output is, if any. We will take the two valves previously mentioned, namely, B12 and a P650. The B12 operates at 400 volts H.T. and has an internal resistance of 2,900 ohms, an amplification factor of 2.85, and a maximum grid swing, at 400 volts, of 90 volts. Substituting these figures in the equation and allowing for the R.M.S. voltage as just mentioned, the expression evaluates to 11.35. This figure is the total watts developed in the circuit and not by any means the wattage output, as we shall see later.

Turning now to the P650, this operates at only 200 volts maximum on the anode, but has a very heavy filament, the constants being $r=1{,}300$, $m=3.5$, and the grid swing 40, whence the expression evaluates to 7.55.

We see, therefore, that although the P650 has a much lower impedance, it is not possible to get quite the same power output as it is from the B12 operating at 400 volts.

These calculations are simply given to illustrate the application of the formula previously cited. As was pointed out, the figure obtained from the evaluation of the first part of the expression is the total power in the circuit and the power developed externally is distinctly less than this. For example, if the external impedance is twice the valve resistance, then the internal power is only one-fifth of the total power, i.e., approximately 2.4 and 1.5 watts respectively. To assist the reader in making comparisons, the curve shown illustrates the factor by which the total power must be multiplied according to the value of the ratio n. Note the big difference between the maximum power output which occurs when $n=1$ and is equal to half the total power in the circuit, and the maximum *undistorted* output which occurs when n is between 2 and 3, usually. The power output here is less than one-half the previous figure, being about one-fifth of the total power in the circuit. Hence, for pure reproduction we must limit our efficiency to about 20 per cent.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

HERE is a real, live piece of mystery which has kept me thinking for many weeks. In writing of the Brixton Astoria's opening transmission, I said that the organ was too loud. The Brixton people tell me, and most definitely insist, that what I heard was an orchestral broadcast, and not the organ.

Now, I am the first person in the world to admit when I am wrong. The Brixton people are so certain that I *am* wrong that I am willing to give their point of view every publicity and, on the strength of their assertion, to agree that in this case I made a mistake. My apologies, Brixton Astoria!

◆ ◆ ◆

The First Second, a "sequence" for broadcasting, by Peter Godfrey and produced by Lance Sieveking, was acceptable, although somewhat gruesome and blood-curdling for the homestead. Those screams accompanied one to bed.

The theme is somewhat the same as Holt Marvel's recent train episode, the play *Outward Bound*, a film the name of which I forget, and, above all, Sir Arthur Conan Doyle's little short-story masterpiece, "How it Happened."

I stress this because of the attempt to make *The First Second* appear daringly original. Nevertheless, it was by no means a bad piece of work.

◆ ◆ ◆

I have received several interesting letters regarding the respective merits of the dance bands, and I will deal with them at some future time.

◆ ◆ ◆

I didn't hear Gambier-Parry's talk on "How to Manage Your Wireless Set." I gather it was quite useful, and he himself tells me he wasn't at all nervous!

I always thought these chaps at Savoy Hill had plenty of nerve.

◆ ◆ ◆

Last week I asked an American friend of mine, who is over here for a short visit, to give me his opinion of the average B.B.C. programme. His answer was that, although our programmes are, in most cases, musically superior to those of the States, he wonders how we can put up with so much "tall talk" and "hot air."

◆ ◆ ◆

We went through a typical English day's programme together, and it was a revelation how much talking there was. Here are the aural items. Mind you—this one day:—

10.30. Weather Forecast.
10.45. Recipes.
2.25. Fishing Bulletin.
2.30. Talk on Rural Survey
3.0. Talk on Pigmies.
3.25. Talk on Longer Distances.
6.0. Talk on Housekeeping.
6.15. News and Weather.
6.30. Talk on Boy Scouts.
7.25. Talk on Village Crafts.
9.0. More News and Weather.
9.20. Debates.

◆ ◆ ◆

Although the American programmes include advertising, my friend assured me that there was less than half the amount of talking. To quote his words: "I'd sooner listen to a Yankee publicity man enlarging upon the delights of somebody's ham than hear one of your professor-johnnies talking 'bugs.'"

But, as I have observed before, it's all a matter of taste!

◆ ◆ ◆

The B.B.C. has been criticised, and will still be criticised, however perfect its programmes. At its worst, however, Heaven save us from the confusion of American broadcasting.

Hoorah!—Three cheers!—and Bravo! for the "Points of View" series. Now, that is what I call a real scoop—a symposium worthy of the B.B.C. I should say it ought to be very easy to get the biggest people before the microphone. And, by the bye, the criticism of Mr. G. Lowes Dickinson, who opened the series, was entirely undeserved. It was, indeed, one of the best talks I have yet heard.

◆ ◆ ◆

To get the "One and Only" Shaw to the microphone is an achievement that should hush the most audacious of critics.

◆ ◆ ◆

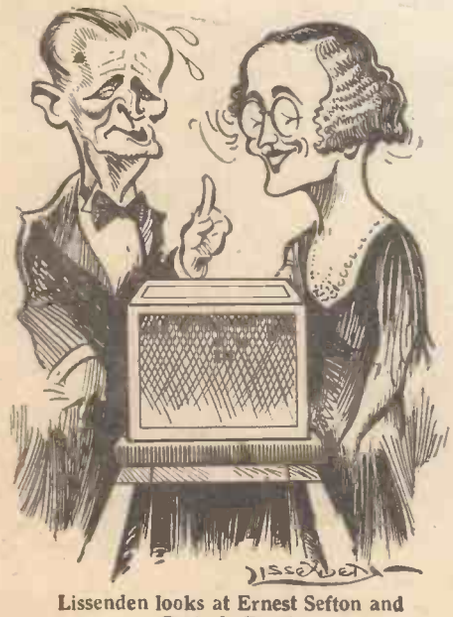
It is a long time since I listened-in to the Children's Hour. I still think there is too much back-chat between the Uncles and Aunts, much of which must be unintelligible to the youngsters.

◆ ◆ ◆

A rather good concert by the Olaf Sextet, with John Morel as a vocalist. I see the latter is described as a baritone. I should say he is more in the neighbourhood of tenor. At any rate, he gave us a charming performance.

◆ ◆ ◆

Josephine Brown, the accomplished pianist, played "Dance de la Frayeur," by De Falla, which interpreted mean "Dance of Terror"—excellently.



Lissenden looks at Ernest Sefton and Betty-le-Brock

An impression of Sandy Rowan

Completing The MUSIC LEADE

LAST week we gave away a free blueprint of an entirely new set, the "Music Leader." This receiver is entirely self-contained and can be carried from room to room without having to bother about aerial or earth wires, loud-speaker, or battery. It is not a portable, but is an entirely self-contained receiver for home use.

Tests Over 6,000 Miles

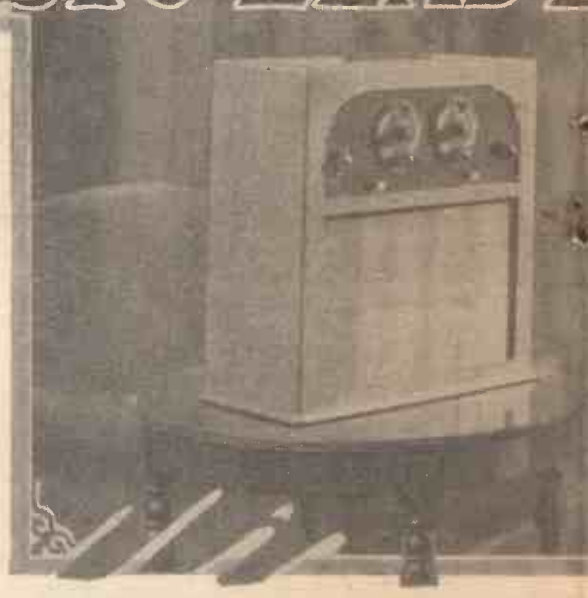
A portable receiver which was taken to the United States last summer, by two Technical Staff members, has formed the basis of the design of the "Music Leader." An account of this appears on page 634. The actual history of the set was given in full last week and all readers who intend making up the receiver are advised to get last week's issue—first, because the preliminary notes given on the technical side of the "Music Leader" will be very helpful in construction and, second, because the free blueprint presented with every copy cuts out any possibility of error in making up the receiver.

As was explained last week, the set can be divided into four separate units, the cabinet, an inner former on which is wound the frame aerial turns, the receiver proper which slides into the frame aerial shell, and, finally a small linen-diaphragm loud-speaker.

The construction of the receiver portion will be dealt with first. In brief, the "Music Leader" is a four-valver having one screened-grid H.F. stage, a leaky grid detector, one R.C. coupled L.F. stage and a final transformer-coupled power stage. There is ample space in the cabinet to accommodate batteries large enough to work the set satisfactorily for long periods. The components required for the construction of the complete set are given in the accompanying panel. The components used, or the alternatives, should be followed exactly.

The construction of the "Music Leader" is not at all difficult. There are, however, several points which need to be noted very carefully, if the set is to work properly. In addition, the construction is rather complicated by the fact that the H.F. stage is shielded and the shielding box has to be accommodated in a rather small space. Nevertheless, if the blueprint and the following instructions are exactly followed no trouble should be experienced.

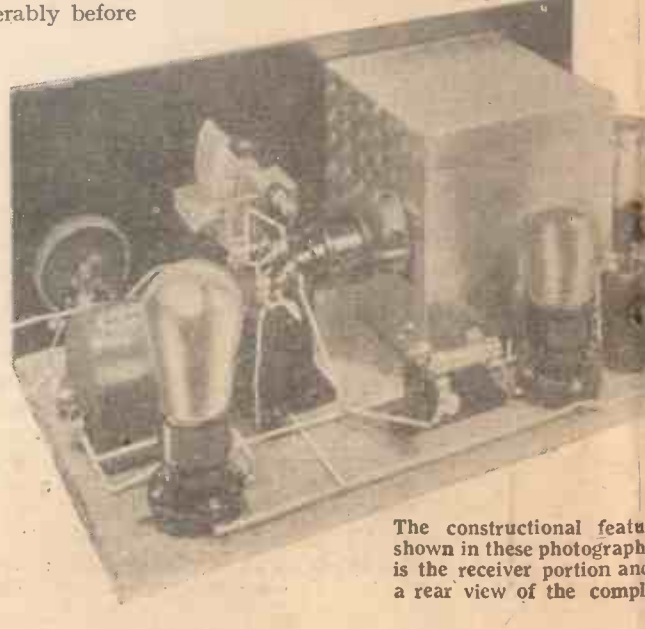
First, drill the panel, using the blueprint as a guide. The easiest way to do this is to take the sheet of ebonite to be drilled and to fold the print over it, so that the panel portion covers the front of the panel exactly. If necessary the paper can be made secure temporarily with two spots of adhesive. All holes should then be drilled, including those for the woodscrews. Then attach the panel to the baseboard, preferably before mounting any of the panel components.



The Entirely Self-contained Fou of the Free Blueprint Presen

The screening box should next be mounted and it will be noticed that this is secured to the panel by two small bolts, and the clamping of the box to the panel also holds down a sheet of foil arranged to shield the panel end of the screen.

The following components can then be mounted; filament rheostat, reaction condenser, the two push-pull switches and the two main tuning condensers. The tuning condenser inside the screening box



The constructional featu shown in these photograph is the receiver portion an a rear view of the compl

r-valver which was the subject ated with Last Week's Issue

should be clamped down tightly to the foil without any insulation; nor is there any need for the switch inside the box to be insulated from the metal foil.

Mounting the Components

It is advisable at this stage to mount the slow-motion dials, or at least that which controls the condenser in the screening box. The reason for this is that the slow-motion dial has to be secured by a small bolt, the nut of which is not easy to fix inside the box. When this has been done, however, there is no reason why all the components on the baseboard should not be mounted, but do not yet place the coil, condenser and H.F. choke inside the screening box.

The components which may be mounted are the three valve holders, the 1-microfarad screen-grid condenser, R.C. unit, H.F. choke, grid condenser and leak, screen-grid valve holder, coupling condenser and L.F. transformer. The wiring so far can then be carried out, using rigid insulated Glazite wire where shown, and for the remainder of the connections using thin rubber-covered flex. Altogether there are only thirty Glazite wires and sixteen flexes, so that the job of connecting up is by no means one likely to take any considerable time.

Wiring Hints

It will be noticed that the baseboard has to be drilled at six points for the passage of flex leads and at four points for the passage of insulated wire. A point which should be noted is that the terminal marked H.T.+ on the R.C. unit is connected underneath the baseboard by means of an insulated wire to the H.F. choke. A portion of this lead, beneath the board, is scraped free of insulation and a flex lead is attached, which, subsequently is connected to one of the H.T. battery terminals.

It will be noticed that the design is such that most of the wires are very short and direct. Indeed some of the wires are so short that they will need to be held with the nose of a pair of pliers while being soldered in place. Where bending is necessary the corners should be carefully formed.

When all the outside wiring is done, attention may then be given to the inside of the screening box. Two wires should be soldered to the switch contacts and these two leads should be left straight so that when the coil is subsequently mounted they can be bent easily to meet the soldering tags on the coil terminal.

The fixed condenser should be screwed to the baseboard, on top of the bottom of the screening box, of course, and this component should then be wired up, before the H.F. choke is mounted. The choke is

LIST OF COMPONENTS

Ebonite panel, 14 in. by 6 in. (Becol, Resiston, Raymond, Ebonart).
Transportable cabinet, complete with 7 in. baseboard and frame (Clarion).
Two .0005-mfd. variable condensers (Formo, Cyldon, Burton).
.0002-mfd. reaction condenser (Bulgin, Peto-Scott).
7-ohm panel-mounting rheostat (Lissen, G.E.C., Burton, Igranic).
Two "on" and "off" push-pull switches (Bulgin, Lotus).
Special screening box, 4½ in. by 4½ in. by 5 in. (Parex, Ready-Radio).
Screened-grid valve holder (Parex).
Three small valve holders (W.B., Lotus, Formo Burton, Igranic).
Special dual-wave coil, Arcadian type (Wearite, Ready-Radio).
Two high-frequency chokes (Peto-Scott, Wearite, Ready-Radio, Igranic).
3-megohm grid-leak (Lissen, Ediswan, Dubilier).
Resistance-capacity coupling unit with 100,000-ohms anode resistance (Lissen, Ashley, Trix).
100,000-ohm grid resistance with holder (Lissen, Ediswan).
.0001-mfd. fixed condenser (Dubilier, Lissen, T.C.C.).
.0002-mfd. fixed condenser with series clip (Dubilier, Lissen, T.C.C., Graham-Farish).
.005-mfd. fixed condenser (Dubilier, Lissen, T.C.C., Graham-Farish).
Low-frequency transformer (Cossor, Varley, R.I., Burton, Telsen, Igranic).
Connecting wire (Glazite).
Two small slow-motion dials (Brownie, Ormond, Formo).
Four yards of thin flex (Lewcoflex).
Seven wander plugs marked H.T.—, H.T.+1, H.T.+2, H.T.+3, G.B.+, G.B.—1, G.B.—2 (Belling-Lee).
Two spade terminals marked L.T.+, L.T.— (Belling-Lee).
Balanced-armature loud-speaker unit (Ormond, Blue-Spot, G.E.C., Hegra, Lissen, Watmel).
Nine feet of ⅞ in. by ⅞ in. wood.
Half-yard of fine-weave embroidery linen.
Small piece of art. silk.
One foot of strip brass, ½ in. by 3/32 in.
Two 4B.A. bolts and nuts, 1 in. long.
¼-lb. 28 d.c.c. wire (Lewcos)
2-volt unspillable accumulator (C.A.V. type 2AN7)

res are well s. On the left d on the right lete assembly

"COMPLETING THE MUSIC LEADER" (Continued from preceding page)

mounted to the side of the box by means of a small nut and bolt.

If the box has not an opening cut for the screen-grid valve then a U-shaped portion should be taken away so that the screen-grid valve when placed in its holder can have the anode terminal end inside the screening box. The short flex lead attached to one side of the fixed condenser inside the box is connected to the anode terminal of the screen-grid valve and this little flex lead should have a tag attached, so that connection can easily be made. Finally, the coil may be mounted and this is held in place also by means of a bolt passed through a hole in the side of the screening box.

Flex Connections

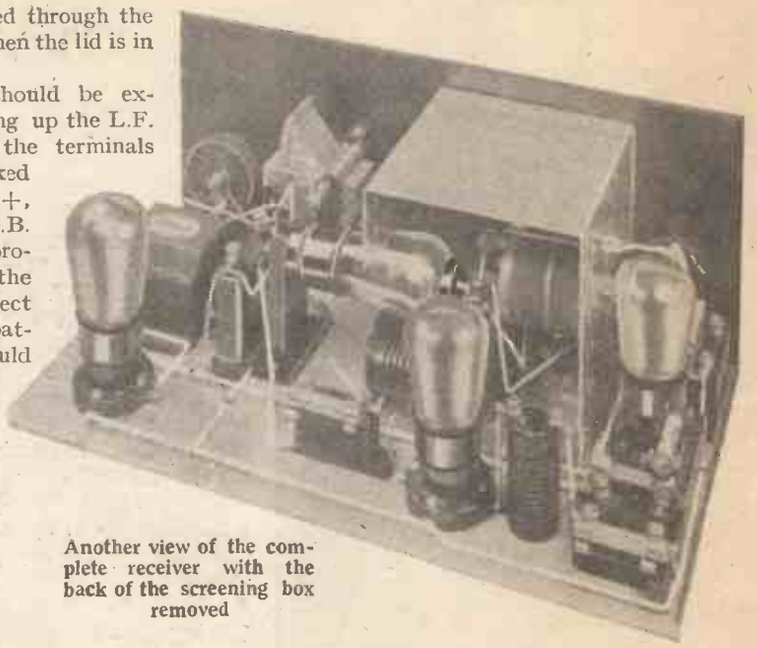
As a matter of interest, it should be noted that under the head of the bolt, on the outside of the box, is placed a soldering tag, so that a wire from one of the fixed condensers can be attached thereto, as you will see from the blueprint. One of the wires to the coil (that connected to terminal No. 1 and to one side of the reaction condenser) has to pass through a hole in the screen.

The connections to the other terminals of the coil are very short and great care should be taken to see that good soldered connections are made. The two wires from the switch, which were left disconnected, can now be bent up and soldered to terminals 2 and 3. Two wires come from the inside of the box (one from the H.F. choke and one from the fixed condenser) and it may be found that the lid of the screening box fouls these two wires. If this is so, then no harm will be done if about half an inch is cut off the lid, so that the wires can be passed through the gap just formed when the lid is in place.

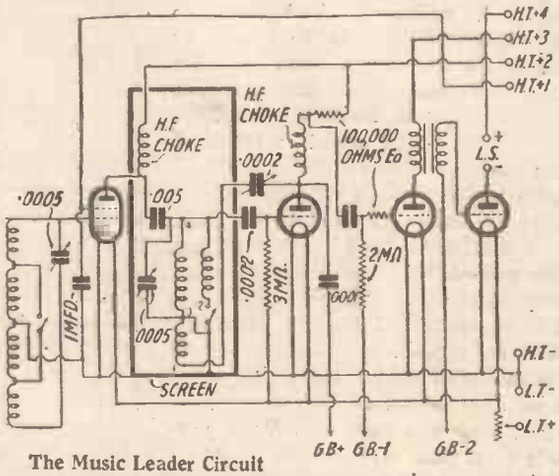
No difficulty should be experienced in wiring up the L.F. transformer, for the terminals are clearly marked A (anode), H.T.+, G (grid) and G.B. The flex leads projecting through the baseboard connect up with the batteries. Tags should be attached, so that there is no possibility of the wrong connection being made.

Flexes are also taken to connecting points on the frame aerial, the construction of which will be given next week. The linen-diaphragm loud-speaker is connected by means of flexes, one to tapping H.T.+4, on the H.T. battery and one to the anode socket of the power valve holder.

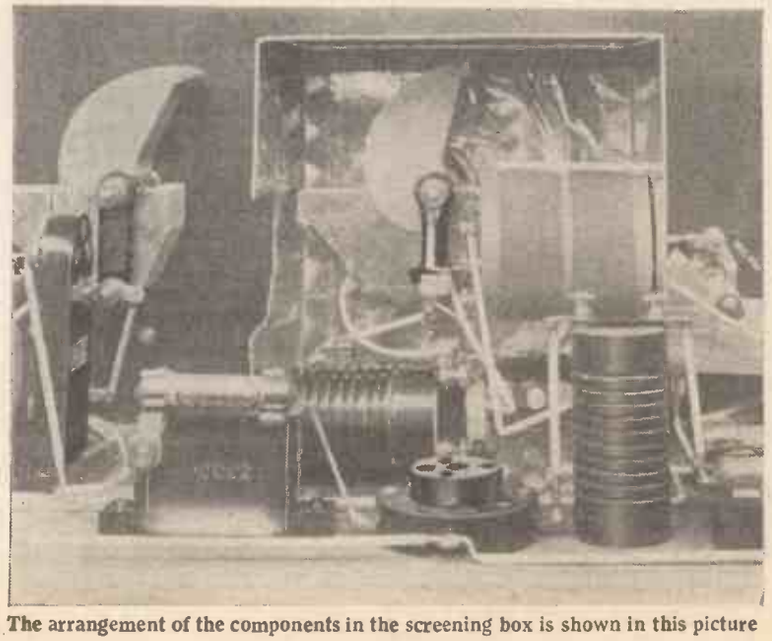
In next week's issue will be described the construction of the special frame aerial and linen-diaphragm loud-speaker. Also instructions will be given for operating this receiver to the best advantage.



Another view of the complete receiver with the back of the screening box removed



The Music Leader Circuit



The arrangement of the components in the screening box is shown in this picture

The Linen-diaphragm Loud-speaker and the Patent Position

The linen-diaphragm loud-speaker is now a patented article and with regard to this the following should be noted.

Until late in August, the linen-double-diaphragm loud-speaker had not, so far as we know, been patented in Great Britain, although the device had been patented in the U.S.A. by W. B. Whitmore in August, 1927. The American patent was communicated to the British Patent Office in 1928 and the British complete specification (No. 295,625) accepted on August 29 this year. This patent is being worked by Messrs. Ultra Electric, Limited, Ultra Works, 661-663, Harrow Road, London, N.W.10, who are manufacturing linen-diaphragm loud-speakers themselves and are licensing other manufacturers.

It follows then that, while the linen double-diaphragm loud-speaker could be made and sold by anybody in this country up to the end of August this year, the position is now altered. The device is now a patented article, but we have great pleasure in announcing that Ultra Electric, Limited, give permission through us for any amateur reader of AMATEUR WIRELESS to make up an experimental model of this type of loud-speaker for his own purposes, but naturally the company objects strongly to anybody making and selling the loud-speaker, except under licence. For the benefit of that large number of our readers who would like to have a loud-speaker of this type and do not wish to go to the

(Continued in 3rd column of page 640)

"A.W." TESTS OF APPARATUS

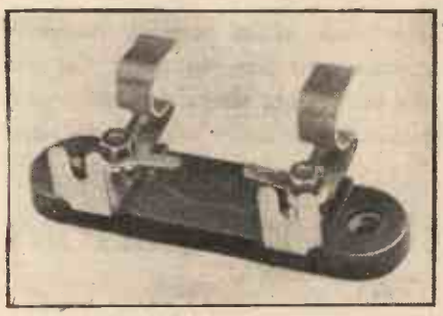
Conducted by our Technical Editor, J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

Lissen Resistance Holder

FIXED high resistances in the form of tubular cartridges such as are used as grid leaks are popular components and one will often find more than one of these incorporated in a set. It is an advantage also to employ the interchangeable type.

Messrs. Lissen, Ltd., who manufacture resistances of this variety from 100,000 ohms upwards, make a special holder, which should prove particularly useful to the constructor This holder consists of two metal strips terminating in a spade connector for attachment to a standard Lissen condenser The clips are mounted on an insulated base, in which there are two countersunk holes for mounting to the baseboard.

One of the particular features about this holder is that, although the leaks are held firmly in position, they can be removed without force by slightly rotating the cartridge, which will slip out of position. This should certainly prove a useful component to readers.



Lissen Resistance Holder

Dual Electric Gramophone Motor

THE trade and quite a large section of the wireless public are enthusiastic over the radio-gramophone, not only because it makes possible excellent reproduction of records, but it also allows a fine graduation of volume to be obtained at will to suit various conditions. It is hardly surprising therefore, that electrical gramophone motors are much in demand at the present time. The designer of an electrical gramophone motor has no easy task to perform, and if he can produce an instrument which is silent in operation and perfectly uniform in speed and capable of standing up to continuous work without need of attention, he has accomplished no small achievement.

This week we have tested an electric motor made by Messrs. Dual Motors, Ltd., of 85-86 New Bond Street, W. This unit is compact and has overall dimensions of 7 in. by 4½ in. by 3 in. from the top board to the base, excluding, of course, the turntable itself. The motor is universal in its application and it may be used for either D.C. or A.C. from 100 up to 250 volts. The field winding is tapped to suit the various standard voltages. The correct tapping point may be selected by rotating a three-way switch actuated by a lever above the top board; no external resistance is required.

Mechanical silence is undoubtedly aided by the use of very few rotating parts, for the governors are mounted on the main armature shaft and this in turn is geared to the turntable spindle by a helical worm and pinion. A sliding speed regulator bears on the brake disc of the governor.

Since the armature is mounted at either end on ball joints running in an oil chamber, attention to lubrication is seldom required, although the worm and pinion gearing should be greased periodically. If it is desired to inspect or renew the copper gauze brushes, these can be readily withdrawn whilst the motor is in position.

During our tests, the motor was commendably quiet when running and the speed remained quite constant at different settings of the regulator.

The price of this motor, complete with turntable, automatic on-off switch, and all the necessary accessories, is £4, whilst a combined clockwork electric drive can be obtained for 15s. extra. The instrument should appeal to readers and can be recommended.

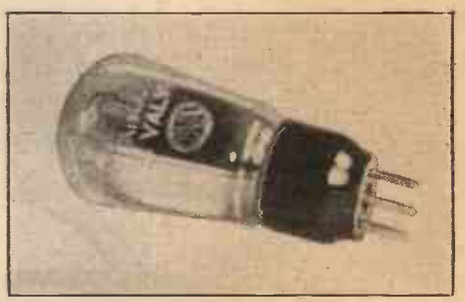
Marconi Indirectly-heated Valves

VALVES with indirectly-heated cathodes are deservedly the most popular mains valves in use at the present time. During the past few years, they have been consistently reliable and capable of exceptionally silent operation off raw A.C.

We have recently had an opportunity of testing a sample of the new Marconi indirectly-heated cathode valves supplied by the Marconiphone Co., Ltd., 210 Tottenham Court Road, W. These are made of the new standardised type, with five pins. As is customary, the cathode surrounds the heater. The anode is novel in that metal gauze is employed instead of a solid plate. The internal structure of the electrodes and their fixing appears to be robust. As one might expect from a valve of this type, the performance is distinctly good. We actually tested in our laboratory a sample of the ML4, and found that with an anode potential of 120 volts, the A.C. resistance was 2,350 ohms, with an amplification factor as high as 6. The mutual conductance was, therefore, approximately 2.5 milliamps per volt. The correct setting of the grid bias at 120 volts is approximately 12. The valve, therefore, makes an excellent final stage amplifier, capable not only of amplifying considerably, but of giving a satisfactory large power output.

The complete series is as follows:

Type	*Makers' Rating*	
MS4	500,000	550
MH4	23,000	35
MHL4	8,000	16
ML4	3,000	6



Marconi Indirectly-heated Valve

"COMPLETING THE MUSIC LEADER"

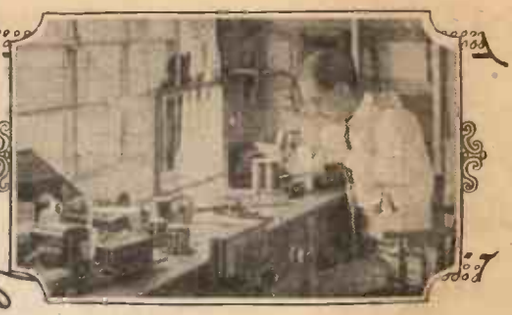
(*Continued from page* 638)

trouble involved in following our constructional directions, we may say that the Ultra Electric, Limited, have produced a range of linen-diaphragm loud-speakers in various sizes and one of them is well adapted for use in the "Music Leader." As a matter of fact, the chassis (the complete loud-speaker minus cabinet) is sold by the company almost as cheaply as any amateur can build it. Probably in our next issue, but certainly in the course of a fortnight or so, we are describing how the chassis of the Ultra Electric speaker can be adapted to the "Music Leader," and our explanation will be accompanied by photographs and drawings making the matter clear to everybody.

Any reader, therefore, wishing to build the "Music Leader"—a course to which he can be confidently recommended—need not fear any difficulty as far as the loud-speaker is concerned, because the new development has made it possible for him to get the chassis practically ready for incorporating in the cabinet.

Announcements by the Ultra Company appear in our advertisement pages and prices are there given.

My Wireless Den



Weekly Tips—Constructional and Theoretical—by W. JAMES

"Leaking" Grid Condensers

HAVE you ever had a fixed condenser which could be used in the grid circuit of a detector without a grid leak? I had one the other day, but it was not of first-class manufacture. It was a cheap condenser; but, unfortunately, amateurs sometimes buy them, and are not always able to find what is wrong with their set when they have finished its construction. A good condenser should have a very high value of insulation resistance. The telephone test sometimes recommended is not always reliable, particularly with small condensers. A megger test is best, but if you doubt the goodness of a condenser it is best to return it to the dealer.

'Ware Mixing H.F. and L.F.

When high-frequency currents are allowed to pass through the low-frequency part of the set to the loud-speaker there is bound to be trouble.

In the first place, the oscillations passing through the loud-speaker connecting wires may return to the aerial circuit if the aerial lead-in to the set lies near the loud-speaker. This is a frequent cause of instability. But there is a further point that should not be overlooked, and that is the valves in the low-frequency amplifier become fully loaded before they are dealing with the maximum strength of signals. As a result, the quality or the volume suffers.

The remedy is to connect a grid leak of about 100,000 ohms in each grid circuit. This will effectually prevent the passage of high-frequency currents through the set. Strangely enough, a grid leak is often a more effective stopper than a by-pass condenser, and it has the great advantage of not lowering the tone.

A large condenser, such as one sometimes sees recommended, always lowers the tone, as it reduces the strength of the higher audio frequencies. Sometimes a fixed condenser is employed to reduce the strength of "needle scratch" when playing records electrically, but, naturally, the higher tones suffer.

Thin Wire for H.F.

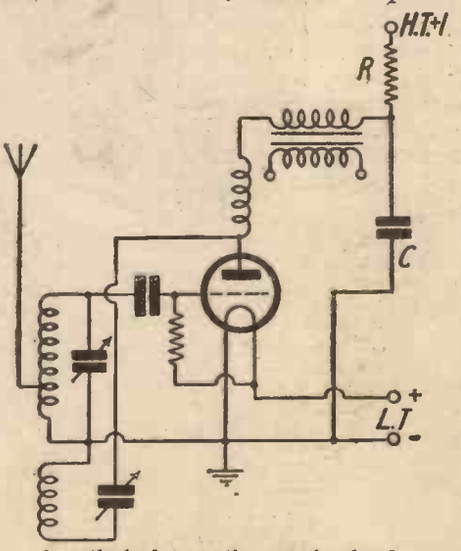
Everyone in these days knows how important it is when wiring a high-frequency amplifier to minimise stray capacities and couplings by spacing grid and anode wires and keeping them short.

I have noticed, however, that very often the mistake of using unnecessarily thick connecting wire is made. Sometimes very thick wire is used, as it is thought to add to the appearance of a set. This is clearly a mistake. The thinnest possible connecting wires should be used in high-frequency circuits, as by this means the capacity of the wires is the minimum.

Thick wires are all very well, but for the best results use thin wires—and make them short when possible.

Reaction Howl

One of the worst faults that can be present in a set is a reaction howl. Most people have experience of it. You increase the reaction, and at the point



A method of preventing reaction howl

where the circuits should just oscillate, or oscillate gently, a loud howl is heard.

Sometimes a growl instead of a howl is produced—it seems to depend upon the circuit values. But in both instances there is something wrong with the circuit, and as the fault is a distressing one it is worth while taking trouble to eliminate it.

I have found the addition of a resistance-capacity filter (as in the diagram) a help, R being of 20,000 ohms and C of 2 microfarads. But this does not always cure the trouble. Sometimes a new grid leak will put matters right, or it may be necessary to join one of half a megohm across the secondary winding of the transformer.

Then, again, the fault may be due—at least, in part—to the particular values of condenser and coil used in the reaction circuit. Too often a small reaction condenser is used. The fault may usually be eliminated by attention to these various points, and, as I have said, it is worth while spending a little time in putting the reaction circuit right.

NEXT WEEK!
FULL DETAILS OF THE "MUSIC LEADER" LINEN-DIAPHRAGM LOUD-SPEAKER

"Spotting" a Good Detector

A question I am often asked is "What is the best type of valve for detection?" This is a question not so easily answered, as much depends upon the circuit and the values of the parts used, as well as upon the strength to be dealt with.

As a general rule, a valve of the moderate-impedance type is the better, particularly when a fairly high voltage, such as 90 or more, can be used. Such a valve is not very easily overloaded, and will suit most low-frequency intervalve couplings. It will also suit most reaction circuits. The anode current may be as much as two or three milliamperes, but what does this matter when the quality and general performance is good?

There are occasions, of course, when a valve of the resistance-capacity type is perfectly satisfactory, but certain valves have a rather too high value of impedance for a transformer coupling to be used with satisfaction. Its high impedance renders it more suitable for a set having a resistance-capacity coupling when good quality and normal magnification should be obtained.

When the detector valve is changed the reaction circuit may need adjustment. More turns may be required in the reaction coil, or a larger condenser may have to be used. It is therefore better, when it is necessary to fit a new detector valve, to choose one whose characteristics are not very different from those of the old valve.

It is reported from Lille that the local transmitter (Radio PTT Nord) will be increased in power within the next few weeks.

RECORDS FOR YOUR RADIO GRAMOPHONE

IT would appear that the gramophone-record companies have recently turned their attention to obtaining a better, clearer and, what is more important, more delicate response to the high notes. This delicacy and greater clearness of detail is quite apart from what might be called a brilliant reproduction of treble notes.

Early High-note Recording

It will be remembered that the pre-electric recordings and early records generally suffered from an exaggerated amplification of the treble as well as the various recording resonances which made a piano record sound like that of a new variety of harp and characterised all soprano records with a nasal tone. You have only to listen to the most recent record by Andres Segovia playing his guitar to realise how effective good recording of the higher sound frequencies can be. The pieces recorded are "Courante" (Bach) and "Allegretto from a Sonatina in A Major" (Torroba), H.M.V. E475.

The radio gramophone is usually supposed to appeal on account of its better reproduction of the bass and its possibilities of overpowering production of sound volume. It is not always realised that its reproduction of high notes can at times have a realism that is almost uncanny.

The Columbia Company, when they issued the Eva Turner records—"Ritorna Vincitor," from *Aida* (Verdi) (L2150), and "O Patria Mia," also from *Aida* (L2156)—showed that they could record effectively the treble notes. Among their recent orchestral records, "Overture to *Oberon*" (Weber), played by Mengelberg's Concertgebonn Orchestra (L2312-3), stands out because of its excellent recording. Volume there is in plenty, but not at the expense of detail, and there is a gradation in tone which seems to indicate that at last we are getting away from records which are only remarkable on account of their extreme loudness. Another Columbia issue, "The Fountains of Rome" (Respighi), played by the Milan Symphony Orchestra (9833-4), is also distinguished by its good recording.

Further records of more serious orchestral works which are notable among recent issues are "The Clock Symphony" (Haydn), played by the Philharmonic Symphony Orchestra of New York, conducted by Toscanini (H.M.V. D1668-71) and "Prelude to Act 3, *Tannhauser*" (Wagner), played by the Berlin State Opera Orchestra (Parlo. E10886). The recording of both is excellent, although the second is rather louder than is desirable for the radio gramophone. At any rate, the signal-to-noise ratio—or, rather, I should say the ratio of intensity of musical sound to scratch noise, which, if you think a minute or two, is one of the most important factors in first-class reproduction—is all that can be desired. Another Parlophone record which should be heard is "Morning, Noon, and Night Overture" (Suppé), also played by the Berlin State Opera Orchestra (E10882).

Light Orchestral Records

To the listener of average musical taste, light orchestral records represent the class of music most readily appreciated. One of the best records of this class that I have heard for some time is "Waldteufel Memories," played by De Groot and his Orchestra (H.M.V. B3084). The clear violin tones of De Groot which used to be so familiar in his Sunday evening broadcasts are particularly well recorded. De Groot's other record, "Les Cloches de Corneville Selection" (Planquette) (H.M.V. B3041), is almost as good.

There is also a Columbia version of "Waldteufel Memories," played by Herman Finck and his Orchestra (Col. 9836), which should be compared with the H.M.V., but the pick of the Columbia issue of this class of music is undoubtedly "Intermezzo and Minuet from L'Arlesienne Suite" (Bizet), played by the J. H. Squire Chamber Orchestra (Col. 9835).

Whatever faults in your equipment may show up on other types of records, you should be able to obtain good reproduction with the records just given, and also possibly the following, which are similar in character: "Ave Maria" (Schubert), played by the Edith Lorand Orchestra (Parlo. E10889), and "*Il Trovatore* Selection" (Verdi), played by the B.B.C. Wireless Symphony Orchestra (Regal G1071). The latter record is rather louder than the others.

Military Band Records and Open-air Performances

Some time ago I was requested to recommend suitable records for radio-gramophone reproduction at an out-of-doors sports event. I made some comparative tests of various types of records, and found that, although dance and "tea-time" orchestral music reproduced well and were quite suitable, the most successful, from all points of view, were military band records. Whether or not the fact that one is more used to listening to brass instruments in the open had any influence on one's judgment, on the score of realism military band records seemed the best.

A number of excellent band records have recently been issued, and the following can all be recommended: "Stars and Stripes March" (Col. 5474) and "Marche Lorraine" (Col. 5473), played by the Grenadier Guards

Band; "Belle of New York Selection" (H.M.V. C1703) and "The Wedding of the Rose" (H.M.V. B3064), both played by the Coldstream Guards Band; and the Parlophone Company's Massed Military Bands record, "Torgau March" (Parlo. E6190). The playing of the Grenadier Guards is characterised by a smooth precision, while some effective trombone recording on the second side of B3064, and drum and woodwind recording on the Parlophone record make these records worthy of note.

For those who are interested in instrumental records, two which can be recommended with confidence are "La Capriccioso" (Ries), played by Master Yehudi Menuhin (H.M.V. DA1003) and "Ecossaise" (Beethoven), played by Levitzki (H.M.V. E537). The first is a violin solo which, although rendered by a boy prodigy, is marked by a high standard of performance, while the second record contains the best piano tone I have heard for some time.

Dance Records

Dance records continue to be issued in such large numbers that it is quite impossible to deal exhaustively with individual records. For those who desire a guide in the selection of their records I give the following list as representing my selection of the best of recent issue :—

"Bitter Sweet Selection," played by Jack Hylton and his Orchestra. H.M.V. C1727.
"Dance of the Paper Dolls," Victor Arden and Phil Ohman (piano duet). H. M.V. C3075.
"Let me dream in your arms again," Jack Payne's B.B.C. Orchestra. Col. 5500.
"Ninette," Debroy Somers' Band. Col. 5499.
"Hittin' the Ceiling," Carolina Club Orchestra. Parlo. R400.
"The one that I love loves me," Sam Lanin's Famous Players. Parlo. R401.

A. G. McD.

ON THE SHORT-WAVE SIDE

IT is a significant fact that the commercial success of wireless telegraphy dates from the introduction of the short-wave beam system. Although long-wave high-powered stations had then been in operation for many years, the cable companies were practically unaffected by their competition. The success of the beam was so pronounced that it was quickly followed by the recent cable-wireless merger.

The normal wavelength used in beam signalling varies from 15 to 22 metres, and there are various technical difficulties in reducing it below these limits. Senator Marconi and Mr. Franklin have, however, recently designed a valve generator in which the whole of the primary circuit, including the aerial, is contained inside one glass bulb. The factors which determine the wavelength to be generated consist of (*a*) the capacity between the anode and grid electrodes and (*b*) the inductance of the strip connections carrying the supply voltages.

M. B.

BROADCAST TELEPHONY

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

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (5SW)	15.0
*200	1,500	Leeds (2LS)	0.13
*242	1,238	Belfast (2BE)	1.0
*261	1,148	Newcastle (5NO)	1.0
288.5	1,040	Swansea (5SX)	0.13
288.5	1,040	Stoke-on-Trent (6ST)	0.13
288.5	1,040	Sheffield (6LF)	0.13
288.5	1,040	Plymouth (5PY)	0.13
288.5	1,040	Liverpool (6LV)	0.13
288.5	1,040	Hull (6KH)	0.13
288.5	1,040	Edinburgh (2EH)	0.35
288.5	1,040	Dundee (2DE)	0.13
288.5	1,040	Bournemouth (6BM)	1.0
288.5	1,040	Bradford (2LS)	0.13
*301	995	Aberdeen (2BD)	1.0
*310	968	Cardiff (5WA)	1.0
*356	842	London (2LO)	2.0
356	842	Brookman's Park	20.0
*377	797	Manchester (2ZY)	1.0
*399	753	Glasgow (5SC)	1.0
*479	626	Daventry (5GB)	25.0
*1,554	193	Daventry (5XX)	25.0
AUSTRIA			
*246	1,220	Linz	0.5
*283	1,058	Innsbruck	0.5
*352	851	Graz	7.0
*453	666	Klagenfurt	0.5
*517	581	Vienna	15.0
BELGIUM			
35.5	1,273.5	Charleroy (LL)	0.25
246.1	1,218.6	Schaerbeek-Brussels	0.25
250	1,200	Ghent	0.5
194	1,031	Liége	0.1
312	961.4	Arlon	0.25
339	887	Louvain	8.0
509	590	Brussels	1.0
DENMARK			
*281	1,067	Copenhagen (Kjobenhavn)	0.75
1,153	260	Kalundborg	7.0
FRANCE			
175	1,714	S. Quentin	0.1
211.3	1,420	Béziers	0.1
220	1,364	Fecamp (Radio Normanie)	0.5
237	1,265	Nice (Juan-les-Pins)	0.5
238	1,260	Bordeaux (Radio Sud-Ouest)	1.0
239	1,256	Radio Nimes	0.25
*255	1,175	Toulouse (PTT)	1.5
*265	1,130	Lille (PTT)	0.7
268	1,121	Casablanca	0.5
268	1,121	Strasbourg	0.3
*272	1,103	Rennes (PTT)	0.5
*280		Montpelier (PTT)	0.2
288	1,049	Radio Lyons	0.5
288.5	1,040	Mont de Marsan	0.3
*294	1,020	Limoges (PTT)	0.5
304	986	Bordeaux (PTT)	1.0
305.6	981.7	Agen	0.25
309	970	Radio Vitus	1.0
*316	950	Marseilles (PTT)	0.5
326.5	918.9	Grenoble (PTT)	0.5
331.4	905	Petit Parisien	0.5
364	824	Algiers	1.0
368	815	Radio LL (Paris)	0.5
*381	788	Radio Toulouse	8.0
411	789	Radio Maroc (Rabat)	2.0
436	687	Radio Flandre (Lille)	0.1
447	671	Paris (Ecole Sup. PTT)	1.5
468	640	Lyons (PTT)	5.0
1,350	222	Tunis (Kasbah)	0.6
1,458	205.76	Eiffel Tower	12.0
*1,725	174	Radio Paris	12.0
GERMANY			
*218	1,373	Flensburg	0.3
*227	1,319	Cologne	4.0
*234	1,283	Muenster	3.0
*239	1,256	Nurnberg	2.0
*246	1,220	Kiel	0.35
*246	1,220	Cassel	0.25
*253	1,184	Gleiwitz	2.0
*259	1,157	Leipzig	1.5
*270	1,112	Kaiserslautern	0.25
*276	1,085	Koenigsberg	2.5
*283	1,058	Magdeburg	0.5
*283	1,058	Berlin (E.)	0.5
*283	1,058	Stettin	0.5
*319	941	Dresden	0.25
*325	923	Breslau	1.5
*339	887	Bremen	0.35
*360	833	Stuttgart	1.5
*372	806	Hamburg	1.5
*390	770	Frankfurt	1.5
*418	716	Berlin	1.5
*453	662	Danzig	0.25
*456	657	Aachen	0.35
*473	635	Langenberg	13.0
*533	563	Munich	1.5
*560	536	Augsburg	0.25
*560	536	Hanover	0.35
575	521.7	Freiburg	0.35
*1,635	183.5	Zeesen	30.0
2,100 / 2,290	142 / 131	Norddeich	10.0
HOLLAND			
31.4	9,554	Eindhoven (PCJ	25.0
*298	1,004	Hilversum (until 5.40 p.m. G.M.T.)	6.5
*1,071	280	Hilversum	6.5
*1,070	280	Scheveningen-Haven (from 10.30 a.m. to 5.40 p.m. B.S.T.)	5.0
*1,875	160	Huizen (after 5.40 p.m. G.M.T.)	6.5
IRISH FREE STATE			
*225	1,337	Cork (1FS)	1.0
*413	725	Dublin (2RN)	1.0
ITALY			
248	1,209	Trieste (testing)	1.0
*274	1,094	Turin (Torino)	7.0
*330.3	908	Naples (Napoli)	1.5
*385	779	Genoa (IGE)	1.0
*441	680	Rome (Roma)	3.0
453	662	Bolzano (IBZ)	0.3
*501	599	Milan (Milano)	7.0
NORWAY			
240	1,250	Rjukan	0.18
*283	1,058	Notodden	1.05
*365	820	Bergen	1.0
*394	761	Frederiksstad	0.7
458	662	Tromsoe	0.1
453	662	Aalesund	0.3
453	662	Porsgrund	0.7
*498	608	Oslo	1.5
1,071	280	Oslo (testing)	7.3
POLAND			
*313	959	Cracow	0.5
*335	896	Posen	1.2
385	779	Wilno	0.5
*408	734	Kattowitz	10.0
*1,411	212.5	Warsaw	8.0
SPAIN			
251	1,193	Almeria (EAJ18)	1.0
314	956	Oviedo (EAJ19)	0.5
*349	860	Barcelona (EAJ1)	8.0
*368	815	Seville (EAJ5)	1.5
403	743	San Sebastian (EAJ8)	0.5
*424	707	Madrid (EAJ7)	2.0
453	662	Salamanca (EAJ22)	1.0
465	645	Barcelona (EAJ13)	8.0
SWEDEN			
231	1,301	Malmo	0.6
*257	1,160	Hoerby	10.0
270	1,112	Trollhattan	0.45
*322	932	Goeteborg	10.0
322	932	Falun	0.5
*436	689	Stockholm	1.5
*542	554	Sundsvall	0.6
*770	389	Ostersund	0.6
1,200	250	Boden	0.6
*1,348	222.5	Motala	80.0
SWITZERLAND			
*403	743	Berne	1.0
*459	653	Zurich	0.63
466	644	Zurich (during afternoon)	0.63
680	442	Lausanne	0.6
760	395	Geneva	0.25
1,010	297	Basle	0.25
TURKEY			
*1,200	250	Stamboul	5.0

All wavelengths marked with an asterisk have been allotted according to the *Plan de Prague*.

IN the "Points of View" series, listeners to the London programme will have an opportunity of hearing Sir Oliver Lodge's opinions on November 1.

A burlesque of *The Merchant of Venice*, which 2LO and 5XX are to broadcast on November 2, should prove good entertainment in view of the fact that, under the title of *Ikey Gets His*, Julian Rose is to take the part of Shylock.

A further adaptation for broadcast purposes of a Joseph Conrad novel—namely, "Typhoon"—is being prepared for transmission from all stations taking the London programme on November 20. On the same evening another of A. J. Alan's adventures will be related by the author; it is called "A Joy Ride."

On November 6, through 5GB, Clapham and Dwyer will give their 1929 Concert Party, which will revive the listeners' memories of well-known incidents associated with summer holidays.

Magneshah, a Salty Tale of the East, from the pen of Dorothy Eaves, will be the main feature broadcast from the Birmingham studio on November 7. It is a musical comedy in Oriental setting, for which a strong cast has been engaged.

A real Russian cabaret, with music, singing, and dancing, will be relayed to 2LO on November 7, and should provide the unseen audience with a true mental picture of a Russian entertainment transported to London.

The radio industry in America has reached the stage where it now employs more than 350,000 people and represents an investment of more than four billion dollars.

Norway has a population of two and a half millions, of which 64,000 are listeners. It is a peculiar fact that many in Norway who have a wireless set have never seen a train! Sweden, with a population of 5,582,000, has 412,000 listeners, with thirty broadcasting stations to serve them!

Brunn, Czechoslovakia, which now uses a power of only 3 kilowatts, is to be converted to a 36-kilowatt station. It is hoped that the conversion will be completed by 1930. New studios will also be erected.

The new station at Kosice, in Czechoslovakia, transmits various programmes which collectively are interesting to the varied population of that country. There are Polish, Hungarian, and Russian transmissions, and once a month a service from one of the Polish synagogues is relayed.

At Podébrady two ultra-short-wave transmitters have been erected for direct communication with the United States. The transmitting power is 20 kilowatts.

The new Prague transmitter will operate on a power of 60 kilowatts, and in order to create as little interference as possible with the reception of other stations the transmitter has been erected five miles from Prague. The future possibility of increasing the power to 120 kilowatts has been allowed for in the design. It is expected that the transmitter will be ready for use in 1930, and it will have a crystal range of 150 miles. The frequency of the new station will be 670 kilocycles—that is, about 448 metres.

With the disbanding of full B.B.C. orchestras in Scotland, the musical background for studio programmes is now being supplied by a new octet recruited from Glasgow and Aberdeen, and under the leadership of Mr. Isaac Losowsky, who was for several years leader of the Glasgow Station Orchestra. The combination is composed of three violins, viola, 'cello, bass, piano and organ, and will be heard in straight-forward Scottish ballad concerts, as well as in the afternoon programmes, and the provision of incidental music for plays and feature programmes.

The series of special talks for Scottish schools on "My Day's Work," promises to be of a most engrossing nature. The series, given a send-off by Tommy Muirhead, the captain of Glasgow Rangers Football Club, includes talks by such various types as a commercial traveller, a minister, a reporter, a sheep-farmer, a postman, a telephone exchange operator, a railway engine driver, a surveyor, a ship's engineer, and a financier.

The Radio Circle of the Glasgow station has just sold a huge collection of silver paper, which has been in the making for the past two or three years. The proceeds, amounting to no less than £100, have been handed over to the Strathblane Children's Hospital.

Authority to use the maximum power available to broadcasting stations in the United States—50,000 watts—has been granted to the Western Broadcasting Company KNX at Los Angeles, California, by the Federal Radio Commission. The transmitter has formerly been only 5,000 watts; it will operate on the 1,050 kilocycle channel on full time.

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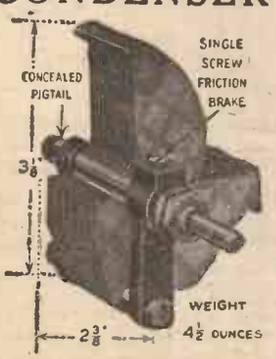

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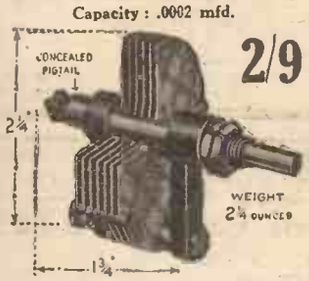

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LETTERS TO THE EDITOR

The Editor does not necessarily agree with the views expressed by correspondents.

Are We Progressing?

SIR,—Your correspondent W.J N P. (London, S.E.) in the October 5 issue must be pulling our legs.

Two W.24 valves and two transformers! Am I correct in thinking that these are H.F. valves of some 60,000 ohms internal resistance? Following these valves with old transformers!

It would be curious to see a laboratory test of the contraption.

Bass there certainly wasn't, and the higher frequencies I should question were not present. He does not state the ratio or give any particulars of the transformer used to couple crystal to first valve (always a stumbling block).

The old Primax speaker was very sensitive to over-load, but perhaps this would be of no consequence, seeing his output characteristic would be so appalling.

His views on the two transformer-coupled amplifiers I agree are quite in order.

Has your correspondent heard a really good M.C. instrument functioning from a first-class amplifier? They are very few and far between. If he has not, let him take the first opportunity and hear one; I am confident he will eat his words.

L. M. B. (Romford).

A Great Success

SIR,—I must write and thank you for the best 2-3 circuit I have seen yet (the "Talisman 2-3"). It took me two hours last night to make up with some parts I had on hand, instead of those specified. Sixteen stations come in at full loud-speaker strength, and on an inside aerial and water-tap earth. Call sign heard in each case.

B. (Lower Clapton).

A Plea for Simplicity

SIR,—I have been taking your paper for some years now, and shall continue to do so, but I trust that you will cater more for the "small man" in wireless. The Radio Exhibition was a mass of expensive apparatus, with loud-speakers giving great purity and enormous volume; but here again the small man was not catered for. Apart from first cost, the cost of H.T. batteries in running the "super" sets is beyond the man of small means.

There are still a great number of crystal-set users, and in this connection research ought to be concentrated on making headphones more and more sensitive, especially on the lower notes.

Loud-speakers have been improved as regards volume and sensitivity, provided

(*Continued on page* 656)

"LETTERS TO THE EDITOR"

(Continued from page 655)

elaborate sets are employed with super-power valves that eat up money in the shape of H.T. current. The sensitivity of speakers has not been improved. Research is needed in increasing the sensitivity so that good reproduction may be obtained on the ordinary two-valve set.

W. R. W. (London, E.C.).

Television Broadcasts

SIR,—I was pleased to see that "Thermion" had noted my recent remarks. However, he ignores the real drift of my letter which was directed at his remarks on the Americanising of our programmes, and prefers to deal instead with the subsidiary grouse on television.

Let us assume, for sake of argument, that television will come. The obvious thing will be to broadcast from Brookmans Park with a large "wipe-out." Will "Thermion" tell me how the users of simple sets are going to receive the alternative programme? By simple sets I refer to those in which the first valve is the detector.

Now everybody pays (or should pay) their licence, and it is unfair to use the money of the general public in expensive experiments, especially when these are likely to interfere with the regular reception of thousands of listeners, and when the money might be more usefully expended in improving the programmes.

In my former letter I disagreed with "Thermion" on his eulogy of the American programmes. I see that he has since stepped still further off the mark by suggesting that a certain amount of advertising might be beneficial to our own. Let "Thermion" make no mistake, the small amount which he advocates would merely be the thin end of the wedge, and we should soon have the programmes entirely run by the big commercial enterprises.

The programmes radiated in U.S.A., if one can judge from frequent "doses" of short waves, are not worth listening to, being of the most rubbishy kind and interspersed with advertising announcements about every five minutes. Our own programmes are miles ahead of anything America can put on the air; so why retrogress by copying a country so far behind us?

F. A. I. (London, W.C.).

NEXT WEEK:

THE B.B.C.'s RECOMMENDED CRYSTAL CIRCUITS AS PRACTICAL SETS.

Owing to the demands upon our space in this issue, it has been necessary to omit the feature "Our Information Bureau."

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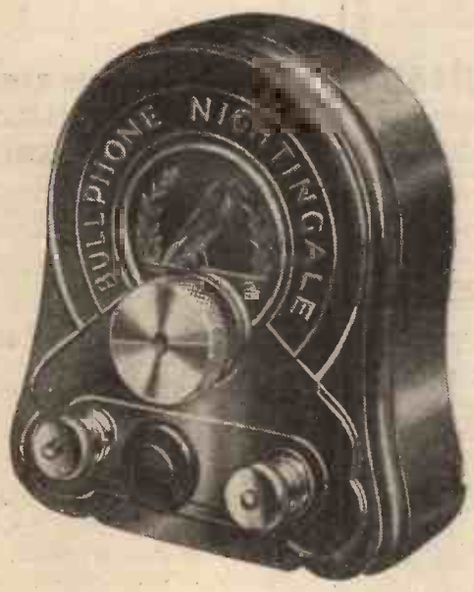

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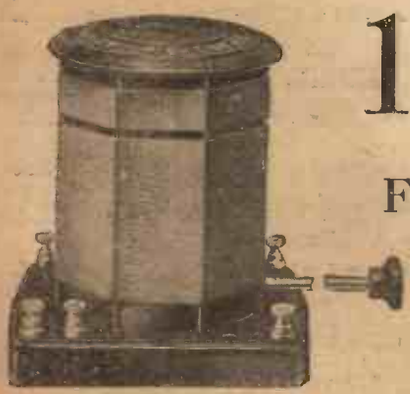

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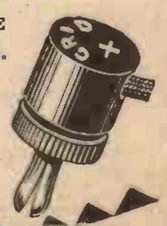

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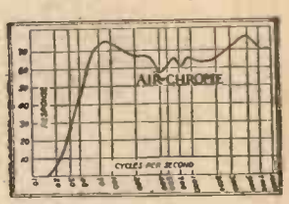

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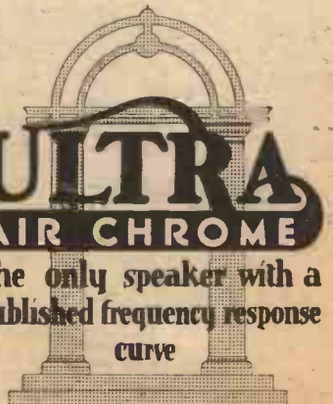

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AMATEUR WIRELESS 58-61 FETTER LANE LONDON E.C.4

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

Oct. 30 *Aida* (Verdi).
„ 31 Hallé concert from Manchester.
Nov. 1 Vaudeville programme.
„ 2 A burlesque talkie.

DAVENTRY EXPERIMENTAL (5GB)

Oct. 27 *The Golden Legend*, an oratorio by Sullivan.
„ 28 *Aida* (Verdi).
„ 30 Light orchestral programme and soloists.
„ 31 Vaudeville programme.
Nov. 1 Symphony concert relayed from Queen's Hall, London.

MANCHESTER

Oct. 28 *Establishing Relations*, a comedy by W. W. Jacobs.
„ 31 Halle concert relayed from Free Trade Hall.
Nov. 2 Eye-witness account of Bolton Wanderers v. Sheffield Wednesday football match.

BELFAST

Nov. 1 Symphony concert conducted by Sir Henry J. Wood, relayed from Ulster Hall, Belfast.

Mr. Ramsay MacDonald's speech to the Council of Foreign Relations in the United States on October 12 last was relayed to some fifty broadcasting stations as well as to many short-wave transmitters.

Station WENR (Chicago) has been granted permission by the Federal Radio Commission to broadcast television with 5,000-watt power. The station has been allotted a channel from 2,850 to 2,950 kilocycles.

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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. **Queries** should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed. **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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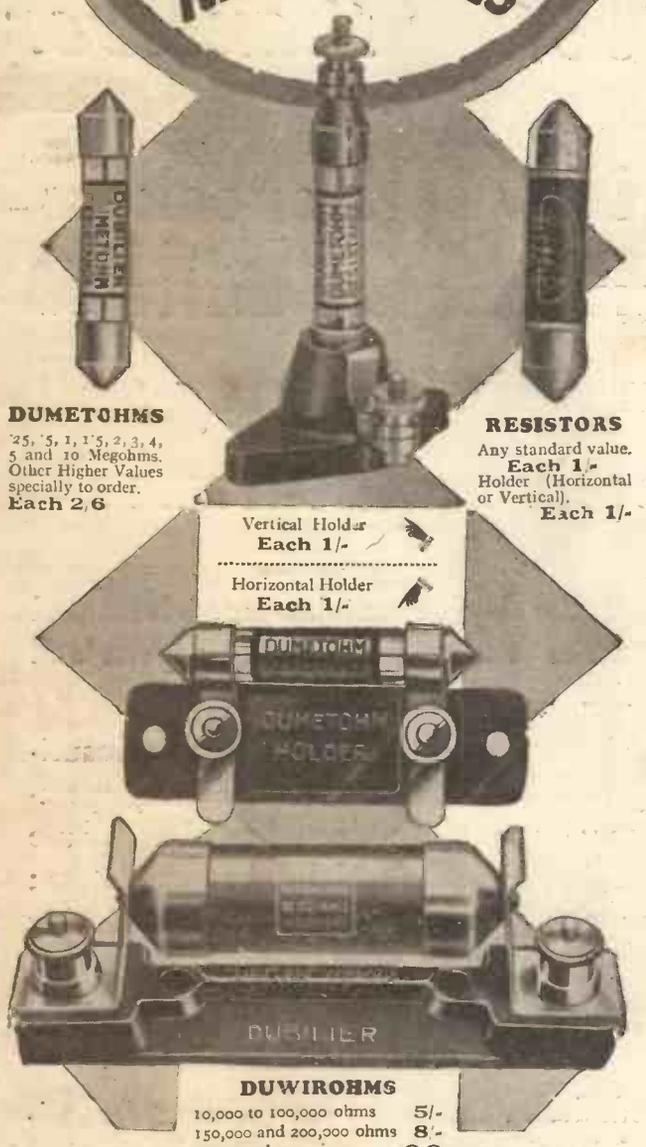
DUBILIER FOR STAUNCH RESISTANCES



DUMETOHMS
·25, ·5, 1, 1·5, 2, 3, 4, 5 and 10 Megohms. Other Higher Values specially to order.
Each 2/6

RESISTORS
Any standard value.
Each 1/-
Holder (Horizontal or Vertical).
Each 1/-

Vertical Holder **Each 1/-**

Horizontal Holder **Each 1/-**

DUWIROHMS

10,000 to 100,000 ohms	5/-
150,000 and 200,000 ohms	8/-
250,000 ohms	9.9
300,000 ohms	11/6
Holder	1/6

If unobtainable from your dealer write direct to us giving his name and address.

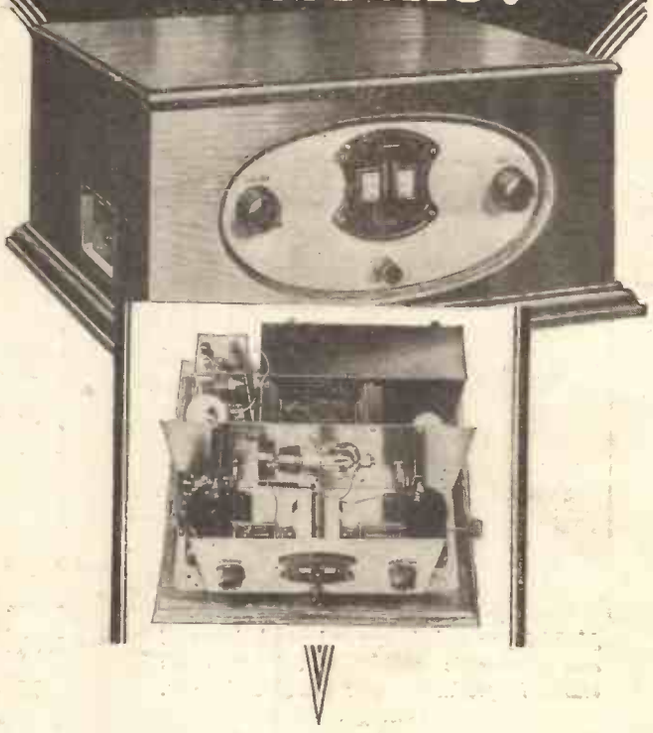
Free for the asking—"A Bit about a Battery." There's a copy for you at your dealer's.

DUBILIER RESISTANCES

Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, N. Acton, London, W.3.

BC 250/R

Build the LOTUS S.G.P. Set at home!



The new Lotus 3-valve S.G.P. receiver is the season's greatest success. British and European stations come in with outstanding clarity and power. It is selective to a degree hitherto unattained.

Build this wonderful set yourself at home. You can buy the complete outfit ready to assemble from any retailer for £7 : 12 : 6.

Ask for the Lotus S.G.P. Kit . . full instructions are with it and the main components are already mounted

From all Radio Dealers

LOTUS

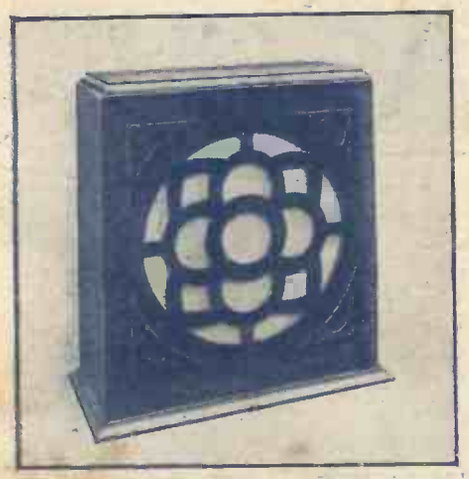
Send to-day for full descriptions, diagrams and instructions for assembling

Made by the makers of the famous Lotus components, in one of the most modern radio factories in Great Britain

GARNETT WHITELEY & CO., LIMITED
LOTUS WORKS, LIVERPOOL

MARCONIPHONE RADIO

now better than ever



Model 60, an entirely new and greatly improved cone speaker in a dignified cabinet. Gives beautiful reproduction of both music and speech. Price £3.

The famous "Octagon" cone speaker, with its clear, full tone, is now obtainable in two distinct styles. Always splendid value, at its reduced price of 30/-.

New sets, speakers and mains units of splendid efficiency and attractive appearance

AT Olympia the new Marconiphone models aroused tremendous enthusiasm among experts and novices alike.

New Receivers of astonishing efficiency, in beautifully designed cabinets, for mains or battery operation; new mains units, simple and reliable, for use with any set, in place of batteries and accumulators; new and improved loud-speakers, including a Moving Coil model at a new low price.

All these, together with the famous Marconi valves, are the best that technical skill can offer you.

Go to your dealer and ask to see the new Marconiphone models—the very latest in radio, designed by Marconiphone engineers to satisfy your every need.

If you cannot easily find a dealer, write for a catalogue to the Marconiphone Company Limited, 210-212 Tottenham Court Road, London, W.1.

MARCONIPHONE

The first and greatest name in wireless

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