

THE "HORIZON FOUR"—TRULY A "CLARION" FOUR

Amateur Wireless

Every Thursday 3^d
and
Radiovision

Vol. XVI. No. 419

Saturday, June 21, 1930

The HORIZON FOUR

FULL DETAILS

The illustration features a detailed view of a vintage radio receiver, showing its internal components like coils, capacitors, and a speaker. The text 'The HORIZON FOUR' is rendered in large, bold, 3D block letters with a red and white striped pattern. A red curved line arches over the word 'FOUR'. Below the radio, the words 'FULL DETAILS' are written in a bold, red, sans-serif font. The entire scene is set against a background of a horizon line over water, with a red and white striped pattern extending from the horizon.

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The Lewcos
C.T. Coil

**— An
Opinion
Endorsed
by Hundreds
of Users**

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The letter printed on the right confirms the opinion of the ever-increasing army of "Lewcos" enthusiasts.

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Amateur Wireless and Radiovision

The Leading Radio Weekly for the Constructor, Listener and Experimenter

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Broadcasting from the R100—For Television “Fans”—Some Hum!— A Small World!—Our 1930 Pirates!

Broadcasting from the R100—The C.N.R. has a very enterprising radio side to its organisation, and ambitious arrangements have been made for the reception of the R100 when it arrives at Montreal at the conclusion of the Transatlantic flight. The noise of the airship's arrival and an account of the voyage will be S.B. through twenty-two linked stations in Canada, over a distance of 3,000 miles. As the N.B.C. and Columbia chains in America may also link up, the whole of America and Canada may be humming with the noise of the R100's engines.

For Television “Fans”—“Monsieur le Directeur,” starts a letter we have received from the Institut International de Television at Brussels and which goes

with the Institut, at 87 Chaussee de Ter-vuieren, Auderghem, Brussels.

Some Hum!—A letter received by the Information Bureau this week is interesting because it deals with a topical problem now that many districts are changing over from D.C. to A.C. “My home-made eliminator with one choke and two ‘two-mike’ smoothing condensers works well on D.C. mains and I hoped that it would work well on A.C. mains when I simply fitted a transformer and rectifier,” says A. G. B. To cut a long story short, it didn't work well, but hummed furiously.

“I tried other and larger chokes,” he says, but while this cured the hum, it cut down the signals. The cure? We advised that the choke should be left as

it was and the value of the condensers increased to 4 microfarads each. This is a cure in most cases, and often cheap, commercial A.C. eliminators can be improved by fitting bigger condensers.

A Small World!—It is really very wonderful when you come to think of it that this year the whole world could



A Derby echo. Just a glimpse of the crowds which gathered outside a radio shop in Fleet Street, in the heart of the newspaper world, to get the results before the newspapers!

on to say (translated) that this society has been formed to further the progress of television. It is an amateur society, anybody may join, and television “fans” in this country are invited to get in touch

mentary on the Derby. 5SW was opened specially to transmit for reception overseas, and both of the big broadcasting chains in America and one in Canada, linked up for a relay by means of the Transatlantic tele-

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phone service. The news agencies weren't far behind, and the result was flashed to places so far distant as Russia and China in a matter of only a few seconds. On occasions like the Derby, one realises what a small place the world has become owing to the ether chain! The picture on this page gives an idea of the crowds which gathered at the door of every radio shop where a loud-speaker was in operation.

Our 1930 Pirates!—Apparently there are other pirates in this year of grace apart from wireless pirates and horrible fellows of like ilk. According to the Marine department of Marconi's there is still a danger of pirates on the high seas. It is said that ships sailing in Chinese waters are still subject to many dangerous experiences, so apparently the thrilling Chinese pirate stories of our youth were founded on fact! Armed military guards are carried on ships likely to be raided, but Marconi's have thought of a still brighter idea to safeguard sea traffic. An automatic transmitter is provided in conjunction with a special fire-proof safe. If the ship is attacked, the wireless operator closes a switch which sets the automatic transmitter in operation, and the safe is locked; then the operator is free to go on board and handle a sabre or six-barrel shooter with the rest of the crew! The set goes on transmitting S.O.S.

NEXT WEEK : A SPECIAL PORTABLE AND RADIO-GRAMOPHONE NUMBER. ORDER YOUR COPY NOW !

Can the B.B.C.'s SUNDAY PROGRAMMES be altered

Asks Alan S. Hunter,
after an interview with B.B.C. officials at Savoy Hill

MORE ink has probably been spilled over the Sunday programmes than over any other B.B.C. activity. Every listener seems to be asking if the present make-up of the Sunday programme is to go on indefinitely. At the moment, the B.B.C. sees no reason why it should change its plans, which it considers adequately meet the needs of those who listen on Sundays.

Sabbath Incongruity

To the average Englishman there is more than a little incongruity in some of the foreign stations' Sunday programmes, where



The B.B.C.'s new Chairman—Mr. J. H. Whitley, who has had long experience of political affairs. From 1921 to 1928 he was Speaker of the House of Commons, and he has been Chairman of the Royal Commission on Labour in India. He is taking over the B.B.C. Chairmanship immediately

dance music quickly follows a church service and grave and gay items are generally intermixed. Since the war, we English have undoubtedly relaxed our Sabbath rigidity a little, so I am not surprised to hear good church-going folk expressing a sneaking interest in some of the diverting Sunday programmes from Radio Paris, Toulouse and Hilversum.

Their attitude is quite understandable. They go to church in the morning and

possibly in the evening also. The afternoon offers a chance of relaxation which is not adequately provided by the B.B.C. programme. Those who go to evening service come home to find a full broadcast service about to begin. The churchgoer who is, admittedly, in the minority these days, is poorly served by the B.B.C. if he wants to lighten his religious observances.

I know of people to whom the B.B.C.'s Sunday religious programmes mean more than all the rest of the week's items. I should be very sorry indeed to see the blessing of broadcast religion withdrawn from them. Even their obvious minority is not sufficient excuse for debarring them from a medium of religious solace that only broadcasting can give.

Let us see what use is at present made of the London regional centre on Sundays. I take Sunday, May 9, as a fair example.

Broadcasting begins at 3 in the afternoon, but only from the National station. One of the interminable series of Bach cantatas is broadcast until 3.55. Those who do not like Bach must wait until 3.30, when the London Regional station starts with a Military Band concert, which continues until 5 p.m.

In contrast to the religious talk that follows from the Regional at the end of the Military Band concert, the National station is in the middle of a light musical programme, which continues until 5.30. At this time, the Regional closes down, but the National continues for half-an-hour with a pianoforte recital, followed by a reading from Milton.

From 6.20 till 7.55, there is a complete blank. Then, one of the twins, the National, starts with a religious service, which, with an appeal, brings us to the news at 8.50. The Regional comes into operation for the appeal and the news.

"Nat" and "Reg"

At 9.5 an Elgar concert starts from the National. It is also radiated from the Regional. The Epilogue at 10.30 completes the day's broadcasting.

A careful study of these broadcasting times brings to light several important facts. The outstanding fact, to my mind, is that, on Sunday, very little use is made of alternative programme facilities; certainly

not in the evening. The next fact is that the B.B.C. will not allow the time of its broadcast service to clash with the evening services in church. The third fact is that it will not permit a light musical programme to clash with its own religious service.

For these reasons, nothing entertaining can be broadcast from 6.30 when the church services begin, until nearly 9 o'clock, when the B.B.C. services end. We cannot begin to jiven up the Sunday programmes on this basis. At the same time, there is no likelihood of the B.B.C. allowing itself to come into conflict with the Church. I cannot see any hope of the B.B.C. putting back the time of its religious service to 6.30 p.m.

But there seems to be no real reason why a musical programme should not be broadcast at this hour. Nor why, when the B.B.C. is broadcasting religion on, say, the National, a musical programme should not be given from the Regional.

Those Cantatas!

I had an instance the other day showing what a brick wall we are up against over these programmes. The new B.B.C. Musical Director was interviewing a group of journalists, to one of whom he explained how the Bach cantatas came to be broadcast early in the afternoon—at 3 instead of 5 o'clock.

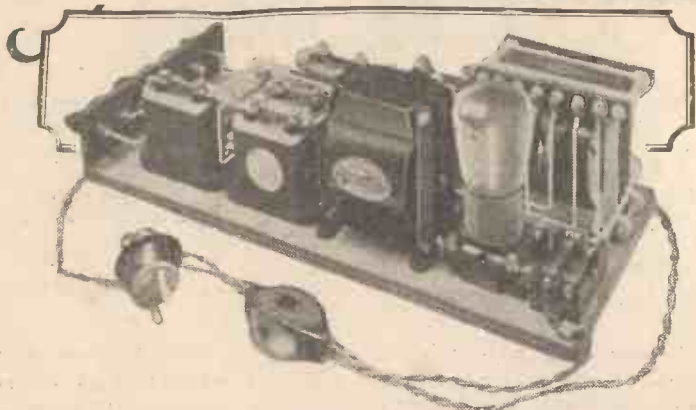
He said that many complaints were received to the effect that the cantatas were being missed by those who most appreciated them, because these listeners were just leaving for evening church when the broadcasts began. So Bach was very conveniently started in the middle of the entertainment period. For this singular example of giving in to a minority, composed of highly-educated musicians, at the obvious expense of the majority, I can find no parallel.

There are hundreds of Bach cantatas. Some of them, undoubtedly, merit a Sunday afternoon's broadcasting. But no composer's work can possibly stand the strain of being played through for a year of Sundays. And not many listeners will stand the strain, either. The cessation of the Bach broadcasts would be a brightening influence.

An ELIMINATOR

for A.C. MAINS

Further details and operating notes of the simple battery eliminator which was described in last week's issue



THE output from the present unit is quite suitable for most sets up to a four-valver, and this is a point that needs watching, for while this unit is cheaper to construct than most commercial A.C. eliminators, there may be found a few of cheap Continental manufacture which appear to compete with it in price, but which really do not do so, the output not being so great.

It is very disheartening to make up a unit suitable for one set only to find, perhaps, a few months later, when something more ambitious is attempted, that the H.T. supply is not great enough. In many D.C. units it is not a difficult matter to increase the current flow by fitting a different type of choke and resistance feed, but with an A.C. eliminator it is a much more difficult job, for the whole of the rectifier connections have, generally, to be changed.

With the average set this possibility is not likely to arise, for the present unit is large enough to supply high-tension current suitable for a four-valver with a total emission not exceeding about 50 milliamps.

As mentioned last week, a full-size blueprint has been prepared to aid constructors of this unit, and this print can be obtained, price 1s., from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4.

Simple Construction

Construction is an easy matter, for there is no panel drilling necessary and all the parts are simply screwed to a plain wooden baseboard, to one end of which is attached a small terminal strip. This terminal strip carries not only the terminals for the H.T. supply, but also a variable resistance, by means of which the voltage may be controlled.

The input to the eliminator is by means of a convenient length of flex, which is clamped at one point at the other end of the baseboard under an insulated staple. At any suitable point in this flex run is an on-off switch of a rather special and very convenient type. The mains flex comes straight in to a twin fuse holder, so that there is a plug-in fuse in both leads. This

is a good point and prevents the possibility of any fault in the eliminator blowing the mains fuse of the house.

The correct positions of all the components can be gauged from the blueprint, and it is strongly recommended that no deviation should be made from the arrangements shown, for there is a possibility that back-coupling and mains hum will be the result of any wrong placing of the parts in the A.C. circuit.

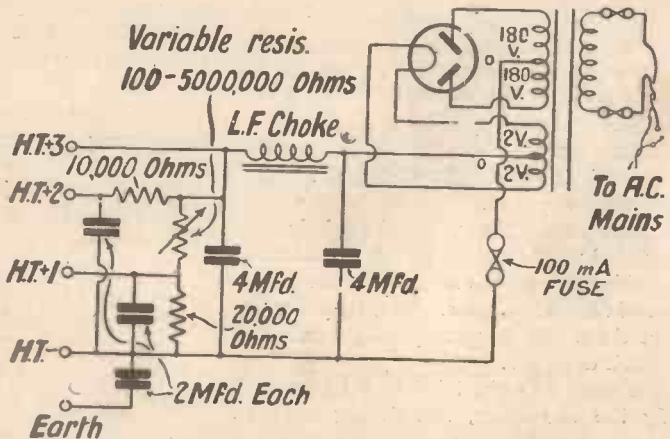
It is recommended that rigid insulated wire be used for the connections, most of which are short and direct. It will probably be found more convenient, however, to take two small flex leads from the primary of the mains transformer (it does not matter which way round) to the two sides of the mains fuse.

Wire-wound resistances are used for breaking down the voltages, with the exception, of course, of the variable control, which is of the compression type, and under no circumstances should grid-leak resistances be used, which would only break down and give trouble under a heavy high-tension current flow. Suitable valves to use in the rectifying stage are the Marconi and Osram U9, Triotron GN24, and Mullard DW2.

There are one or two little points to note when operating this unit. The earth lead should be disconnected from the set and taken to the earth terminal on the unit. This will make a difference to reception so far as stability and the freedom from hum are concerned, but will not affect the normal performance of the set in any way.

Make sure that the connections to the mains point are made in a workmanlike fashion, for many good eliminators which appear to give trouble are blamed for faults which occur outside them, and generally

down at the connection to the mains point. Usually it will be possible to make a convenient connection to a mains point by means of the normal two-pin power plug. All sockets have not standard centres for the hole, however, and this point should be watched. In some cases it may be more



The theoretical circuit; the actual wiring diagram was shown last week and a full-size blueprint can be had, price 1/-

convenient to use a bayonet-cap type of plug.

If the wiring has to be altered for the addition of the mains unit, then make sure that the joints are adequately insulated. Use porcelain connectors in preference to a length of electrician's sticky tape.

Finally, do not place the eliminator too near to the set itself, for this is a common source of mains hum, which is due, not to any fault in the eliminator, but to direct induction between some part of the set and the wiring or power transformer of the eliminator.

In view of the success obtained by the First International European Relay carried out recently by Stuttgart, Langenberg, Königsberg, Barcelona (EAJ1) and Toulouse on the occasion of the *Craf Zeppelin* trip to Seville, negotiations are taking place for a Franco-German-Spanish programme to be broadcast shortly. The definite date has not yet been fixed

MY WIRELESS

Weekly Tips
Constructional
and
Theoretical—



DEN *By* W. JAMES

For the
Wireless
Amateur

Reaction, or No Reaction?

I OFTEN wonder how long we shall have to wait before sets without adjustable reaction are almost universally used. My own attempts in the production of sets of this type are well known.

In 1926 I produced a powerful four-valve set without adjustable reaction, and this set, the "Everyman Four," certainly achieved a measure of popularity.

Why did I use reaction in later sets? I had to, owing partly to the demand for dual-wave tuning and to the introduction of screen-grid valves. Early screen-grid valves had relatively poor characteristics. Their anode-grid capacity was fairly high, with the result that the desired results could not be obtained without the use of adjustable reaction.

American receivers, on the whole, are not fitted with reaction and provide all the magnification that is needed for the reception of distant stations. True, they usually have three high-frequency stages and they are well designed.

We seem to have tried to manage with only the one stage, but during the next season we shall see sets having two and three high-frequency stages being pushed by the manufacturers, and soon I hope that the one H.F. set will be a thing of the past.

Up-to-date Speakers

It is pleasing to note how speakers are gradually being improved. No longer should one say that acceptable quality of reproduction can only be obtained from a moving-coil speaker.

There are several armature types which put up a very good performance when used with a properly made set. They are reasonable in price, too, and even amateurs with a slender purse are able to buy a unit and cone assembly capable of providing really good results when fitted to a plain board baffle.

Full use ought to be made of the various connections often provided. The connections that suit a pentode will most certainly not be the best for an ordinary power valve.

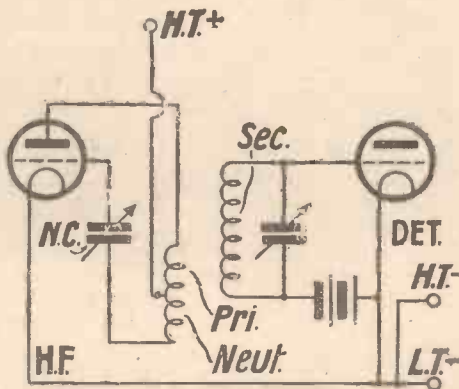
"Neut." H.F.

As there seems to be a little doubt as

to the direction of windings of a neutralised high-frequency transformer, I have shown this week in the accompanying circuit a typical arrangement.

The primary and neutralising windings may be considered as a single coil having a centre tap. This tap is taken to H.T.+, whilst the two outer ends go to the anode of the H.F. valve and to the balancing condenser respectively.

The windings may be in the same direction as the secondary, and be placed at the end of it which is connected to the filament. A fine wire may be used for the primary and neutralising coils. No. 30 d.s.c. is suitable, but for a really good transformer a finer wire should be used



This is the typical neutralised H.F. arrangement mentioned by W. James

with a good secondary. It is not essential to make the primary and neutralising windings of equal turns, but it is satisfactory in practice to do so.

Will Valves be Cheaper?

Will the prices of valves be reduced in the autumn? It seems to me that prices need overhauling. A 2-volt detector valve costing 10s. 6d. is not, for example, more easily produced than a 2-volt power type priced at 12s. 6d. or 15s.

One can understand that a screen-grid or pentode valve is a little more difficult to make than a standard three-electrode valve, but there seems no good reason for the higher prices charged for power valves.

Bad Mistakes

Occasionally, one comes across a bad

mistake on the part of an amateur constructor, although, on the other hand, many of those who write to me have really sound reasons for the circuit values adopted or for the layout employed.

The case I have in mind is of switching out the last valve of the set in order to reduce amplification from the more powerful stations. The set was a four-valve one, having a single high-frequency stage and, therefore, two low-frequency stages.

To be correct, the last valve should always be included in the circuit and the third valve be cut out for strong signals. When the last valve is cut out and the loud-speaker transferred to the third valve the possible output is reduced, as the third valve is of the L.F. and not of the power type.

In the early days of broadcasting mistakes of this sort used often to be made, but, as all valves were of one general type, the results were hardly affected from the point of view of the quality of reproduction.

R.C. and H.T.

Tests of the anode-resistance-fed transformer circuit following a detector valve show quite clearly that distortion of a serious nature may easily be produced unless the high-tension voltage is relatively high.

With the usual 20,000-ohms resistance and a current of 3 milliamperes the voltage drop across the resistance is 60. The fact that distortion is likely to be produced by strong signals when the anode voltage of the detector is low has often been stressed in these pages, and this is why the anode resistance scheme is dangerous.

With such a large voltage drop the actual voltage of the anode may be too little for good results. With a maximum high-tension of 120 it is possible that the scheme will be a failure, as only 60 volts may be across the valve itself.

Although considerable progress has been made in the construction of the Vatican wireless station, it is stated in Italy that the transmitter will not be in a position to operate on June 29, the date provisionally fixed some few weeks ago. It is hardly likely that the opening ceremony will now take place before October next.

On Your Wavelength!

Make a Note

AS the lists still show Hilversum as using during the daytime a wavelength of 298.8 metres, I have no doubt that many readers have not bothered to tune to 1,071 metres before 5.40 p.m. At this hour we are told that Hilversum changes from 298.8 to 1,071 metres. Actually he has been using his old 1,071-metre wavelength both during the day and during the evening for some time now. It is 10.15 a.m. as I write this note, and my set on the table at the other side of the room is tuned to 1,071 metres. Just to make quite sure, I will switch on and see what happens.—There is Hilversum going strong, as he has been every morning and every evening that I have tried for him for some weeks now. You should certainly add him to your daylight list of Continentals, for, as a matter of fact, he is at his best during daylight hours, since, for some reason that I do not know, there is then hardly ever any interference.

Other Long-wavers

A glance at the wavelength lists might make you think that Kalundborg would hardly be worth tuning in, since he uses only 7.5 kilowatts and Denmark is a long way off. But just you try. Kalundborg is the most reliable at the moment of all European stations as a supplier of genuine alternative programmes. His signal strength is fine and he seems to run something like a non-stop programme from breakfast time onwards. Let's see if he is there.—No, I find that he isn't. It is 10.25 a.m. now. He is sure to come on pretty soon. Where Kalundborg scores is in the excellence of the Copenhagen programmes, which he always relays. Radio Paris comes in every bit as strongly, and the actual transmission quality is good. Other good long-wavers are the Eiffel Tower, if he is not being heterodyned by Moscow; Königswusterhausen, if Daventry is not working; and Huizen, the second big Dutch station.

Some Surprises

There are some very curious points about the long-wave band, as you will find if you care to explore it after reading this. Since Kalundborg, with its 7.5 kilowatts, comes in so well, you would expect to hear something like a noise from Lahti, rated at 40 kilowatts, or the two Moscow stations, old Komintern and Popoff, both of which are also shown as having 40 kilowatts wherewith to push out their programmes. If you do find Lahti at all just now, he will most likely come in as a very small voice indeed. The only Moscow station that I can receive at all regularly is the old Komintern, and this is never very

strong. Stranger still is the case of Zeesen. Here we have a station rated at 26 kilowatts, which is no great distance away from us. Tune him in on Sunday morning when 5XX is not working. You will hear him all right, but as a general rule he will not suggest anything like that amount of kilowatts.

Motala

But the weirdest case of all is that of Motala, the Swedish 30-kilowatt station, which relays the Stockholm programmes. Two or three years ago, when this station first came on the air, signal strength in my house was every bit as great as that from 5XX, though the latter is only forty-five miles away. Motala was, in fact, so strong that with anything like high-frequency amplification, detuning became necessary to avoid overloading the output valve. His power to-day is the same as it was then, but signal strength has declined, until now Motala is as equally hard to receive as Warsaw. Madrid Union Radio, Vienna, Milan, Langenberg, Berlin Witzleben, Stuttgart, Oslo, Stamboul, Brussels, Berne, and Frankfurt are all stations which once came roaring in; but now, though their output power has not been decreased, are heard with greatly diminished strength.

An Interesting Point

The other day one or two of us, who have done a good deal of experimental and practical work with screen-grid valves, were discussing a point which I have not seen mentioned before and which is really rather an interesting one. Here it is. If you are using two screen-grids in cascade as H.F. amplifiers there is no half-way house so far as the use of screening is concerned. Work out a design incorporating a very simple screening device between the two H.F. tuned circuits, and by the use of carefully chosen components and a suitable layout you may obtain smooth, stable, and efficient working. Suppose, now, that very slight traces of interaction between coils or other components are evident. It is not a bit of good trying to improve matters by slightly increasing the amount of screening. In fact, nothing short of complete screening with each circuit housed in its own copper or aluminium container will effect any improvement. And even then your screening boxes must be made with soldered joints.

One or the Other

I have seen and used circuits which gave highly efficient and delightful working, though the minimum amount of screening was used with two S.G. stages. In one, for

example, the panel was of ebonite, the baseboard of plain wood, and the two H.F. circuits were divided simply by plain vertical screens. In another design complete screening boxes were used, but stability was not at first what it might have been. Nor could an improvement be effected until more elaborate boxes were used and precautions taken, such as bringing leads out through the smallest possible holes made in specially chosen positions. It seems, then, that in your S.G. design with two in cascade, either you are lucky and hit upon a layout where a minimum amount of screening will suffice or you have to use the most elaborate measures that you can think of.

Decoupling Does Tell

If we were a little puzzled over the screening problem, we were all agreed upon one point, which is that in any kind of screen-grid circuit, where high amplification per stage is looked for, decoupling is absolutely essential. Whatever your source of high-tension supply, it must contain a certain amount of resistance, and if you don't use decoupling circuits, back couplings between valves are certain to be brought about through this. A decoupling circuit consists simply of a series resistance between H.T. positive and the plate of the valve, which acts as a stopper to H.F. currents. These are provided with a free path to earth by means of a condenser connected between earth and the end of the resistance nearest the plate.

Smoothing Reaction

Often when I try out a ready-made set, or one made up from his own design by some friend, I am surprised to find how little some people realize what perfect smoothness of reaction control there is to be obtained with modern apparatus. As you tighten the reaction coupling by means of the control knob the set should slide into oscillation at a definite point with no more than a slight hissing noise. When the control knob is turned back it should come out of oscillation exactly at the setting where it went in to it. Many sets show a respectable build-up in signal strength as the reaction knob is turned clockwise; then comes a sudden grating noise or "plop," and oscillation is in full swing. The grating noise means that the set is wobbling into and out of oscillation. The plop indicates that it plunges into oscillation instead of gliding smoothly into that condition. Now, in the great majority of cases the cause of the trouble is quite straightforward. The grid return, if the leaky-grid condenser method is employed, is taken straight to

On Your Wavelength! (continued)

low-tension positive, which makes the grid approximately 2, 4, or 6 volts positive, according to the class of valve in use. Two volts may not be far out, but 4 volts or 6 volts are certainly far too much for effective rectification or for decent reaction.

Radio Drama

It is quite a long time since we had anything outstanding from the B.B.C. Radio Play Department. I may have been unlucky in my listening, but I seem to have heard either re-broadcasts of old plays which are good or new plays which are bad. It would appear that the reigning powers—that be at Savoy Hill have little faith in radio drama. This coldness on the part of the "high moguls" has evidently damped the enthusiasm of the Dramatic Department, for the plays we do hear lack the finish of those of a year or so ago. The "technique" of fading and dissolving from scene to scene is frequently carried out in a slipshod manner and the players sometimes give evidence of insufficient rehearsing.

American Radio Plays

Cecil Lewis found that the American radio plays were in a very early stage of development. One-act plays were spoken by the players, each into his or her own microphone, with one extra one for the effects man, and all were accommodated in the same studio. The British idea of using several studios for different sets of players, orchestras, effects and background noises seemed quite revolutionary to our American cousins. But the serious radio play requires a good deal of concentration on the part of listeners, and the American listener is not prepared to sit quietly and listen. Radio to him is merely a background noise in his household.

Not a Fade Out

The departure of Mr. R. E. Jeffrey, the B.B.C.'s old chief producer, to the film studios about a year ago may have had something to do with the gradual subsidence of the radio play in the B.B.C. programmes. But, on the other hand, the best plays were not always produced by Mr. Jeffrey. A good radio play can have a high entertainment value, providing the listener will deign to concentrate, and it is to be hoped that the old spirit of enthusiasm will revive at Savoy Hill.

The field of selection of material for radio plays is very wide. The tendency has been to select highbrow and modern futuristic works for the most ambitious efforts. Short one-act one-scene radio plays are as unsatisfactory as the one-reel super film dramas of pre-war days; they give insufficient time for the development of a theme.

The "Fever Tube"

I hear most interesting accounts of the "fever tube" developed by Dr. Walter Witney, the research director of the General Electric Company of Schenectady. This is a vacuum tube on the lines of the wireless valve designed to emit oscillations of exceedingly high frequency. It has been found that these have a curious effect upon the human body. In the process of valve manufacture, occluded gases are expelled from the electrodes and their supports by placing the partly finished valve in a strong high-frequency field. This induces currents in the metal which heat it up and cause the gas molecules to be driven out. The oscillations from Dr. Witney's tube appear also to induce currents in the human body. These have the effect of raising its temperature considerably. Now, fever is not in itself a disease. When Nature wants to kill certain kinds of germs she raises the temperature of the blood to a point at which they cannot live. A high temperature, therefore, is a sign that a patient's blood has been invaded by these germs and that Nature is doing her best to slay them.

Another Use

The Witney tube has been employed with considerable success to produce high temperatures in patients in order to combat the germs of certain diseases. There is another possible application. Experiments have shown that its high-frequency radiations, suitably controlled, can be used to produce in a man a feeling of summer-time comfort, though he is actually sitting in a room of which the temperature is a long way below freezing point with all the windows open to the iciest blasts.

Universal Television Scanner

A Cologne engineer named Fries puts forward a scheme which he thinks will allow the actual television receivers to be adjusted irrespective of the standard of the television transmitter. In normal working the image to be televised is analysed into elemental areas by two movements, namely, a primary or vertical scanning and a secondary or right to left movement. This is effected by the rotating Nipkow disc with its spirally arranged holes.

Two Discs Instead of One

The proposal made by Fries is to use two discs instead of one. The first disc will possess a spiral slot while the second will have radial slots. The pitch of the spiral line and the length of the slots correspond to the length of the picture, while the circumferential distance apart from the slots corresponds to the picture width. By superimposing these two discs the resultant analysis is equivalent to one disc with a spiral of holes and if rotating at the same

speed the image strips scanned are equal to the number of slots. Should, however, the slotted disc be rotated at a higher speed independent of the spiral disc, then a different effect will be obtained. By this simple means of rotating the disc at different relative speeds it is claimed that the vision apparatus can be adjusted to suit any transmitting standard.

A Mains Problem

I was called in the other day to solve a little mains problem which may be of interest. Some time ago I gave a friend of mine a circuit for a three-valve receiver, intended to operate entirely from 100-volt D.C. mains. The arrangement was a simple screen-grid, detector and L.F. circuit, and worked very satisfactorily. It happened that this particular set had been made by my friend as a present to someone else, and he himself was operating his own set off batteries. Finding how easy mains operation really was, he asked me how to convert his own set for his mains which were 200 volts. I gave him a diagram of an eliminator with a potentiometer across the output, providing various intermediate voltages.

This again worked very satisfactorily, and I am sure my readers are beginning to wonder where the point of this story comes. However, what happened was this. For some reason my friend got back the 100-volt set—I think to alter one component or something—and thought that he would try it out on his own mains by using the 100-volt tap on the eliminator. To be on the safe side he measured the voltage very carefully, and adjusted it to 100, but he found on switching on that nothing happened. On a further investigation he discovered that the voltage on the set was only 20.

The Cause of the Difficulty

It was at this point that he solicited my advice. The trouble was, of course, that the potentiometer across the mains unit normally carried a current of 20 milliamps, and the voltage across the respective tappings would only be correct, or even approximately so, as long as the current taken was relatively small compared with 20 milliamps. The 100-volt set was taking 100 milliamps, since the filaments of the valves were drawing their current from the mains. Under these circumstances the potentiometer action is practically destroyed, the relatively large current flowing through the portion of the potentiometer between the 200- and 100-volt taps causing an excessive voltage drop. The only solution, of course, was to use a variable series resistance to break the voltage down from 200 to 100, and to adjust this to give the correct voltage drop when the set is taking its normal current.

THERMION.

Working a Portable Out of Doors



There are many points to note when taking a radio set out of doors—and here

KENNETH ULLYETT
gives several practical hints for the radio-motorist

IF any passers-by were puzzled by the antics of a small motoring party on the main Chelmsford-Colchester road at an early hour one day last week, here is the explanation. We were trying out the "Merry-maker," described in No. 411; to ensure that all the connections had withstood the jolts and bumps in transit!

Have you yourself ever tried to work a portable set while on the road, and in a car? If you haven't, then don't be prejudiced by what is often said about magneto interference spoiling reception. My car has a six-volt coil-ignition set, and although the low-tension current is fairly heavy and it might reasonably be expected therefore that the H.F. radio interference would be considerable, this was by no means the case.

"Mag" Interference

The ignition interference is heard in the loud-speaker as a regular crackling, and it is surprising what an amount of regular interference the ear can tolerate. When the engine is running fairly fast the noise in the loud-speaker is somewhat the same as that of a television transmission, a low-pitched brrrrrr... and although it is hardly pleasant, it does not completely spoil reception.

The "Merry-maker" is not shielded in any way, and I do not think that shielding would help very much, because the ignition interference is caused by the high-frequency component of the A.C. pulsations at the sparking plug points, and is picked up by the frame aerial. Somewhat the same high-frequency interference is experienced in the "A.W." Fetter Lane laboratory and has been found due to adjacent motors, the H.F. component of the commutator ripple of which is a constant bother in set-testing.

Later on I had the opportunity of trying the "Merry-maker" in a "straight-eight" car also fitted with coil-ignition, and here the trouble was too bad. Owing to the greater number of sparks for a given engine revolution rate, the noise heard in the loud-speaker was of a higher pitch and formed a note of definite audible frequency, though interrupted, of course.

The trouble in this case was so severe that listening while the engine was running was anything but a joy; so it cannot be said that

it is always possible to work a set while a car is in motion, but with the average car it is quite feasible and pleasant, and I have always found that magneto ignition gives much more radio interference than modern coil ignition, though the type of coil ignition fitted to early American cars causes a deep spluttering noise like a spark transmitter at its worst, and this makes reception intolerable.

Carrying Cases

The "Merry-maker" is fitted in a wooden case and is as much a house transportable as a portable for the car. I would recommend all portable-set users who value the appearance of their portables (and have to consider the wear and tear of car upholstery) to keep the set in a stout canvas case, and even to go so far as putting one or two layers of felt or packing between the case and the cabinet. A set with sharp corners can do a lot of damage, and, on the other hand, a nicely polished cabinet soon becomes scratched without a canvas protective cover.

There is no doubt that while a portable set should be so designed that it is easy to work, the operation is bound to be different from—and, at first, a little more difficult than—that of a home set with an aerial and earth.

In the first place it is essential to get the

direction of the frame aerial approximately right. The silent point (that is when the frame is at right angles to the station, and nothing is heard at all) is always more critical than the direction of maximum strength, when it will be found that the frame is roughly lying along the direction of reception.

A Handy Compass

A knowledge of the locality in which the set is worked, and the possession of a small pocket compass is an asset because it saves puzzling over the question of "Now, where is Brookmans Park from here?" If one has neither a map nor a compass it is worth remembering that the direction of the rising and the setting sun is an indication of east and west, and the approximate direction for the frame can thus be gauged.

Of course, matters such as battery values should be attended to before the set is taken out of doors. Keep the detector H.T. voltage as low as possible in order to save current, and in such a portable as the "Merry-maker" set the grid leak potentiometer (by means of the flex and spade tag) until the best point for detection is found, consistent with a low detector anode voltage.

You may find that if you use a high detector H.T. voltage the tendency to
(Continued at foot of next page)

"If any passers-by were puzzled by the antics of a small motoring party... here is the explanation. We were trying out the "Merry-maker" to ensure that all the connections had withstood the jolts and bumps in transit!"



You need— A Big Set for Summer DX

According to "Set Tester," who reviews the Marconiphone Model 56, a five-valver, with three screen-grid high-frequency amplifying stages

FOREIGN stations that during the winter months have become old favourites are already beginning to weaken in strength or to disappear entirely. On the medium waveband, especially, distant stations lose some of their winter-time vigour during the warm days.

Long waves do not suffer nearly as much from the ionisation of the upper layer of the atmosphere, which is supposed to reflect wireless waves received over long distances. A good set will bring in seven or eight long-wave stations from the Continent at excellent strength throughout the summer.

Selectivity

This advantage might be more fully exploited if the average set were less inherently unselective. When tuned to over a thousand metres, many sets have difficulty in separating Daventry 5XX from Radio Paris and Eiffel Tower, transmitting on adjacent wavelengths.

I recommend those who, finding the medium-wave stations fading out of their sets' repertoire, still pine for Continental programmes, to have a shot at stations like

three screen-grid valves, an anode-bend detector and a single stage of low-frequency amplification. The last valve is a super-power type, coupled to the detector by the resistance-capacity system.

From such a specification one would expect great selectivity combined with exceptional sensitivity and purity of reproduction above the average. One's expectations are exceeded when the Marconiphone Model 56 is put into operation.

Three models of this five-valver are available. For A.C. mains operation, the price is £35; for D.C. mains, £32 7s.; and for battery operation, £30 7s. These prices include the full equipment of valves and power supply, but not the loud-speaker.

The set can be bought separately, with just the valves, for £27 10s. The polished mahogany cabinet, with its walnut finish, exemplifies modern furnishing styles. I like the look of the hexagonal knobs controlling the set; they are a welcome departure.

I have been testing Model 56 equipped for A.C. mains operation. The set has been tried on a 205-volt supply in south-west

tion available is controlled by one of the hexagonal knobs; for most stations the volume control had to be retarded considerably. There is a big reserve of power in Model 56.

The detector valve and power output valve can be utilised as a gramophone amplifier. Tested in conjunction with the new Marconiphone pick-up, which is unusually sensitive, full volume from this two-stage amplifier was obtained on a moving-coil loud-speaker. With less sensi-

A PAGE FOR THE SET BUYER

Every set referred to in this regular feature by "Set Tester" has reached a certain standard of efficiency in the "Amateur Wireless" Laboratory. Reports are not given on sets that fail to reach this standard. This will explain why reports that do appear express general satisfaction with the set's performance.

tive pick-ups the volume is fairly limited, but of good quality.

A medium-wave test carried out after 10 o'clock one recent evening brought in quite a number of stations. Milan, Lyon la Doua, and Frankfurt were all good, as was Toulouse and, later, Rome. I enjoyed testing this set very much.

Nebraska, U.S.A., proposes to curb the practice of soliciting insurance business via radio, and Kansas is considering measures to end the sale of patent medicine through the medium of broadcasting.

Bulgaria has decreed that anyone found guilty of using a receiving set without a permit shall be subject to solitary confinement for a period not exceeding one year and a fine up to 5,000 leva, which is slightly more than £70.

The Federal Radio Commission at Washington issued recently a general warning to all licensed coastal and ship stations to observe the international telegraph regulations regarding listening to distress signals. It is urged that silent periods, and twice hourly watches be observed in the interest of the safety of life at sea. The warning was issued owing to the failure of a number of stations to observe the regulation.



The back of the Model 56 Marconiphone set open, disclosing the "works"

Kalundborg, Hilversum, Huizen, Paris, and Berlin.

An excellent set for summer reception, especially on long waves, is the new Marconiphone Model 56, with which I have been having a lot of fun during the last few weeks.

Model 56 is one of the largest sets in the Marconiphone range. It is a break-away from average British practice, for it has

London. I was glad to find that all the long-wave stations could be brought in at full loud-speaker strength, without interference from 5XX. To tune in these stations was a simple process; although there are four separate stages of tuning, they are coupled together in pairs, so that the two tuning discs varying the four tuned circuits can be rotated together.

The enormous high-frequency amplifica-

THE DYNATRON EFFECT

An article by J. H. Reyner explaining how a "negative resistance" effect can be obtained by operating an ordinary screen-grid valve under special conditions

A SHORT time ago I referred to the possibility of using the screen-grid valve in a somewhat unorthodox manner, by utilising the negative-resistance portion of its characteristic. I propose in this article to discuss this effect in greater detail and to give figures for the approximate order of negative resistance for some of the principal valves in use to-day.

The idea of negative resistance has already been explained in the previous article (AMATEUR WIRELESS, No. 413). In that article it was pointed out that on an ordinary resistance the current increases as the voltage increases, and vice versa. On a negative resistance, on the other hand, if we increase the voltage the current decreases so that the arrangement behaves in exactly the opposite manner to an ordinary resistance. Let us make this point

of 10,000 ohms, equal to the actual resistance R.

Now let us assume that we increase the voltage of the battery from 10 to 11 volts. We saw that in the case of the resistance alone, this caused the current to increase

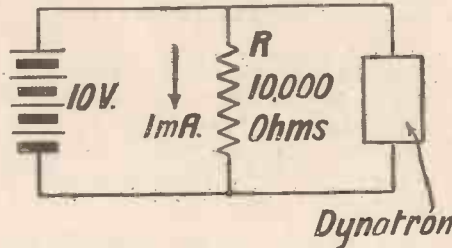
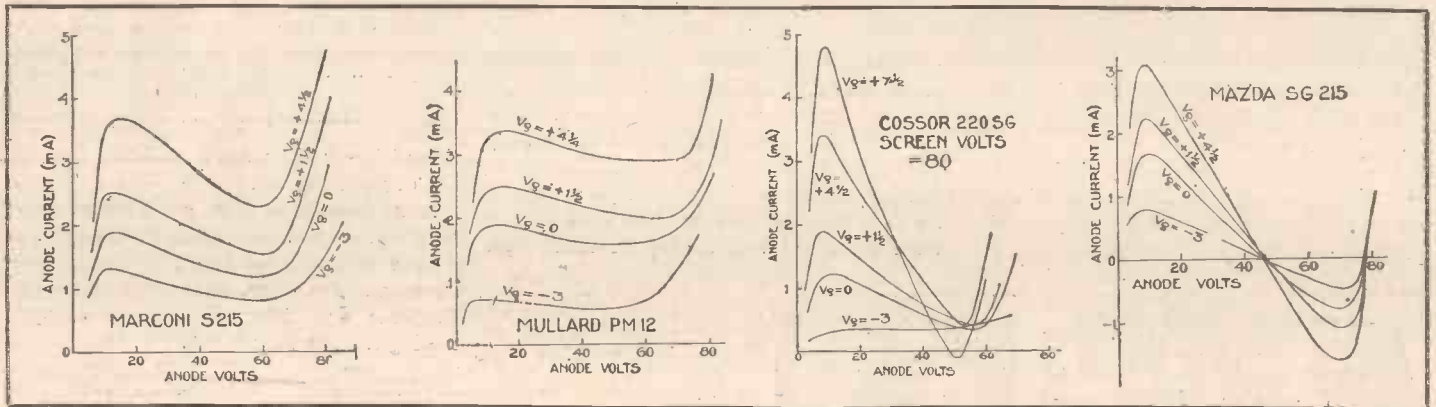


Fig. 1. Diagram showing negative-resistance effect is obtained

from 1 to 1.1 milliamperes, i.e., gave us an increase of .1 milliamp. The negative

state of affairs takes place if we decrease the voltage of the battery to 9 volts. The current through the ordinary resistance will fall by .1 milliamp, whereas that through the negative resistance will rise by an equal amount, so that as before we have made no change whatever in the total current flowing in the circuit. The negative-resistance device has completely cancelled out the effect of the positive resistance as far as any variation in the voltage is concerned.

This is the point which has to be borne in mind, namely—the negative-resistance action only comes into play when we are concerned with varying voltages. The steady current taken by the negative resistance device may be quite appreciable, so that it does not wipe out all the current flowing in the circuit, but as soon as we vary the voltage we find that it acts in opposition to



Figs. 2, 4, 5 and 6. Typical curves of some representative valves—Marconi, Mullard, Cossor and Mazda

quite clear by considering the circuit shown by Fig. 1. Here we have a battery supplying current to a resistance connected across its terminals. Let us assume that the voltage of the battery is 10 volts, and the resistance is 10,000 ohms, we shall then obtain a current of 1 milliamp through the resistance. If we increase the voltage of the battery to 11 volts, we shall obtain 1.1 milliamperes, while if we decrease the voltage to 9 volts the current will fall to 0.9 milliamp.

Now let us connect in parallel with this resistance, a negative-resistance device, such as a Dynatron. The device itself will take a certain steady current. It will not immediately proceed to give out current like a battery; in the steady state it behaves like an ordinary resistance and will draw current from the battery. The actual steady current is unimportant but we will assume that it has a negative resistance effect

resistance, however, works in the opposite way, so that instead of obtaining an increase of .1 of a milliamp, we obtain a decrease of a corresponding amount, so that the total current in the circuit will be exactly the same as it was before. A similar

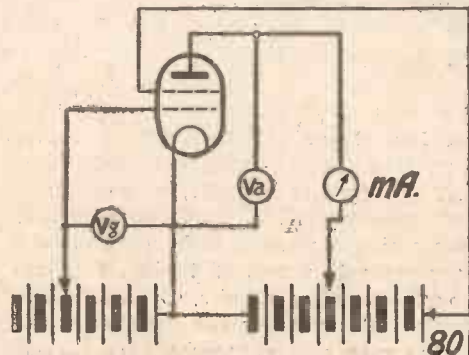


Fig. 3. Circuit used for testing characteristics

the existing resistance, so that the current through the circuit is constant. The term "negative resistance" is perhaps a little misleading and it is for this reason I have gone into the point somewhat carefully.

The next step in the development of this form of circuit is to find what order of current variation is obtained with the forms of screen-grid valves available to-day. Fig. 2 shows the characteristic of a Marconi S215 screen-grid valve. A constant voltage of 80 was applied to the screen, while the voltage on the anode was varied from zero upwards. It will be seen that at first the current rises quite rapidly. Then it bends over and we obtain a portion from about 20 to 60 volts, over which the current falls as we increase the voltage. This is the negative-resistance portion, for an action such as this is the exact reverse of what one

(Continued on page 803)

SYDNEY MOSELEY'S WEEKLY PROGRAMME CRITICISM

Holiday Programmes
 ~~~~~  
 The Children's Hour  
 ~~~~~  
 Outside Announcements



Not Enough Vaudeville
 ~~~~~  
 The "Diversions"

THE holiday programmes were, as ever, a good mixture, although I doubt, in view of the excellent weather, if many listeners, except those with portable sets, invalids, etc., took advantage of what was offered.

Being fond of Wagner, I naturally enjoyed the Hallé concert relayed from Liverpool. It was a good idea to give one part of the programme from one station and the second part from another station. That is what I call making full use of the alternative programmes. Those who liked the first part could have heard the second, and those who did not could have switched over and avoided either part.

By the by, the timing of the Hallé concert was arranged so that two popular pieces had to be left to the end; which was a pity.

To go back to the two-part programme, I wish they had done the same with regard to operas. Those who enjoy opera could then take a little more of the fare provided. Which reminds me that a good deal of disappointment was expressed when, at the last minute, the transmission of *Tosca* from Covent Garden was cancelled. I do think Covent Garden ought to co-operate more closely with the B.B.C. with regard to changes in the programme.

On the night we expected *Madame Butterfly* we were given *The Bat*, and then, because a tenor's contract does not permit

him to broadcast, a whole opera is kiboshed. That, too, is a thousand pities. In order to make up for this disappointment I tried to get Rome, which was putting over the whole opera.

Mr. Ernest Newman, about whose big correspondence bag I once referred, seems to have developed a difficulty in pronouncing his consonants. It is a common fault. I refer particularly to his over-emphasis of the "s," of which I am sometimes guilty—but it is easily curable. That is why I have mentioned it.

I enjoy many of the Children's Hour programmes. One often regrets that wireless was not in vogue when we were children. What is so amazing is the apparent popularity of birthday greetings—so boring to grown-ups.

I suppose it is difficult for the B.B.C. to check announcements made during outside broadcasts by people not actually on the staff of the Corporation. In this regard two points occur to me. The first is that during an important transmission the announcer solemnly stated amid breathless silence that a certain artiste or other had arrived. As if one cared a bean. Incidentally, this was an extremely valuable advertisement which must have created envy in the bosom of less fortunate artistes.

The second point is in regard to the announcers of dance numbers played by the bands in hotels and cafés.

These people, including those who sing the choruses, are either fully fledged Cockney or pseudo-American. Their pronouncements used to amuse—now they merely irritate. I have never been able to understand, too, why those who sing the choruses are engaged for that purpose—many of them certainly would not earn a penny singing to theatre queues. One man, however, who is not so bad—or let me be generous and say that he is worth listening to—belongs to Ambrose's Band.

I get many strange letters, but here is one from Swansea, in which the writer says that the general opinion these days seems to be that we are not getting enough vaudeville. He points out that during seven days' programmes the National and London Regional have one vaudeville hour each, and in the case of the former it is one

of those new high-brow ones—including such items as Edith Clegg's bedtime stories and somebody else's flute solos. He regrets the passing of the "good old robust variety hours; the days when we can have a good laugh with Tommy Handley, Leonard Henry, Stainless Stephen, and the rest are few and far between."

I always have a sneaking sympathy for the Talks Department, who have to think out new subjects. On picking up a copy of *Nature* I find an article entitled "Do Cockroaches Eat Bed Bugs?" I pass on this suggestion to Savoy Hill.

Did you like "Diversions"? Here is a view by D.R.B. (Reading): "I hope it will not be long before we see the start of a new 'Diversions' series; the last ones added a spice to the programmes. Here again tastes differ. I trust, also, that the new 'Diversions' (if any) will not waste quite so much time on everyday affairs, such as signal-boxes. Most of us City people are fully acquainted with railways and their din, and when we get home we want to be taken away from such noises. Another hope of mine is that the gentleman with the abysmal, dismal voice will occupy himself elsewhere."

Personally, I thought they were all fairly good.



A Roberts' impression of O. B. Clarence



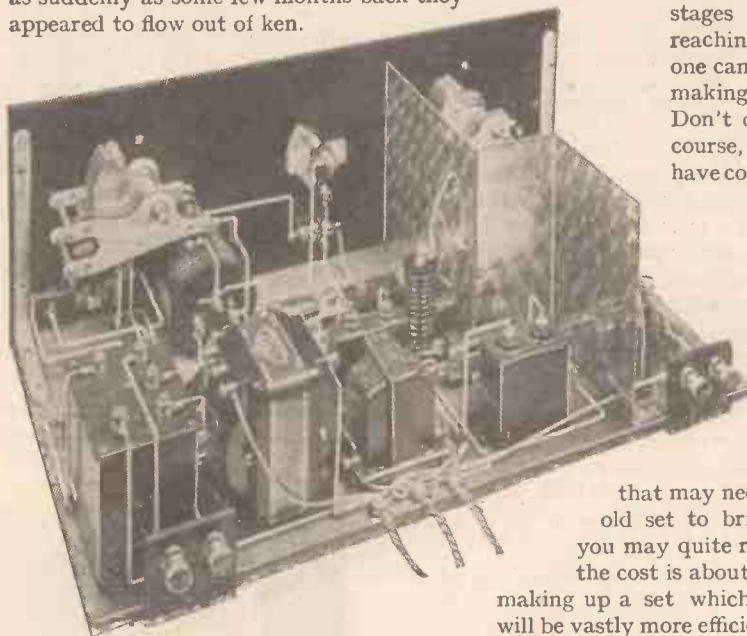
Albert Sandler in cartoon

**T**HE horizon," says the dictionary, "is the circle bounding the view where the earth and sky seem to meet," but please don't take that literally as the limit of range of this new **AMATEUR WIRELESS four-valver!**

Only the radio horizon, if there is such a thing, is the boundary of this four-valve set's range; and the mention of an horizon brings to mind several points which are pertinent about the performance of a set in the summer-time. Quite frankly, there are few sets which pull in distant stations satisfactorily during the long light evenings.

#### Overcoming Summer-time Conditions

So accustomed have many listeners become to this natural summer-time decline, that from about June till the beginning of September many receivers are used only for reception of the local station, and their owners forget the condenser settings for the foreigners, lose their wavelength logs and, in general, totally disregard DX reception—that is, until at the end of September or thereabouts, when the long evenings become suddenly noticeable again and the foreign stations ebb in again just as suddenly as some few months back they appeared to flow out of ken.



The "Horizon Four" is an up-to-date four-valve development of the famous Clarion Three, described in Nos. 404 and 405, which was a proved success

that may need to be done to the old set to bring it up to date, you may quite reasonably find that the cost is about as great as that of making up a set which, in the long run, will be vastly more efficient.

Just what is the reason for summer-time fading is a little bit of a mystery, though there are many amateurs who love to talk about the vagaries of the Heaviside layer, sun-spot effects, night effects, and so on; nor does the solution of the mystery (if there is one) matter very much just at the minute. What *does* matter is that, instead of regarding this periodical fade-out as something of a blight by Nature upon the blessings of wireless, and putting up with an inefficient set during the dead period, one should remedy matters by the simple expedient of improving the set's DX properties.

It is for those who are wise enough to adopt the course of making up a new set for summer-time working that the "Horizon Four" has been designed. It will meet their present needs for it is a set with vast reaching-out properties, owing to the use of an efficient S.G. H.F. stage. It has an exceptionally good and powerful L.F. arrangement, with two stages of L.F. amplification, the first valve being coupled to the detector by means of a special arrangement being the combination of transformer and resistance amplification. The power valve is coupled by a straight transformer arrangement and—a very good

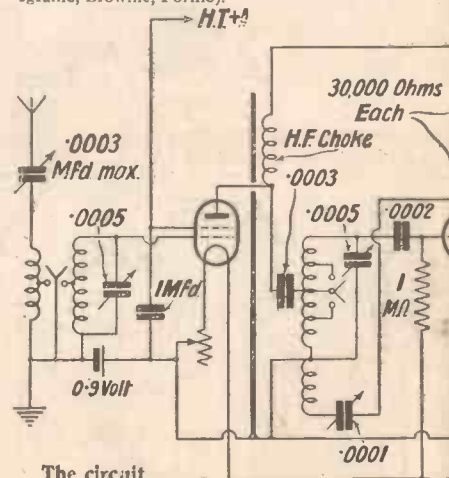


## A DEVELOPME —TR

idea in a large set—there is an output choke and condenser filter in the anode circuit of the power valve.

#### COMPONENTS REQUIRED TO

- Ebonite panel, 18 in. by 7 in. (Becol, Trelleborg)
- Two .0005-mfd. variable condensers (Igranic, Burton, J.B., Lissen, Lotus, Formo, Ready Radio).
- .0001-mfd. reaction condenser (Formo, Burton, Dubilier, Lotus, Bulgin, Ready-Radio).
- Pair of "Clarion" coils, Aerial and Anode (Tunewell).
- 15-ohms rheostat (Lissen, Igranic, Wearite, Varley).
- Push-pull filament switch (Bulgin, Lotus, Benjamin, Claude Lyons).
- One 2-mfd. fixed condenser (T.C.C., Dubilier, Lissen, Hydra).
- One .25-mfd. fixed condenser (T.C.C., Dubilier, Lissen).
- One pre-set condenser, .0003-.00025-mfd. (Sovereign, Lissen, Formo, Igranic, Lewcos).
- One aluminium screen with foil (Parex).
- One grid-bias cell (Siemens type S.G.).
- Two terminal strips, 2 in. by 2 in. (Becol, Ready Radio, H. & B.).
- One pair panel brackets (Bulgin, Ready Radio, Parex, H. & B.).
- Two spade tags, one red, one black (Belling-Lee, Eelex, Clix).
- Pick-up jack with plug (Lotus, type J.K.5, Igranic, Ormond).
- Two slow-motion dials (Ormond, Burton, Lissen, Brownie).
- Four anti-microphonic valve holders (Benjamin Vibrolider, Lotus, W.B., Wearite, Trix, Burton, Igranic, Brownie, Formo).



The circuit

# HORIZON FOUR

EVOLUTION OF THE FAMOUS "CLARION THREE"  
 INTO THE "CLARION 'FOUR'"

Minor points will appeal, such as the simple control of switching from the medium to the long wavelengths and vice

versa, the provision of plug and jack for gramophone pick-up, the easy control of selectivity, and so on.

## BUILD THE "HORIZON FOUR"

One low-frequency transformer (Lissen, "Hypercore," Igranic, Varley, R.I., Telsen, Lotus, British General).

One low-frequency transformer (Lewcos, Ferranti, Telsen, Varley, Lissen, Igranic).

One output choke and condenser (Wearite, Igranic).

Two 30,000-ohms resistances with holders (Graham-Farish, Lissen, Dubilier, Ferranti, Varley, R.I., Ready Radio).

One high-frequency choke (Ready-Radio, Lewcos, Tunewell, Sovereign, Watmel, Igranic, Dubilier, Bulgin, Wearite, Varley).

One .0003-mfd. fixed condenser with grid-leak clips (Dubilier, T.C.C., Graham-Farish, Lissen, Watmel, Trix, Atlas).

One .0002-mfd. fixed condenser (Dubilier, T.C.C., Graham-Farish, Lissen, Watmel, Trix, Atlas).

One 2-megohm grid leak (Lissen, Dubilier, Watmel).

One .0001-mfd. fixed condenser (Dubilier, T.C.C., Graham-Farish, Lissen, Watmel, Trix, Atlas).

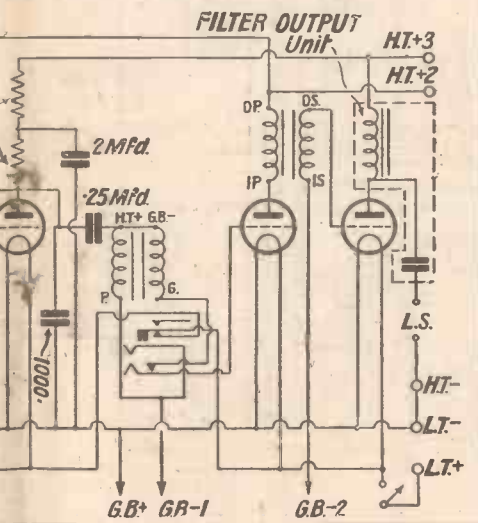
One 1-mfd. fixed condenser (T.C.C., Dubilier, Hydra, Lissen).

Seven wander-plugs marked, G.B.+ , G.B.—1, G.B.—2, H.T.—, H.T.+1, H.T.+2, H.T.+3 (Belling-Lee, Eelex, Clix, Igranic).

Four terminals marked A, E, L.S.—, L.S.— (Belling-Lee type "M," Eelex, Burton, Clix, Igranic).

Quantity of flex for battery leads (Lewcoflex)

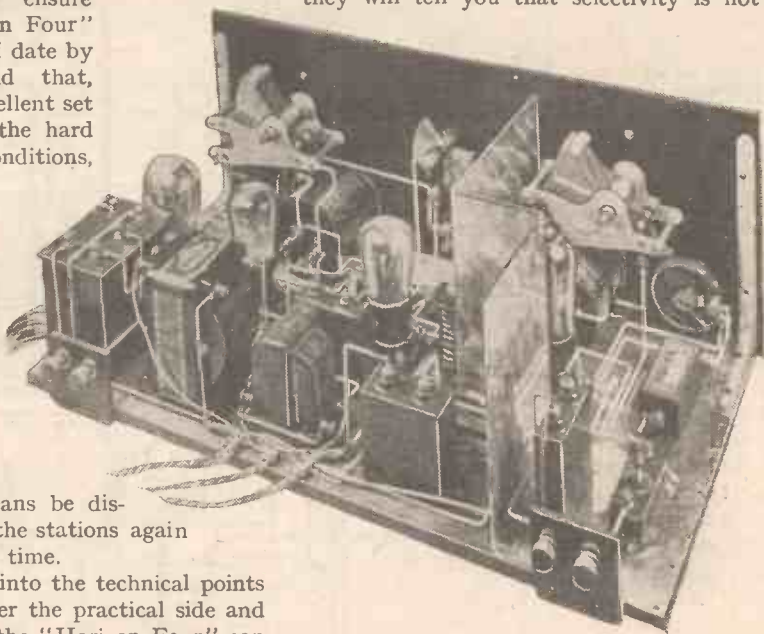
Glazite for wiring.



## Distinctly Modern

These features ensure that the "Horizon Four" will not be out of date by next season and that, while it is an excellent set to have during the hard summer-time conditions,

An ideal set for summer-time use by reason of its powerful distance-getting qualities regardless of reception conditions



it will by no means be disappointing when the stations again romp in in winter time.

Before delving into the technical points of the set, consider the practical side and see how cheaply the "Horizon Four" can be built. All the parts needed are detailed in an accompanying panel, and it is necessary to emphasise the advice so frequently given, that the components (or the alternatives) specified in each instance should be rigidly adhered to, for in a big set there is nothing so likely to cause trouble and disappointment as the experimenting with unsuitable parts and new layouts.

## Easy to Build

So far as the actual construction and layout of the set is concerned, there should be no opportunity to go wrong, for the photo-

graphs clearly show most of the details of the set, and in any case a full-size blueprint is available, which reduces the business of construction to child's play and eliminates the possibility of making any mistake, either in the constructional work or in wiring. This print can be obtained, price 1s. 6d., post free, from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4.

It would be advisable for the intending constructor to gather some idea of the method of functioning of each part of the circuit, for not only will this facilitate the construction on intelligent lines so that the constructor will know exactly what he is doing and why each wire has to be so connected, but also if anything should later go wrong a rough knowledge of the working of the circuit is a good first-aid cure.

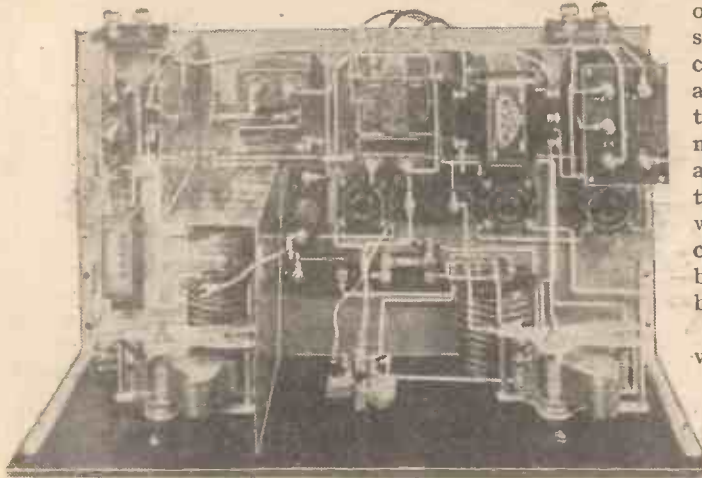
The first thing that will be noted is that a very selective arrangement is used for the tuning of the H.F. stage. There is a pre-set condenser in the aerial lead, and there is an aerial coupling coil. Now, there are people who will tell you that H.F. stages need not have a selective aerial tuning because they themselves are inherently selective; also they will tell you that selectivity is not

needed to so great an extent in summer as it is in the winter time, because as so many stations cannot be received, there is not so much effective jamming.

Both these are wrong. With the "Horizon Four" the distant stations can be pulled in to the same extent as in winter, and if the set were not naturally selective, there would be jamming reminiscent of the best winter-time conditions.

So a very selective aerial tuning arrangement is used in conjunction with the H.F. stage, and the resulting overall selectivity of the set is amazing. This is the best reply

“THE HORIZON FOUR” (Continued from preceding page)



Comparison of this plan view with the wiring diagram below will assist in the construction

of the power valve is specified as a complete component, and it is advisable to adhere to this because the commercial combined choke and condenser filter takes up less space than would the two separate components placed side by side on the base-board.

The photographs herewith show most of the details, and the small reproduction of the blueprint is a great help. For those, however, who wish to have the

fullest possible constructional details before embarking on the making up of an ambitious set, further particulars will be given next week.

If, in the meantime, you happen to be in the neighbourhood of Oxford Street, London, then make a point of seeing the original “Horizon Four” in the Somerset Street windows of the Radio Department of Messrs. Selfridge & Co., Ltd., where a special show of this summer-time set is being arranged.

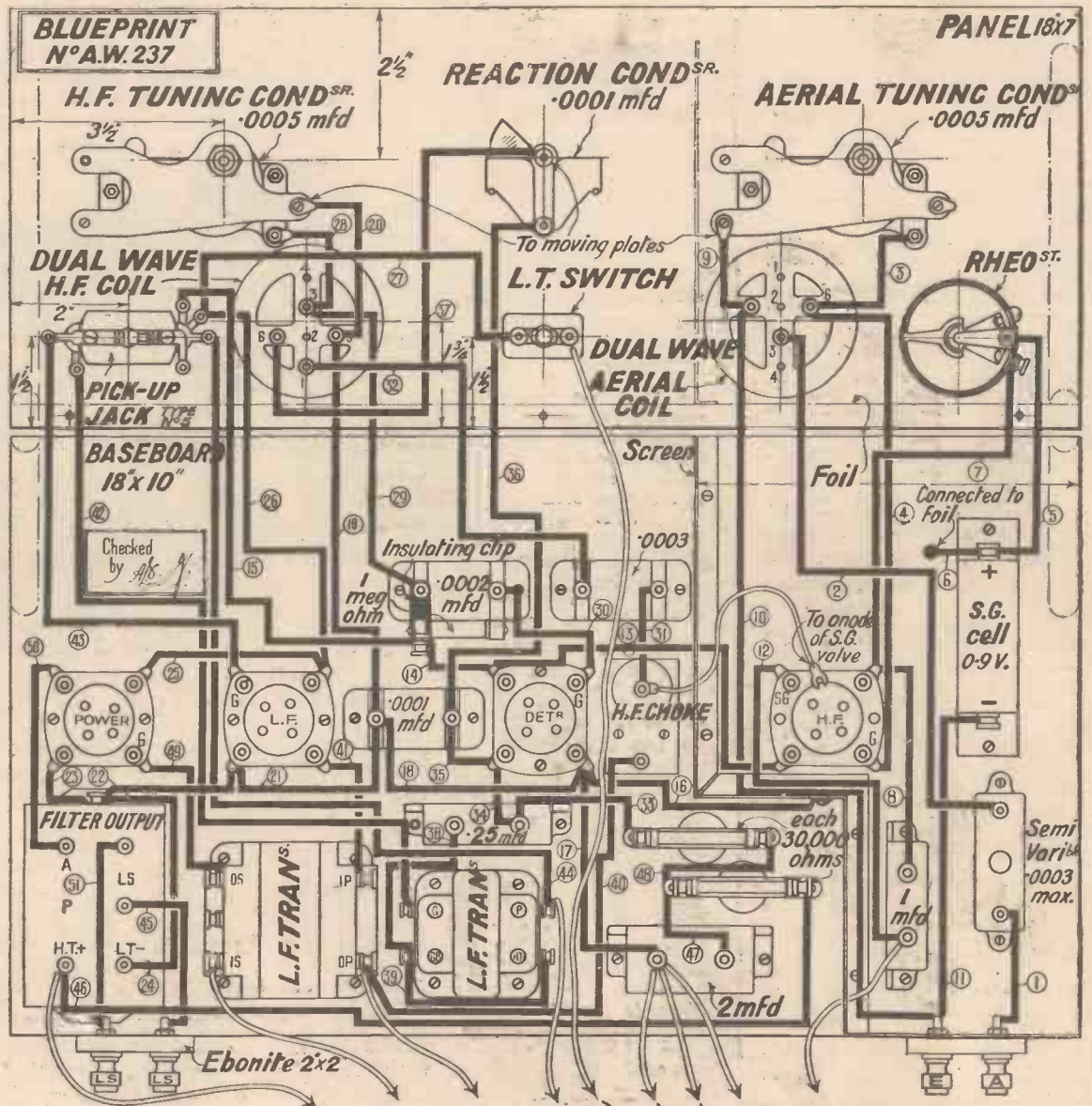
Complaint has been made that because the two B.B.C. relay stations at Dundee and Edinburgh now broadcast their respective programmes on a common waveband, both of the stations are now eliminated from users of wireless sets in Central Fife-shire.

to the argument of those who say that an H.F. stage does not need any selective aerial arrangements.

It may be observed in passing that both the aerial and H.F. coils are switched on to the long and medium wave-lengths by the simple expedient of shorting the centre portion of the coil. This means that the centre-tapped position is not disturbed in any way by the wave-changing.

The values of the condenser and leak in the detector circuit have been chosen with care and provided normal valves are used (recommended types will be given next week) no alteration in the values of .0002 microfarad and 1 megohm respectively are advised.

As has been said, the coupling arrangements to the first L.F. valve are interesting. You will see that an anti-motor-boating unit is included also in the anode circuit of the detector, and the values, both of the filter resistance and the coupling resistance, are 30,000 ohms. The L.F. coupling condenser has a value of .25 microfarad. The output filter unit in the anode circuit



The wiring diagram. A full-size blueprint can be obtained from this office for 1/6



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## "A.W." TESTS OF APPARATUS

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

### Lissen Transformer

MESSRS. LISSEN, LTD., have long been associated with low-frequency transformers, and it is interesting to note that they have recently designed and placed on the market a new transformer, having both a high primary inductance and a high step-up ratio of 4 to 1. We found on test in our laboratories that the inductance with two milliamps D.C. flowing through the primary winding was as much as 60 henries.

This figure for an instrument having a large step-up ratio was almost unknown some months ago, but recent research on the qualities of transformer steels has revolutionised the design of transformers in general.

Both windings and core are housed in a brown moulded case, the terminals arranged at the bottom. The size is not excessive, for the overall dimensions of the case are only  $2\frac{1}{4}$  in. by  $2\frac{1}{2}$  in. by  $2\frac{3}{4}$  in. high. The necessary directions for making connections to the terminals are stamped on the moulding at the top.

Readers should find this instrument an excellent performer, particularly after a medium-impedance valve, because owing to the high primary inductance, amplification should be maintained in the bass frequencies. The current flowing through the primary winding should be reduced as



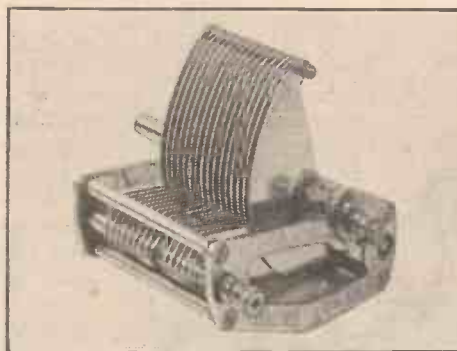
A new Lissen L.F. transformer

much as possible for the best results. With 4 milliamps D.C., the inductance had fallen to 38 henries, and with 5 milliamps to 25.5. If, therefore, the instrument is used after a low-frequency or power valve it will be advantageous to feed the transformer through a resistance choke filter circuit, in order to prevent the D.C. current passing through the winding.

### Ready Radio Condenser

WE have received for test and report a variable condenser marketed by Messrs. Ready Radio. In this condenser both the vanes and the end plates are made of aluminium, built up in such a way that, although light, the component is sufficiently robust to withstand long wear and tear. The moving plates are shaped to give a logarithmic law and the spindle is provided with a suitably lubricated friction pad on the upper bearing, giving a commendably smooth and even motion throughout the full movement. There is simple friction grip at the other end of the condenser which provides even contact between the terminals and the moving plates. Owing to the evenness of this motion the electrical contact is good.

The capacity range as measured in our laboratories extended from .000025 microfarads to .000465 microfarads; we should



Efficient Ready-Radio condenser

like to see this maximum capacity increased. The component is supplied with one-hole fixing to the panel.

### Six-Sixty Tester

VALVE testers may be of two kinds. Firstly, there is the type which gives an indication as to whether a valve is functioning correctly, and secondly there is the type which enables one to read off the characteristics and compare these with makers' charts. This type, of necessity, is more elaborate, but it can be made to give more useful information if a little extra trouble is taken. An instrument of this second class has been submitted to us for test by the Six-Sixty Radio Co. It contains a number of switches for changing connections, so that as far as possible it shall be universal.

There are three meters. At the right-hand bottom corner of the panel is an ammeter for reading the filament current, or heater current in the case of A.C. valves. On the left-hand side is a voltmeter calibrated in two ranges, from 0 to 200 volts and 0 to

10 volts for reading H.T. and grid bias respectively. In the centre of the panel is a milliammeter capable of reading from 0 to 15, or from 0 to 45 milliamps respectively, a small press button switch serving to change from the higher to the lower scale.

The instrument may be used as a simple valve tester with external batteries by connecting to terminals along the top of the panel and inserting the valve in the appro-



A useful instrument—the Six-Sixty valve tester

priate holder. Two holders are provided, one having four pins and the other five, suitable for practically every type of valve. According to whether the valve is a triode, pentode or a screen-grid it is necessary to set a switch under the milliammeter in the appropriate position.

A further feature of the arrangement is that, if necessary, the batteries of a receiver may be used instead of external batteries. There is a valve socket at the back of the cabinet itself, and into this a plug is inserted. The other end of the cord connected to this plug terminates in a second plug which is placed in one of the valve sockets in the receiver. The batteries already connected to the receiver then apply the power to the valve tester. There is a slight error introduced in this method owing to the resistance drop in the receiver itself, but if one chooses a suitable valve holder this error may be minimised.

The instrument may be used in this latter manner to test the continuity of the various circuits in the receiver to some extent since if there is a break in the anode, grid or filament circuits, the voltages will not be transferred through to the tester and the correct reading will not be obtained.



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Details of Nicore Transformers, Output, Push-Pull Input and Output Transformers, Push-Pull, L.F. and Constant Inductance Chokes are given in SECTION D, whilst SECTION E deals with Power Transformers, Standard, Dual and L.T. L.F. Chokes, Constant Inductance Chokes, and Power Potentiometers.



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# RADIOGRAMS

ONE of the outstanding broadcasts of this summer will be the relay to the National transmitters of the opening of India House by the King on July 8.

The thanksgiving service to mark the re-opening of St. Paul's Cathedral, at which it is hoped the King and Queen will be present, has been fixed for June 25; it will be taken by all B.B.C. stations.

Sir John Simon, chairman of the Indian Statutory Commission, will personally broadcast two special talks on the Indian position; on June 19 he will deal with the "Problems of India"; on June 25 with the "Future of the Indian Government."

A welcome change from the usual character of the Sunday evening programmes will be found in the entertainment offered to listeners on June 29. The National transmitters will broadcast a dramatic performance entitled, *Yes and Back Again*, a paraphrase of Walter de la Mare's work.

An interesting vaudeville programme has been arranged for the evenings of July 3 and 4; it will be presented by Melville Gideon, with the assistance of several stage stars. Another ex-Co-optimist, Austin Melford, is responsible for the book, and the cast includes Phyllis Neilson-Terry, Robert Atkins, Betty Chester, William Stephens,

Florence Bayfield, with Harry S. Pepper at the piano.

*The Everlasting Club*, a new sketch by Theo. V. Norman, is down for production on June 23, and forms one of the items of a strong variety entertainment. Other turns in the programme are Elena and Clara Cyuela, South American artistes, in vocal and Hawaiian guitar duets; Tommy Handley, in his conception of *My Ideal B.B.C. Programme for Saturday, 1950*; Norman Long; David Wise, violin solos; and the Gershom Parkington Saxophone Orchestra.

On June 24 the Birmingham studio will provide the Midlands and London with light entertainment suitable to the season. The programme includes Tommy Handley, in *Midsummer Musings*; Mabel Constanduros and Dorothy Summers in a sketch entitled, *A Day in the Country*; orchestral items by Sir Edward German and Herman Finck; and *Summer Sports*, a song-cycle for chorus and orchestra, by Sir Herbert Brewer.

On June 26 London Regional listeners will be given a vaudeville hour, including Herbert Thorpe, in Neapolitan songs, to the accompaniment of Mario de Pietro's quartet; Lillie Lane, entertainer; Jack Payne and his B.B.C. Dance Orchestra; Ethel Durnford, in light songs; Claude Hulbert

and Enid Trevor, in some more nonsense; Myddleton and Windeatt, with two pianos; and Clapham and Dwyer, in their usual spot of bother. *The Law*, an original sketch by Harold French, will also be broadcast.

*Sweeping a Chimney*, as conceived by Mabel Constanduros and Michael Hogan, is down for transmission in the National variety entertainment to be transmitted on June 28. Albert Whelan, the Australian entertainer, and "The Roosters" will also be heard on the same evening.

For its evening broadcast on June 25, Midland Regional will relay "The Frills and Flounces Concert Party," from Leamington Spa.

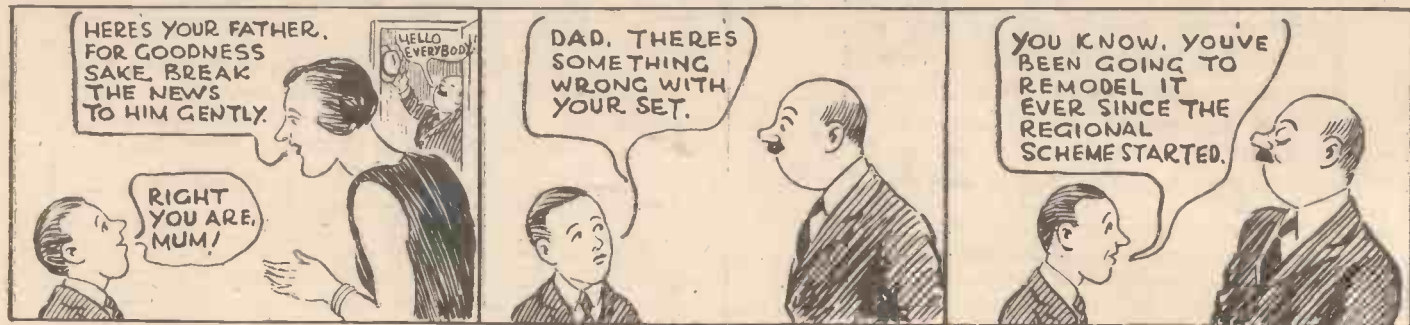
It is anticipated that work on the buildings erected to house the new Salzburg (Austria) relay station will be completed by the end of July and that the transmitter will be formally opened on October 1.

The next meeting of the *Union Internationale de Radiodiffusion* will take place at Budapest on October 13.

Although Bulgaria possesses no broadcasting system, a recent law passed authorises the use of wireless receivers in that country. The cost of the listening licence varies according to the number of valves used. Simple one-valve apparatus is taxed 300 leva, or roughly 9s. per annum; three or more valves must pay the equivalent of 15s.

Every effort is being made to complete the new Strassburg high-power station in order that its official opening may take place on July 14, France's National Fête day. Tests with gramophone records will be carried out in the course of a few days. The wavelength allotted to the station is 345 metres.

## THE OPPORTUNITY MR. FLEX GOT FOR REMODELLING HIS SET—



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# Further Notes on the "SUNSHINE THREE" PORTABLE

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

THE "Sunshine Three" portable, which was described in the two preceding issues, appears to have made an instant appeal to many AMATEUR WIRELESS readers on account of its simplicity, its compactness, and low cost. One of the most attractive features of this set, to my mind, is the ease with which the results can be duplicated.

One often finds, particularly with portable receivers, that the first model works very well, while other models made from the same design fail to come up to the expected standard by an appreciable margin. I have on various occasions endeavoured to overcome this defect, with only partial success, and, in point of fact, I decided that this year I would not publish a portable set design at all unless I could be reasonably sure of consistent results.

Experiments were started on the bench some time before the final design was evolved, and it immediately became clear that the lines on which I was proceeding held out considerable promise.

A further encouraging sign was that the model of the receiver in final form worked straight away without any modification. This is always a good sign, for it shows that the circuit has been thoroughly explored during the experimental period, and that the factors which are effective in maintaining it in correct operation are correctly understood.

### Alternative Components

As a matter of interest, however, a second model of the receiver was made almost immediately after the first had been finished, and in this case an alternative set of components was used. The H.F. chokes, of course, were the most important, and Watmel chokes were employed in this second model. With the exception of the Igranic reaction condenser, for which there is no suitable alternative, every other component in the set was different, although the layout was maintained the same. The results, however, were equally satisfactory, and again the receiver operated without difficulty straight away.

Incidentally, it should be noted that it is the Watmel DX<sub>3</sub> H.F. choke which is to be used, and not the PX<sub>3</sub>, as incorrectly stated last week.

The frame aerial is an important point, as I explained last week, it being necessary to ensure a good clearance between the long- and the short-wave sections to avoid excessive damping on the short waves.

### Using an Ordinary Detector Valve

I suggested that it might be interesting to some readers to learn how the use of the screen-grid valve may be obviated in the

detector stage. There may be some who like the design in question, but do not feel that they wish to purchase a screen-grid valve, especially for the detector stage. Results can be obtained with an ordinary valve, although the performance is not quite of the same standard. If a three-electrode valve is to be used, the following alterations must be made to the circuit.

1. The flex lead from the anode socket of the detector valve holder, which normally is connected to plus 18 volts, must be removed.

2. The flex lead from one side of the second H.F. choke, which terminates in a small tag and is normally connected to the anode of the screen-grid valve, must be removed and in its place a connection must be taken from the same point on the H.F. choke to the anode socket of the valve holder.

Then on inserting an ordinary three-electrode H.F. valve, satisfactory results will be obtained.

It may be questioned as to whether the



Here is the "Sunshine Three" Portable of which full constructional details were given in the two preceding issues

use of a screen-grid detector is worth while, if it only makes a relatively small difference to the result. It should be remembered, however, that audible difference in strength corresponds to from 20 to 30 per cent. change in the volume. Therefore, one is able to detect the difference by ear and there is quite a distinct difference between the two arrangements. In practice the reception from distant stations is just noticeably better with the screen-grid valve, making the difference between obtaining a station on the loud-speaker and not being able to resolve it from its carrier, so that the use of this somewhat unconventional form of detector is justified by the results.

# Stations galore!

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## HORIZON FOUR

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| 1 Dubilier .0001 fixed condenser                  | 2          | 6         | 0        |
| 1 Dubilier 1 mfd. fixed condenser                 | 2          | 6         | 0        |
| 1 Lissen 2 meg. grid leak                         | 1          | 0         | 0        |
| 7 Belling-Lee wander plugs                        | 2          | 0         | 0        |
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| 2 Belling-Lee spade terminals                     | 1          | 9         | 0        |
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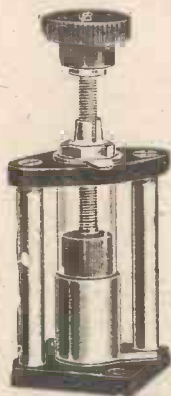
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# What are the Sound Waves Saying?

THERE was a famous song of Verdi's a night or two since, and as I listened to it I found myself thinking of the man almost more than of his music. He began life in humble surroundings; he was born in a tiny hamlet called Le Roncole, hidden away in an attractive and fertile plain of maize and hemp somewhere at the foot of the Ligurian Apennines. His father was the innkeeper.

When Verdi was less than a year old misfortune befell that peaceful village; it was laid waste by the Russian and Austrian troops.

The men of the village banded themselves together to defend their modest homes; the women were ordered to seek refuge in the church. But the soldiers forced the door and an appalling carnage took place; the stone floor of the church was red with the blood of the women and little children.

One woman escaped. She mounted the belfry steps, and with her babe, took shelter under the shadow of the great tenor bell; thus Giuseppe Verdi was saved.

It was the proudest moment of the simple innkeeper's life when his boy was appointed organist of the tiny church in Le Roncole; he had nothing further to wish for, and was somewhat dismayed when Giuseppe wanted to go to Milan to learn to write an opera like the only one he had ever heard.

One of Verdi's first commissions was to write a comic opera; as soon as he began it he was interrupted by the illness and death of his younger and then of his elder child. Within a month his wife also died. Broken in spirit, he threw down his work and vowed never to write another bar of music. Fortunately for him, Marelli (who had commissioned him) understood and, in time, persuaded Verdi to turn to Art for consolation. He gave him a libretto to read and that was the real beginning of Verdi's amazing career.

His operas had a political touch about them that soon meant conflict with the Archbishop, who ordered the Chief of Police to interfere. It so happened that the official was musical, and perhaps for the only time on record did a policeman alter a libretto of an opera. Victor Hugo's *Le Roi s'amuse* was certainly dangerous in the political sense, for it made a king appear in a ridiculous light; but the Chief of Police suggested that the king should be a duke and the title *Rigoletto*.

The part of the duke was given to the great tenor Mirate. In course of time Verdi handed out the parts to his caste, but when Mirate came to examine his own he found that one song was missing.

He spoke to Verdi about it. "Sorry," said Verdi; "you shall have it in a day or

two." This went on for some weeks and Mirate began to feel irritated. The night before the dress rehearsal Verdi paid him a visit. "Here you are," he said, "I had it all the time, but I dared not let you have it because had you sung it outside the theatre all Venice would have got hold of it, and that was just what I wanted to avoid."

The song—need it be said?—was "La donna è mobile." Verdi was right; all Venice *did* get hold of it!

WHITAKER-WILSON.

**THEATRICAL MAKE-UP**

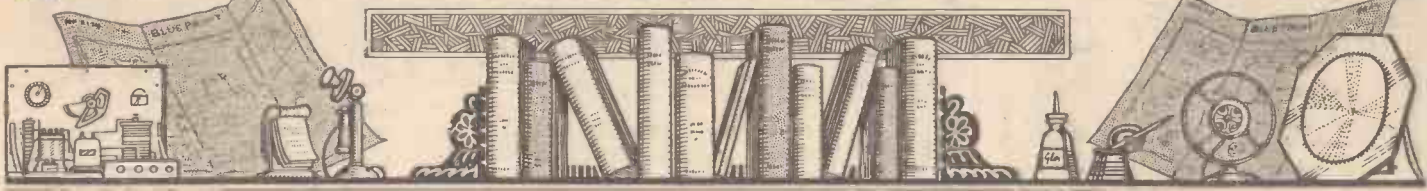
MESSRS. WILLIAM HEINEMANN (Medical Books) Limited, of 99 Great Russell Street, London, W.C.1, have sent us a copy of "Paint, Powder, and Patches" (7s. 6d. net), a handbook of make-up by H. Stanley Redgrove and Gilbert A. Foan, illustrated with sixteen plates and with various line illustrations. It treats of facial make-up for the amateur and professional stage and contains a special section on make-up for cinematograph work.

The amateur actor who usually finds great difficulty in mastering the technique of make-up and frequently has no-one at hand to advise and guide him, will find this book full of most excellent suggestions, and each of the thousands of amateur stage societies throughout Great Britain would do well to have a copy of this book in its green room for reference. We have tested it in the light of our own experience and find it "not wanting." It shows how to portray many national and traditional types of the stage, and the instruction is given in such detail that any amateur or professional possessed of a little imagination will have no difficulty in applying it to his own needs.

"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.

# 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

### Screened Wavetraps

**Q.**—I have been in the habit of using a wavetraps to cut out interfering signals, but having read of a screened wavetraps, I am wondering whether this would be an improvement.—R. Y. (Yorks).

**A.**—There is little point in using a screened wavetraps 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 wavetraps 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 screen wavetraps will be useful.—C.

### Reversed Reaction

**Q.**—I have constructed the "Music Leader," using the "Arcadian Portable" coil, and whilst I am very satisfied with reception on the long waves I have had no success with short-wave stations, I cannot seem to get a proper reaction effect on the medium waves and feel that there is

only some small fault.—J. D. (Birmingham).

**A.**—It seems to us that the winding of your special H.F. tuning coil is incorrect. We have

## When Asking Technical Queries

PLEASE write briefly

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.

Queries cannot be answered personally or by telephone.

learned that some samples of coils sent out from certain manufacturers had the medium-

wave winding connections reversed, thus giving rise to a reverse reaction effect on the medium-waves only.—C.

### Using a Pentode

**Q.**—I have constructed the "Everybody Three" receiver, and it has certainly exceeded all expectations in regard to reception of different stations and the power with which they are received. In fact, on some stations, the volume is so great as to cause distortion, and it is for this reason that I write. I am using a PM2 power valve with adequate H.T. supply and I have proved that I am overloading the grid of this valve. In view of this, should I use a pentode valve, or should I get a larger power valve?—R.N. (London, E.10).

**A.**—If you want purity and you are already overloading the grid of a PM2 valve, then a pentode type of valve is not to be recommended. Granted that it has a larger grid swing than a PM2 valve, there is still the possibility that even the grid of this valve will be overloaded. We suggest that you use a super-power valve of the ordinary type, such as the PM252 or any other make of super-power valve.—C.

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NATIONAL 1977

# LETTERS TO THE EDITOR

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

### Liability of Electricity Companies

SIR,—I was interested in the article in a recent issue of AMATEUR WIRELESS on the Liability of Electricity Companies on Change of Current.

The points dealt with by "A Barrister-at-Law," are perfectly true, clear and concise, but in certain cases may possibly be misinterpreted by consumers. The supply of current is at present in the course of being changed over, in this Borough, from direct to alternating. The Municipality are, in this case, the undertakers and it is the practice of consumers requiring current to complete a form, stating whether the current is required for lighting or power, or both.

Private residents naturally apply for lighting rate only, but should they require power for electric heaters, vacuum cleaners, or other domestic power, the consent of the Corporation is necessary. In the case, however, of eliminators, the power consumption is so negligible, that many consumers have connected their sets to the mains, and although paying for consumption through a meter, have not thought it necessary to advise the local authority of the mains connection.

In these cases, consumers will find they have no remedy against the local authority when A.C. is the type of supply unless they have previously notified the Corporation of the existence of an H.T. unit.

PERCY C. CAVANAGH (Southend Chamber of Trade).

### Alternative (?) Programmes

SIR,—"Thermion's" article on alternative programmes tempts me to respond.

I cannot state the listener's case in better terms than he has done or say very much to strengthen his argument. Thousands of listeners must feel that there has been bad faith on the part of the B.B.C. who promised us alternative programmes under the Regional scheme and now give us something which no reasonable person could describe as alternative. We hear one item from one station, and the same item from another station on another day. That is not an alternative programme.

It would not be so bad if listeners could still enjoy other stations from abroad, but most of us modified our sets in order to obtain best-quality reproduction from our local stations—and good quality does not go hand in hand with long-distance searching—so we have been had properly! How long would a business house retain its reputation by the use of such methods?

E. G. B. (Harrow).

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Everybody's Three (SG, D, Trans) .. .. AW209  
1930 Ether Searcher (SG, D, Trans) .. .. AW211  
New All-Britain Three (HF, D, Trans) .. .. AW214  
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Everybody's all-electric Three (SG, D, Trans) .. .. AW221  
—A.C. .. .. AW221  
1930 Clarion Three (SG, D, Trans) .. .. AW223  
Auto-coupler Three (D, 2LF) .. .. AW225  
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AMATEUR WIRELESS 58-61 FETTER LANE LONDON, E.C.4



**"THE DYNATRON EFFECT"**

(Continued from page 790)

would obtain with ordinary resistance. Beyond this point the current begins to increase again, and subsequently shoots up very rapidly when the anode voltage is of the same order as the screen voltage.

The characteristic is shown for several values of voltage on the inner grid. In order to make this quite clear, the circuit shown in taking the characteristic is given by Fig. 3, from which it can be observed that the inner grid was connected directly to the filament through an appropriate battery. The significant point is that although the increase in the inner grid voltage causes an increase in the average value of the anode current, the steepness of the slope of the negative-resistance portion increases to quite a marked extent as one proceeds to make the inner grid slightly positive with respect to the filament. This means that the action of the valve as a negative resistance device or Dynatron becomes progressively better as we put positive voltage on the grid.

Fig. 4 illustrates a similar characteristic taken from a Mullard PM12 valve, from which it will be seen that the same action is taking place, but that generally the negative-resistance action is not so well defined. This is very probably deliberate on the part of the designer.

**Actual Negative Current**

When we come to Fig. 5, however, taken on the Cossor valve, an interesting state of affairs is shown. First of all we see that the curves do not lie one above the other as in the previous two examples, but that they cross over each other at one point so that the mean value of the anode current does not rise as rapidly as in the previous cases if we increase the voltage on the inner grid. What is perhaps more interesting is the extraordinary steepness of some of the curves. The anode current can be reduced from several milliamps down to zero by relatively small variation of the anode voltage. It will be noticed that with this particular valve the current actually becomes negative at certain values of the anode voltage.

Perhaps the most interesting characteristic of all, however, is that shown by Fig. 6. This characteristic, which was taken on a Mazda valve, shows that this valve has a considerable portion of its characteristic over which the current is actually reversed. The negative resistance characteristic is relatively steep, so that the valve has a good Dynatron action, and in this particular instance it is possible to make the valve behave as a negative resistance almost in the true sense of the word. One can, for example, choose a point such that the total anode current is zero. This will correspond to about 45 volts H.T. on the anode with 80 on the screen. Then, if we increase the anode voltage, current will flow in the wrong direction, i.e., from negative to positive.



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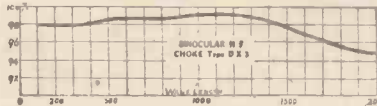
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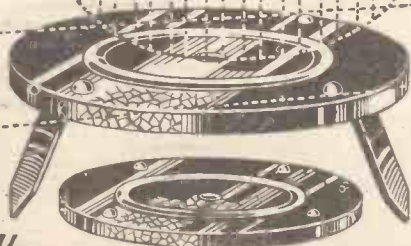
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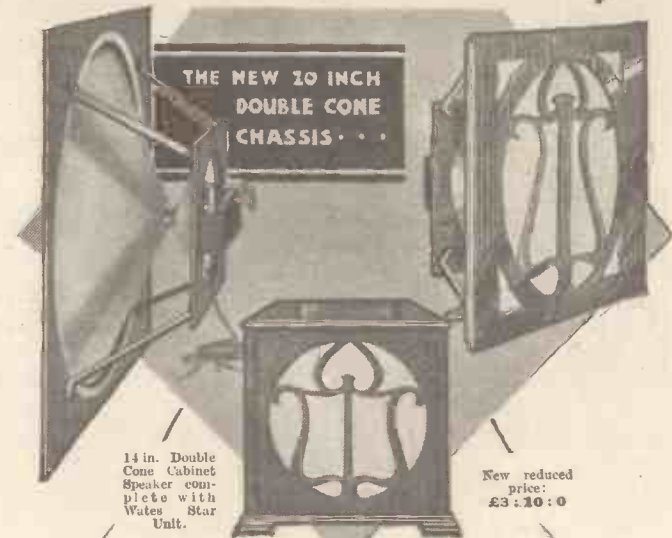
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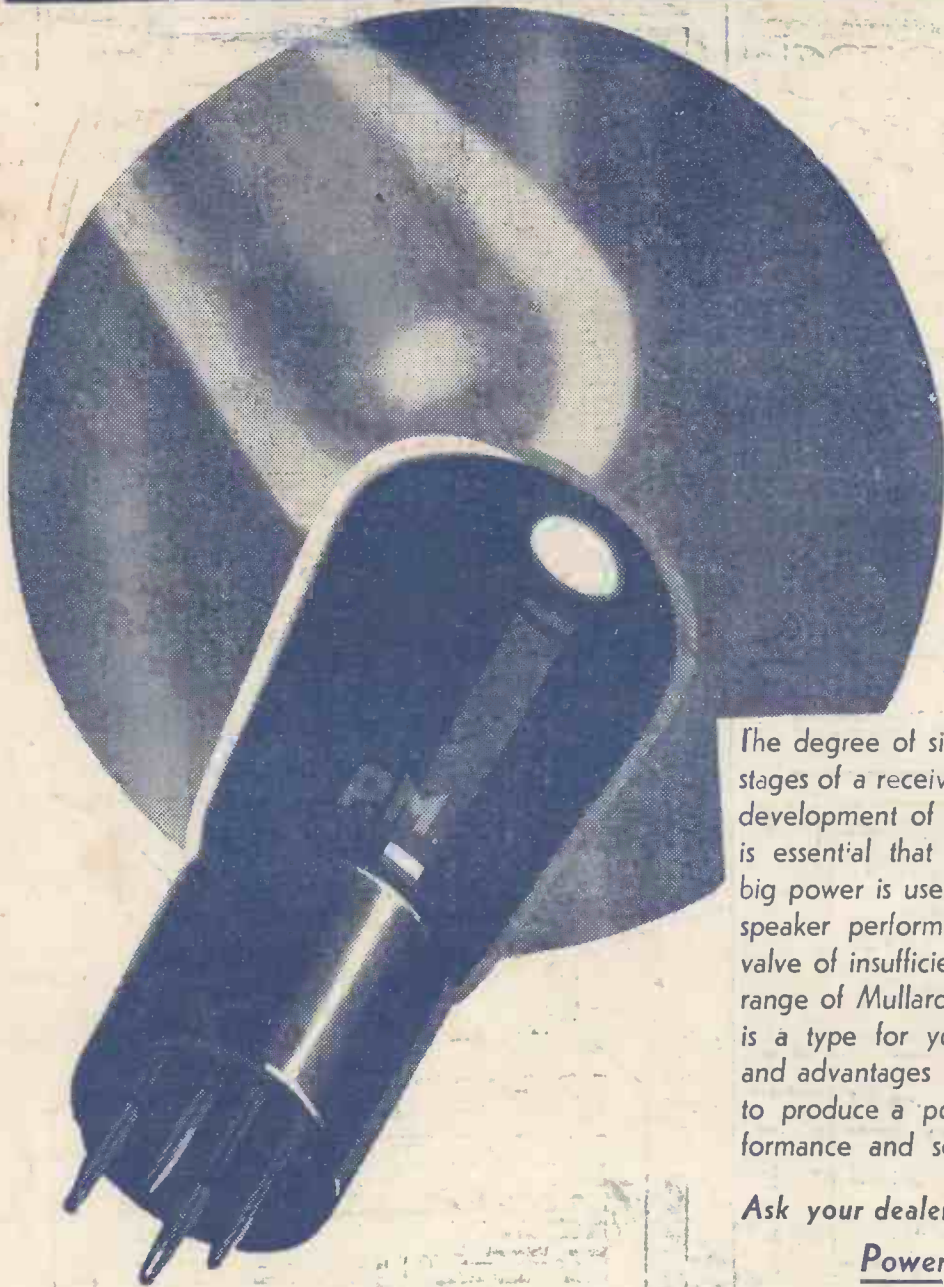
|                                                                                                                                                                      |                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Wates Universal Double Cone Chassis, complete with Universal Bracket, instructions and all screws for mounting the unit, together with supporting leg, ready for use | 12 in. chassis - 11/6                                                                                  |
|                                                                                                                                                                      | 14 in. chassis - 12/6                                                                                  |
| but not fitted with supporting leg                                                                                                                                   | 20 in. chassis - 17/6                                                                                  |
| Wates Universal Double Cone Chassis, complete in handsome cabinet, and fitted with Wates Star unit speaker, complete, ready for use                                  | 14 in. speaker in polished oak - £3 10 0                                                               |
|                                                                                                                                                                      | in polished mahogany - £3 15 0                                                                         |
|                                                                                                                                                                      | 20 in. speaker in polished oak - £4 10 0                                                               |
|                                                                                                                                                                      | in polished mahogany - £4 17 6                                                                         |
| Silk-lined fret in polished wood, for 12 in. chassis, 4/-, for 14 in. chassis, 5/-.                                                                                  | Universal bracket only with fixing screws and full instructions for fixing to all unlisted above, 2/-. |

If your dealer does not stock, obtainable direct. Full details free on request from:  
**THE STANDARD BATTERY CO., Dept. A.W.,**  
184/188, Shaftesbury Avenue, London, W.C.2  
Phone—Ten. Bar 6193

# WATES UNIVERSAL PAT. NO. 309214 DOUBLE CONE CHASSIS

M.B

# PLAIN FACTS ON THE POWER VALVE



The degree of signal energy produced by the amplifier stages of a receiver has tremendously increased with the development of modern radio design. As a result it is essential that an output valve capable of handling big power is used in the last stage. A harsh distorted speaker performance is the result of using an output valve of insufficient power-handling qualities. In the range of Mullard Power and Super Power valves there is a type for your own receiver. Long experience and advantages in the manufacturing process enable us to produce a power valve that is unsurpassed in performance and service.

Ask your dealer for the following type numbers:—

| <u>Power</u>  | <u>Super Power</u> |
|---------------|--------------------|
| 2 volt P.M.2. | P.M.252.           |
| 4 volt P.M.4. | P.M.254.           |
| 6 volt P.M.6. | P.M.256.           |



Above: The Mullard P.M. filament which since its discovery over four years ago has set a precedent in radio valve design.

# Mullard

## THE MASTER VALVE

Advt. The Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, London, W.C.2

Arts.