REAL MIDGET VALVES FOR BATTERY USERS—Exclusive Details

Amateur Wireless

and Radiovision

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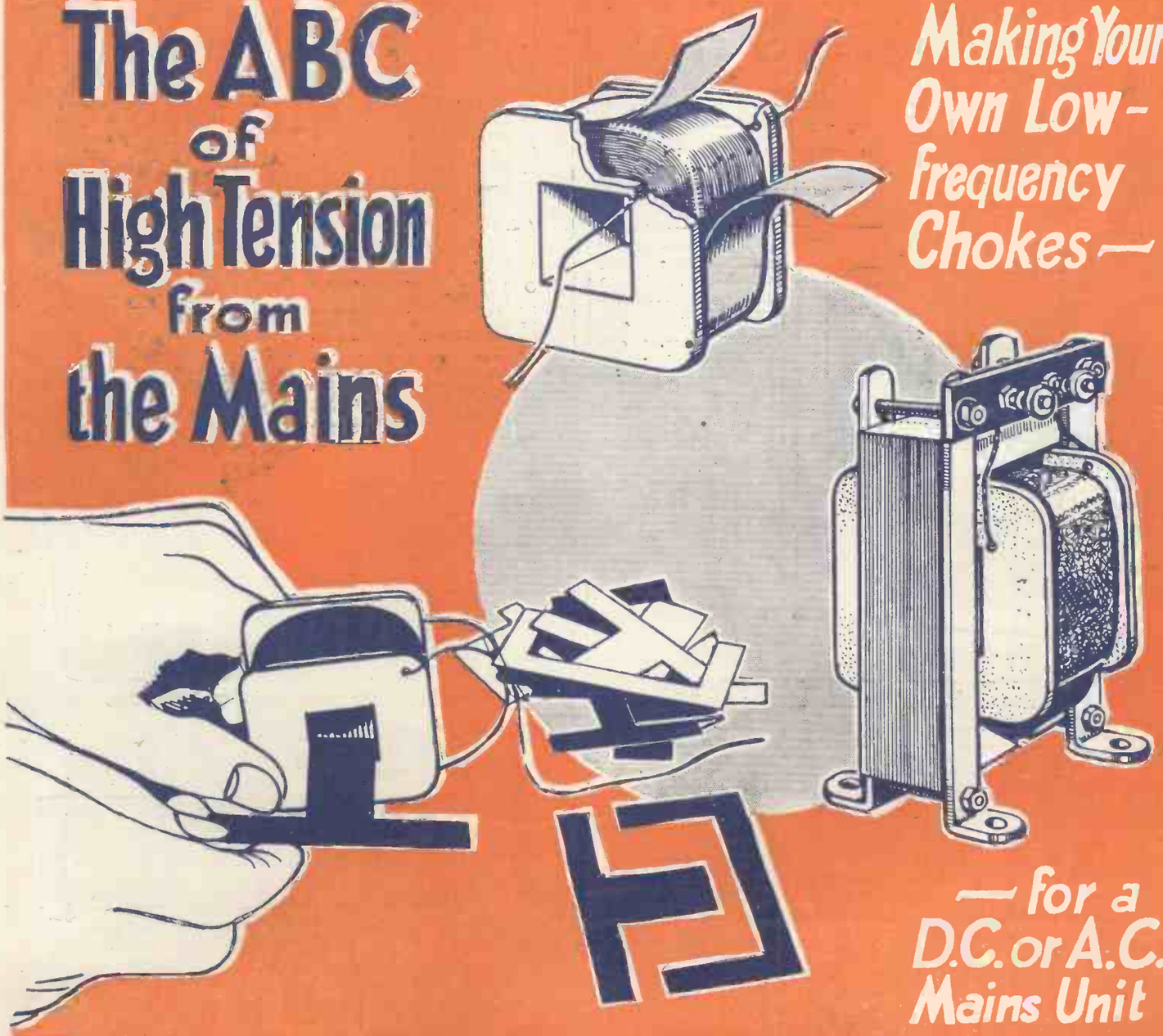
A RIDE IN A NEW YORK RADIO TAXI

The ABC of High Tension from the Mains



Making Your Own Low-frequency Chokes—

—for a D.C. or A.C. Mains Unit

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News and Gossip of the Week

Beating No. 10

At the Maida Vale rink premises recently acquired on a long lease by the B.B.C., builders are already hard at work on a really big studio.

It will easily out-do the wharf studio known as No. 10. The dimensions will be 72 feet wide, 125 feet long and 26 feet high.

Compare these figures with No. 10, which is 70 feet wide, 85 feet long and 22 feet high.

Another "Clacque"

To clap hands in this new studio, 150 people will be accommodated in a gallery. Among other things, the Maida Vale studio will be equipped with all the latest balance-and-control apparatus.

And, presumably, we shall, eventually, be regaled with "posh" Maida Vale concerts. All nice and highbrow, what?

Big Tom Coming

While Big Ben is being cleaned up there is a suggestion that the B.B.C. will take its microphones into St. Paul's Cathedral. From there you may hear Big Tom from the South-west Tower.

How different Tom will sound from Ben! Close to, Big Tom has an A flat note, but in the distance it becomes E flat.

Quarters would be struck on bells, only the hours coming from Big Tom.

Chasing the "Hets"

Tatsfield has been busy again. This time chasing up those poisonous heterodynes on London Regional. A note of 5,000 cycles has been registered—very annoying to listeners about 30 miles out.

But is it a carrier, or is it a harmonic from a long-waver causing all the bother? Not yet proved.

Plenty of Them!

Seems to be a perfect spate of these "hets" just now. Scottish Regional has one—but here the cause is definitely a long-wave station's harmonic, says Tatsfield.

London National had a bad spell from two causes—Luxembourg's harmonic and a similar offshoot from Mühlacker. When the last-named ceased on his temporary aerial, the trouble went.

No Censorship!

April 6 should go down to history as the night on which the B.B.C. talks censor had his night off. For on that night we are to hear an informal discussion relayed from the Ingle Nook of the Lygon Arms, Broadway.

The issues will be those that naturally arise between town and country people—nothing very dangerous, of course, but it just shows that the B.B.C. is not frightened to take the gloves off sometimes.

Henry on Saturdays

Yes, Henry Hall every Saturday night from now until at least the end of the merry month of May.

Thus Bert Ambrose's six years unbroken record of Saturday-night dance music is definitely over—though what will happen after May, no one seems to know.

Meanwhile, Henry Hall is frightfully bucked with life. Heard his guest nights?

Now There Are 11

Did you realise that the B.B.C.'s exclusive ten wavelengths has quietly and without any fuss grown to 11? Probably not. We ourselves had not noticed it until we came to reckon up—and then we found that Plymouth and Bournemouth are on what is known as a national exclusive wavelength.

Improved Newcastle

For the Newcastle station the B.B.C. is putting in new control and amplification apparatus, this being installed at the Bridge Street premises recently taken over.

All in readiness for the opening of North-eastern Regional some time in the not too utterly distant future.

By Royal Command

Henry Hall will appear before Their Majesties the King and Queen at the command performance at the Palladium.

Henry's had a spot of bother because he is not strictly a variety act, but that is being overcome by a week's appearance at the Palladium before the command performance. These things can be arranged, you see.

Latest on Television

After many false alarms, the E.M.I. apparatus for high-definition television on ultra-short waves has now been installed at Broadcasting House, London.

First test transmissions may be expected very soon. Baird has been busy at the Crystal Palace, too. It will be interesting for London lookers to compare the two transmissions, won't it?

A Long Way Off?

Especially as Mr. Louis Sterling, the managing director of E.M.I., is alleged to have said, in a recent interview, that *"We cannot transmit over the ether even a good imitation of the most crude flicker pictures of the very early movie days."*

Graphic Union photo.

This photograph shows you just what an audience saw in Wardour Street when a mannequin was televised from the Crystal Palace

Extending the News

In the autumn the B.B.C. is thinking of extending its news activities. Curious how this one aspect of broadcasting is never criticised in the papers—*they like it to be rotten, of course.*

THE PENTA-QUESTER IS COMING!

See preliminary details on page 363

The News Reel is coming back, and we are to be regaled with the exploits of the B.B.C.'s own news reporters.

Relaying Daventry

Growing interest in the Empire stations is shown by the fact that the Ceylon broadcasting station relays our short-wave Daventry programmes every night on medium waves.

They have recently installed the latest short-wave equipment in order to pick up Daventry to the best advantage.

Recorded Programmes

For the "bottled" programmes distributed to the medium-wave stations in various parts of the Empire a great "material" search is now being made.

Plays, news reels and so on are of the stuff Empire people want, because, of course, there is no sense in doing acts that are already available in ordinary gramophone-record form.

B.B.C. Prestige

Whatever may be said against the B.B.C. at home, it has a wonderfully high prestige abroad.

J. Beresford Clarke, the Empire Programme Director, has been asked by the Egyptian government to go over to Egypt to advise them on a broadcasting system.

Riding in a Radio Taxi

By Our U.S.A. Correspondent: LIONEL MERDLER

This view shows the type of screening from buildings encountered in New York. Looking up Broadway from the Battery

RECENTLY I hailed a radio cab on Broadway and went for a run around to try out this novelty. New York wants its radio cabs and does not mean to do without them, even at the cost of the increased accidents put to their count. Personally I should say the accidents are caused by the increased competition for customers brought about by the recent introduction of the radio cabs.

I have seen three taxis locked right up solid, back of one to radiator of other, in the mad rush for a fare. So much money has been spent on the fixing of radios, however, that the Chief Commissioner was persuaded to withhold his decision to stop this practice.

Are Taxis Radio Equipped?

And it seems as if every taxi in New York will thus soon be equipped with radio.

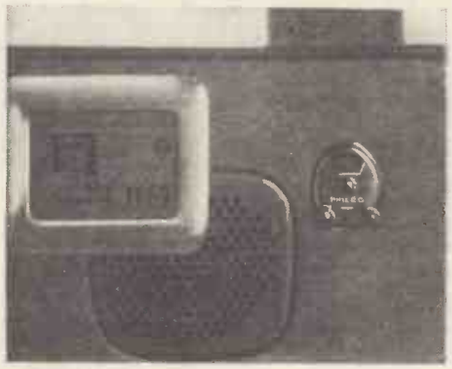
There is no doubt that radio is an attraction, and especially so to women after finishing their day's shopping, as taxis are always more used in New York than in London owing to the terrible crushes in the New York subways. In the near future the Ford concern is planning to place radio cabs on the roads.

It is easy to recognise one of New York's radio cabs

It must not be thought that these new traffic additions are merely old types with radios attached; they are not. These cars are specially designed with the radio portion well to the fore and are placed on the roads as complete installations.

To see what advantages there are in the radio cab, I have made a point of using them whenever possible. The loud-speaker and controls are fitted in the rear portion of the front seats facing the passenger, the loud-speaker being inset to be flush with the surface.

The radio is not left running and is only brought into use at the request of the passenger, who has full use of the volume and tuning controls. The set, like the majority of automobile receivers, is a super-het with self-adjusting volume control and a remote tuning



View inside cab showing loud-speaker. Tuning and volume controls for the super-het are placed very accessibly

control with illuminated dial is fitted. There is a choice of about half-a-dozen stations with high field strengths and these, with the aid of the S.A.V.C. control, keep background noises at a minimum.

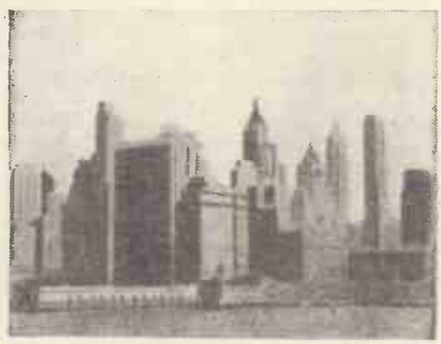
The chassis of the car has, of course, been designed with a view to keeping all outside and inside noises at an absolute minimum and even without radio the cars are a pleasure to ride in due to this quietness, which is an advantage in noisy locations.

To give one of these radio taxis a complete test, I directed the driver as follows: down Broadway, where we have high buildings, electric signs and electric trams, then through Wall Street, where we have skyscrapers and narrow streets, out on to the Battery, which is open ground and faces the Hudson river, into the town again and under the elevated electric trains; and finally I directed him to pull up right underneath a steel-structured elevated station with trains constantly passing.

During the whole time I was enabled to enjoy pleasurable listening. In the noiser locations I was reduced to a choice of one or two stations owing to the heavy background noises. In the open localities a choice of several stations was permitted at excellent programme quality.

Under the elevated way, where we remained stationary, reception was little affected, although passing trains forced one to keep to the more powerful broadcasts to prevent background noises upsetting programmes. Fading of signals did not bother me at all as the S.A.V.C. action appears to function exceptionally well.

Programmes are radiated almost the whole day through and the passenger is thus assured of constant entertainment.



More of New York's screening! View from a steamer at the end of Manhattan

The question has been raised as to whether the public want radio cabs. One newspaper has actually been running a ballot to decide this point. I think that the answer is given by the number of radio cabs on the streets and the fact that other concerns and private owners are either fitting or considering fitting radios on their taxis.

Society for Radio Pioneers

ONLY a select few of our readers can have been engaged in wireless experimenting for ten years or more. But there must be some among you—some veterans of this new science.

The question is whether *you* are one of them. Because if you are, why, then, you ought to join the Society of Wireless Pioneers.

This new organisation has sprung up, like so many fraternity groups of its kind, in America. It is headed by one of the vice-presidents of the International DX'ers' Alliance, about which AMATEUR WIRELESS has already written on several occasions recently.

Mike Mickelson is the man. He has just sent Richard L. Rawles—of the Publicity Department of the I.D.A. in this country—full details, which have been sent on to us.

The new organisation, the Society of Wireless Pioneers, is being formed by those who have been connected with high-frequency or short-wave work for the past ten years. Commercial operators, experimenters, short-wave listeners and amateurs are all eligible, provided they can furnish proof of their ten years' seniority.

The object is to bring together fellow fans who may have lost contact with each other; to form, in a word, a strictly fraternal organisation of real pioneers.

Local chapters will later be organised, these to be self-supporting, all funds subscribed by members to be paid to officials chosen—no financial aid coming from headquarters.

What It Costs

Fees have been fixed—one dollar for life—payable to headquarters. Annual subscription to the official organ, the Globe Circler, to be 1 dollar 25 cents, or five shillings sterling. This to be paid to C. A. Morrison, President of the International DX'ers' Alliance, of 1018 North Prairie Street, Bloomington, Illinois, U.S.A.

All application forms for membership are to go to Mike Mickelson, 3229 Bloomington Avenue, Minneapolis, Minn., U.S.A. The forms of application can be obtained from Richard Rawles, Publicity Department, I.D.A., Blackwater Corner, Newport, Isle of Wight.

It seems a good stunt. The only point is whether there really are any ten-year-olds.

Real Midget Valves for Battery Users

They Consume Only .1 Ampere at 1 Volt!

WE have in our possession the first of the new midget battery valves to be produced in this country. They are real midgets—only 2 in. in overall height. You only realise how very small this is when you come to put the midgets up against the ordinary battery valves, which are between 4 and 5 in. high.

The new midgets are made by the Marconi-Osram Valve Company, Ltd., and will very shortly be marketed by the Marconiphone Co., Ltd., as Marconi midgets, and by the General Electric Co., Ltd., as Osram midgets.

For Special Points

A lot of interesting points arise.

(1) No valve pins, because the contacts for each electrode are brought out to side contacts, which save over half an inch height. At the same time these contacts make better connection than the ordinary pin and spring method, and they are self cleaning.

(2) A new base, a minute moulded bakelite base, which is only two thirds the height of the standard type of base.

(3) The glass bulb is not much larger than the cap of a fountain pen—and roughly the same diameter.

(4) The sealing pip of the bulb is at the top, as in the earlier types of valve. The reason for this is that when the pip is at the bottom as in the standard valves of to-day there has to be a clearance between the pip and the base to prevent the pip being broken off—and this to some extent wastes space.

(5) The valve is mounted in rubber, not unlike the Catkin mounting, so that there is no cement to get loose, and the troubles of microphonic noises are reduced to a minimum.

From these five constructional points you will begin to get some idea as to how the valve size is kept down. It is by attention to details at every point in the construction.

Now for a few technical points. At present there are only two types in the Midget range, an H11 and an L11. The H type is for detection, while the L type is a very small output valve.

These are the only valves of their kind on the market to-day, as they have filaments of only 1 volt. As they both take 1 volt at .1 ampere they can be run in series from a 2-volt accumulator. Right away, then, you economise your low-tension current, because of course the total current when the valves are in series is no more than that of one valve.

The working characteristics of these valves are of course largely determined by the minute electrode mounting. The construction is similar to larger valves, in that there is the usual upright anode, mica bridge across the top, into which the filament, and grid supports are anchored.

The 1-volt filament is of the single inverted-V type and owing to the very small clearances between the electrodes, the characteristics are quite reasonably good.

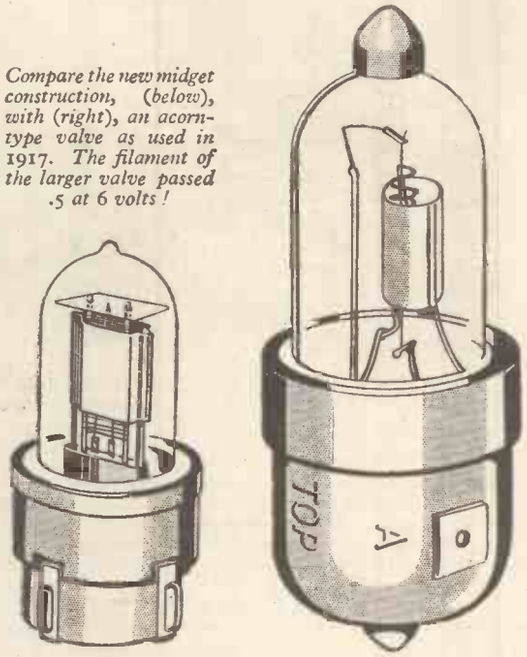
For example, the impedance of the H11 is 30,000 ohms, with a slope of .5 milliamperes per volt, giving an amplification factor of 15.

The L11 has an impedence of 12,500 ohms, a slope of .4 milliamperes per volt, giving an amplification factor of 5. This is quite a good output valve for headphone use, but if a loud-speaker is wanted two of these valves would have to be connected in parallel to give enough output—this applying even for the smallest loud-speaker.

The maximum anode voltage for each of these valves is 100 volts, but as a rule 60 volts will be found ample for good results. For example, with about 5 volts grid bias and 60 volts high-tension the anode current of the L11 would be in the region of 2 milliamperes.

Of course the anode current of the H11 is very small indeed, being only a fraction of a milliampere. Actually, .5 milliampere is about the average with normal high-tension and zero grid bias.

From the characteristics mentioned, it will be seen that these midget valves can be used in the following ways: the H11 as either a leaky grid detector or resistance-capacity amplifier, or even as a high-frequency amplifier stage; the L11 is simply a low-frequency amplifier, although it will work as a detector—but of course the amplification factor will then give a rather low output.



Compare the new midget construction, (below), with (right), an acorn-type valve as used in 1917. The filament of the larger valve passed .5 at 6 volts!

Now what use are these midget valves? Originally they were intended for deaf aid equipments, and for pocket receivers for the police force. As the manufacturers saw all sorts of possibilities in these midgets they decided to market them for everyday use.

At present the price of these valves is on the high side, partly because they are somewhat difficult to make, and the demand at first will not be very widespread. Each valve of the types mentioned will cost 15s. No doubt this price will be lowered if the midgets get really popular.

Just a few examples of what you might do with these midgets. A two-valve set can be assembled to run from a small dry cell for the low-tension and about a 36-volt high-tension battery. Such a set would give you local-station results at least. On earphones, of course—but only a small aerial would be needed.

Into a Small Space

The whole thing could be put into a very small box, and could be carried about on a pedal cycle or motor bicycle quite easily. Or, of course, it would make a nice little standby set to keep in the pocket of your car.

There are lots of other interesting possibilities. More ambitious portables might be constructed. For example, a four-stage set with two choke-coupled triode high-frequency amplifiers is quite a feasible idea. It involves a certain amount of experiment, but there is no doubt that you could have a lot of fun.

You could take full advantage of all the midget components now on the market, such as coils, condensers, resistances, high-frequency chokes and so on.

We should emphasise that these valves have already been utilised for police sets and deaf-aid sets of all types.

There are great possibilities in the new midget valves announced on this page. For some time, battery users have complained of neglect by the valve manufacturers, but here is a development that will make them sit up and take notice.

These valves take only .1 ampere at 1 volt, so that not only are they small in size but they take only a small current from the low-tension accumulator.

The illustrations reproduced in these pages show very clearly the small size of the new valves when compared with standard types commonly in use.

They do definitely represent a revolutionary change in valve design—and for once they appeal to the battery man.

One of the new Marconi 1-volt midget battery valves photographed by the side of a standard type

The ABC of High Tension from the Mains

The Experimenters Tackle a New Problem

Completing the assembly of the D.C. mains unit described in this article. Two home-made smoothing chokes are used—and they can be made very cheaply

WE are going to cover the mains high-tension front—thoroughly. We are going to tell you first of all how to get your high tension from D.C. mains. Later, we shall go on to A.C. mains, showing you how the unit described now can be adapted by additional gadgets.

By starting off with the needs of the D.C.-mains merchant we are being quite logical. For it so happens that the unit for D.C. serves three functions. It can be made up right away by the D.C.-mains user, who, if he goes over to A.C., can simply add a rectifier section and thus make the original unit suitable for the change-over. The A.C. man can make up this D.C. unit and add on the A.C. part to be described later. In this way we are catering for all needs without wasteful duplication of effort.

D.C. to A.C.

We want you to realise that when the mains are changed from D.C. to A.C., no alteration at all is involved in this D.C. unit. You simply add the extra components. This is all part of a well-thought-out plan of ours—so don't imagine that the A.C. version is going to be a—er—botch.

Well, let's go. How shall we start? By assuming, say, that you are on 250-volt D.C. mains. Maybe you are actually on 200, or 230, or some other quaint voltage. Never mind, the same idea follows. Just listen to this. We have got this voltage and we want to use it for the high-tension supply of the radio.

Why can't we use this voltage right away? Because it is rough, unsmoothed, varying slightly up and down—nothing much so far as electric lights and fires are concerned, but a ghastly noise when it is turned into radio power. Hum—and then some.

A simile might help. Imagine the upper reaches of the Thames, where the water flows rapidly at one part and sluggishly at another, is deep in one spot and shallow in another. Come down to, say, Boulter's Lock, and here the water is smooth and at a level depth.

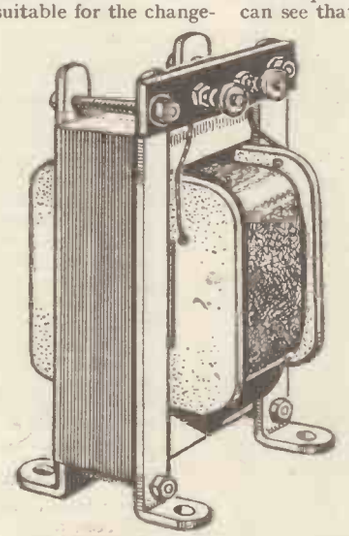
Your mains unit is rather like the lock. It smoothes out the inequalities. Gives you a steady output, free from ripples.

All very nice. But this is not a fairy story—what about that mains unit? What is there actually in a D.C.-mains unit? The most important components are *chokes* and *condensers*—which together smooth out the ripples and give us that steady and level voltage.

It is not easy to explain exactly how condensers and chokes smooth out the mains, but here is a rough-and-ready idea.

The choke coil is connected in series with the mains lead. It has the property of inductance. When a current flows through it a magnetic field is set up around the winding.

This field produces a sort of inertia to current change. So that when the current wants to rise the field tends to absorb the extra energy, whereas when the current wants to drop the field energy is thrown into the fray and so holds up the mean current. In this way you can see that a choke has a very important job in a mains unit.



The low-frequency choke complete. It can be made for as little as 6s. 9d.

Now what about the condensers? As you know, condensers have the property of *capacity*, an ability to store electrical energy as a potential. A sudden surge of current will be absorbed as an increase in potential on the plates, and likewise a sudden drop of current will be made good by stored potential energy that will then flow as current. Here, again, the tendency is for the condenser to stop any *change* in the output from the mains.

So much for the theory; in practice we arrange one or more chokes in series with each mains lead, and a smoothing condenser after the chokes—that is between positive and negative. We don't put a condenser in front of the chokes because there is already a very high capacity across them—the capacity of the mains leads, which runs into several microfarads.

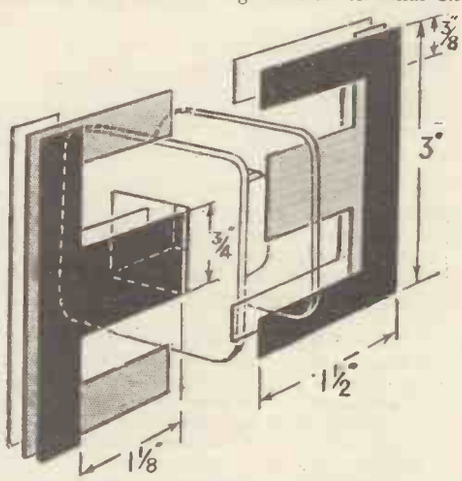
If we take two leads from the smoothing condenser the voltage across those two leads would be almost the voltage of the mains—not quite, because of losses. We will assume, for example, that you want a high-tension supply to feed your power valve.

The average small power valve needs about 150 volts at 10 milliamperes. The voltage of your mains, we assumed, is 250. The resistance of the chokes is, say, about 500 ohms.

From Ohm's Law we know that when we pass 10 milliamperes through a resistance of 500 ohms we shall drop 5 volts across that resistance. As the drop across the chokes is only very small—10 or 15 volts, at the most—we will ignore it, and assume that the voltage available at the output is actually 250 volts.

Now we really only want 150, which means that somehow or other we must dissipate 100 volts. How are we going to do it? Obviously, with resistances.

If we connect a resistance in series with the positive side of the output condenser of the mains unit and the high-tension terminal on

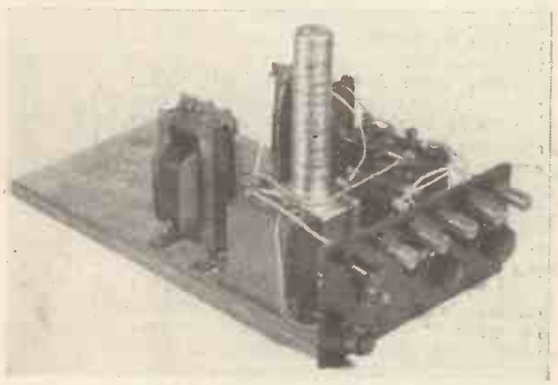


How the core laminations for the low-frequency choke are arranged

the set, the voltage will drop in accordance with Ohm's Law.

That is not very helpful if you don't yet know anything about Ohm's Law. We have already said that you want to drop 100 volts, and that the power valve takes 10 milliamperes. So we want a resistance of 10,000 ohms. Simple!

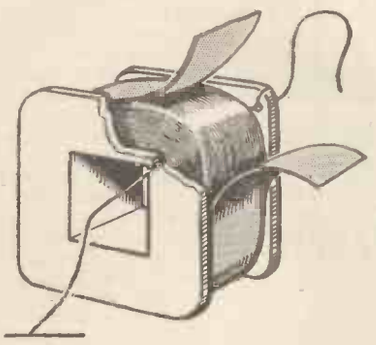
How did we know that? *By dividing the anode current of the power valve in milliamperes into the voltage to be dropped, and multiplying the answer by a thousand*—this being necessary



The completed D.C. mains unit. The space on the left is for adding A.C. gear

because one unit is being expressed in thousandths of the other.

A simple example will clear this up. Say your voltage on the mains is 200. Suppose you want 100 volts for your detector, and it takes a current of 2 milliamperes. Applying Ohm's Law—that is, dividing the voltage to be dropped; in this case, 100—by the current passed—in this case, 2 milliamperes—we get a figure of 50. Multiplying this by the 1,000, this gives us a figure of 50,000 ohms, which is the value of the dropping resistance needed under these conditions.



Bobbin with continuous winding of 10,000 turns of No.38 enamelled wire

Outputs

In the modern set you often need as many as three or four different output voltages from the power supply. You can have them all from a mains unit, so long as you arrange the right values of resistances between the positive maximum output and the various high-tension terminals on your set. Between the set end of each of these resistances and earth you must connect a 1-microfarad fixed condenser to prevent any back-coupling effects.

The series resistance method of voltage dropping works very well providing that the current flowing through each resistance is 2 milliamperes or more. If it is less, a high resistance has to be used, and it is not then a very accurate method.

Usually, you can get high tension for your screen-grid valve anode, detector anode, low-frequency anode, and power valve anode, using different values of resistance for each. But for the screen of the screen-grid valve, where only a fraction of a milliampere is flowing, you must make use of a different idea for dropping the voltage.

Power and Detector Valves

By the way, valves in the PX4 power class, wanting 200 volts or more high tension, can be run directly from the smoothed side of the choke, without any resistance at all. And for the detector voltage a variable resistance is an advantage, to vary the working voltage.

Assuming that the detector valve takes 2 milliamperes use a variable resistance of 100,000 ohms. With this you will then be able to vary the voltage from as low as 50 volts right up to the maximum—which should cover practically every working requirement.

Then about this screen-grid voltage. And for the anode voltage of anode-bend detector, which also take only a minute current. For either of these valves, 1 milliampere maximum will be ample, and we can therefore make use of a potentiometer arrangement to feed them with the required voltage.

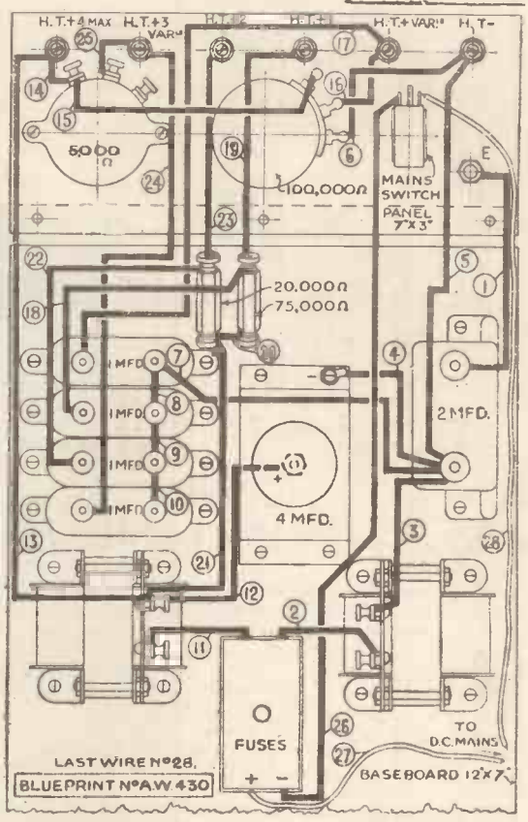
If we obtain a potentiometer with a resistance of 100,000 ohms and connect the winding across the positive and negative of the mains output, we shall obtain a constant current flow through it of 2.5 milliamperes with a 250-volt supply, and at the same time we shall be able to vary the voltage practically from zero up to the maximum.

The slider of the potentiometer is, of course, taken to the screen-grid high-tension terminal on the set. Such a tapping is also ideal for anode-bend detectors—such as are becoming very popular in television sets to-day.

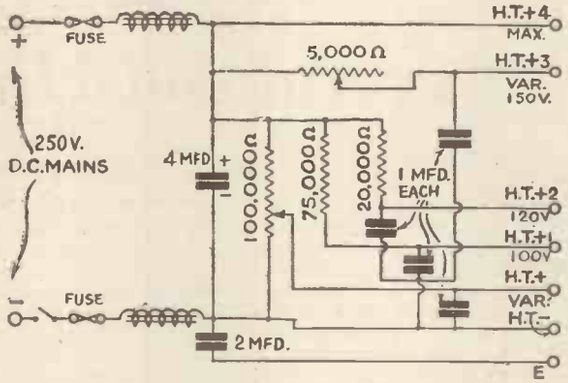
Now take our own little mains unit, the pictures of which you can see with this article. There are one or two little points we have yet to explain. There is a switch in the negative side of the mains input. This is followed by a 1-ampere fuse, one in each of the mains input leads.

Then come two 60-milliampere 30-henry chokes, which we have specially designed for this unit. The condenser is a 4-microfarad electrolytic type, which must be connected the right way round—that is, with the case earthed and the isolated spindle to the positive side of the mains.

We suggest that you find out before you use this mains unit what is the polarity of your domestic supply. Try the old dodge of sticking two leads from the mains into a large potato—the wire that sets up a discoloration is the negative. In a glass of salt water the wire that bubbles most is the negative.



If desired, a full-size blueprint can be obtained for 6d., post paid; ask for No. AW430



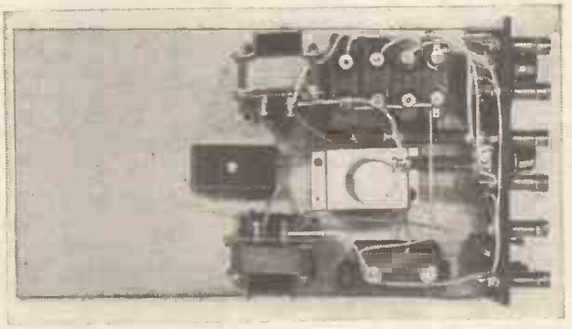
Circuit of the D.C. mains unit. Three fixed and two variable outputs are provided

Take a good look at the various illustrations and you will see how we have designed this D.C. unit. Actually, the unit gives the following outputs: H.T.+ is completely variable, H.T.+1 gives 100 volts at 2 milliamperes, H.T.+2 gives 120 volts at 6 milliamperes, H.T.+3 is variable up to 150 volts at 20 milliamperes, H.T.+4 gives the maximum output. This will be practically the voltage of your mains, and will hold good up to a maximum of 60 milliamperes anode current.

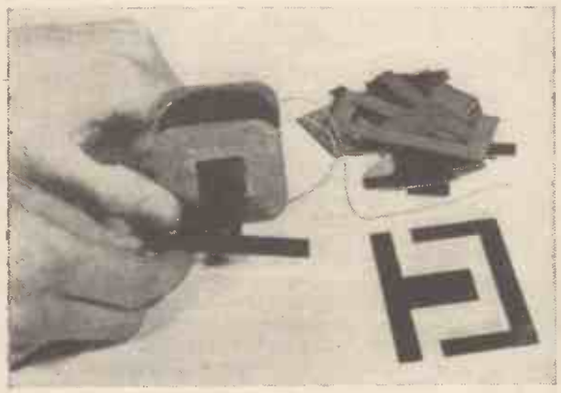
You may as well understand the significance of the voltage and current output figures. You can obtain a certain voltage output *only so long as you do not exceed the specified current.* Normally, if you go beyond this current limitation the output voltage will fall. Conversely, if the current taken from any tapping is very small the output voltage will be slightly higher than we specify.

There is just one component in the unit that

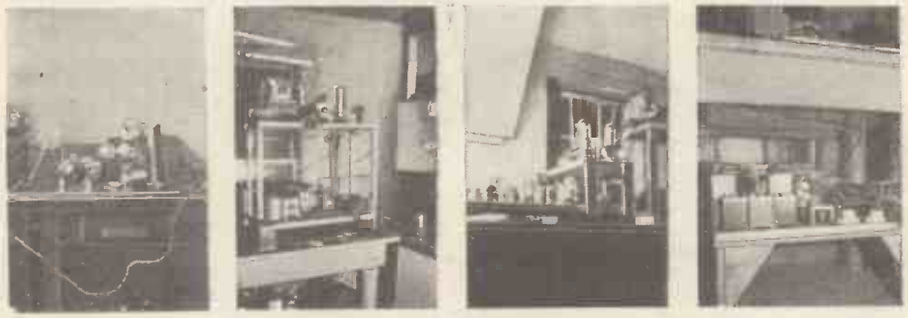
Continued on page 368



This plan view should be consulted in conjunction with wiring guide reproduced above



Inserting the iron laminations into the bobbin to build up the core



The well-equipped amateur transmitting station, W1EOP, owned by Walter Dresser, of Calais, Maine, U.S.A. From left to right the photographs show (1) the 5-metre section; (2) the 20-metre section; (3) the 85-watt modulator and (4) the 1,000-volt power supply

With the Short-wave Fans

By KENNETH JOWERS

IN response to my requests for reports from listeners in the South of England, I have had a shoal of letters all proving that Scotsmen are not the only successful short-wave fans.

One of the most interesting reports comes from S. W. Mallett, of Great Holland, Essex. He sends me an exceptionally fine log of stations, all on the 20- or 80-metre bands. A straight two-valve receiver was used.

A Fine Bag of Stations

On the 20-metre band he heard thirty-one American amateur stations, six Canadians, one from the Virgin Islands, one from Czechoslovakia, one from Finland, and one from a boat off the coast of Mexico. That's a pretty good start for a two-valve set, but there are more to come.

On the 80-metre band his log consists of six Dutchmen, twenty-two G stations, including such old friends as G6KV and G2DQ, who is heard in the most unexpected places. This log shows that the fine results achieved by our friends North of the Clyde are not due to better conditions, but perhaps, may I say, to more enthusiasm.

Speaking of Scotsmen, here is a report from a consistent listener, J. Wilson, of Newmains, who has done quite well, but not so well as a Southern listener. He reports that conditions are rather poor, particularly on the 80-metre band. However, he has logged W1BES, calling PAOASD at R6, which is quite good. VK2ME was also logged at the same strength.

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A New Station to Note

I have a new station for you to add to your list. In a letter from Strattons they tell me that their agents in Portuguese West Africa are on the air from Loboto. The call-sign is CR6AA, and the frequency is 7,177 kilocycles.

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Commercial short-wave stations often have some interesting problems to tackle. I have just received some details of how the Dutch station PHOHI was able to render some help to a Dutch lady in trouble. This station—owned by the Philips Company—received a request to send an SOS message to Venezuela on behalf of the lady, who was anxious about the welfare of her family in that country.

The difficulty was that at that time of the year it was almost impossible to receive PHOHI in Venezuela and even should it be received the percentage of Dutch-speaking people was very small, so that the possibility of contact was remote. The trouble was overcome in rather a roundabout manner.

During one of the broadcasts to the Dutch East Indies, amateur transmitters in that country were asked to get in touch with amateurs in Venezuela to try to get a message through to the lady's family.

For a long time nothing was heard, but at length PHOHI received a letter from the Dutch lady to say that the message had got through and that her family were safe and well. Once again PHOHI has been of help, but it must be remembered that without amateur assistance, it might not have been so successful. Just another example of the superiority of the short waves.

I have received a very interesting letter from W1EOP, an American amateur of Calais, Maine, U.S.A. Most of the letter consists of details of his transmitter, part of which is illustrated on this page, but there is an interesting paragraph which I am going to quote to you

Amateurs In Wartime

"I wish to pass on a thought which struck me the other day. I had been reading a European newspaper as to the danger of war, and I wondered what likelihood there would be of armed conflict if the armies were recruited from amateur transmitters.

"It would take a tremendous amount of propaganda to make me kill a citizen of any country if he could handle a transmitter. I fear that a whistled test or C.Q. would start a rally rather than a war. What do you think?"

Quite a number of letters I receive are in this strain, so I cannot help but feel that the happy relations that exist between amateurs of all nations must have some effect on the feelings of the people of the world.

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Just consider some of the more important amateur stations. A good example is the Dutch PAOASD of Amsterdam. Every amateur knows Messrs. Jacot and Porcelain, who are in daily contact with amateurs all over the world.

I have often mentioned in these columns the English station G2IZ. Here is another good example of this international friendship business. Last year, week in and week out, he maintained a daily schedule with the New Zealand station ZL4AO nearly 12,000 miles away.

Lucerne-coil Hints and Tips

By "The Experimenters"

AS our post bag has grown out of all proportions through the Lucerne coils and the sets that we have designed to embody them, we are finding some difficulty in keeping up with our correspondence. After collating a number of our letters we find that a lot of them can be answered *en bloc* by means of a short article, so here are a few hints that will be of use to some of the lucerne-coil constructors.

We have from time to time mentioned that the detector valve in any Lucerne coil set must be of a low-impedance type, such as a Cossor 210 Det, otherwise the receiver may not oscillate over the entire waveband. In spite of our settling this point there are many readers who will persist in using the R.C. type of valve in Cossor Melody Makers and sets of similar design.

To help you over this point, we have asked the various suppliers of these coils to make a slight alteration in the design, so that oscillation will be easily obtainable with high-impedance valves and a low-capacity reaction condenser.

The construction of this Lucerne-coil crystal set was fully described last week

The alteration is this: The medium-wave winding is shifted up the coil instead of being more or less in the middle as it is at present. Actually the windings should commence at approximately ¾ in. from the top of the outside former.

The idea is that you will bring the medium-wave winding closer to the reaction coil, which is on the insider former. If you are having any trouble with reaction make this slight alteration. Component variations may make this alteration advisable.

Resistance-capacity Coupling

If you want to use the Lucerne coil with a set that has the first stage resistance-capacity coupled, we suggest that you use an anode resistance of 50,000 ohms, with a maximum of 75,000 ohms.

Many who have bought the coils already wound do not go to the trouble of making the necessary adjustments to the aerial coil to obtain the correct degree of selectivity. Those who find the coils too selective should connect the wire that goes to the terminal marked A to the terminal marked GC. This will flatten the tuning a little and at the same time increase volume.

If you want an increase in selectivity, the only alternative to experimenting with the aerial coupling coil is to connect a .0003-microfarad preset condenser in series with the aerial lead-in wire and adjust the selectivity by means of this to meet your own requirements. Sometimes it is an advantage to take the aerial through the preset to the terminal marked GC on the coil, instead of to the terminal marked A.

On Your Wavelength

By Thermion

Wireless Back Answers

AN American expert claims to have invented a simple means whereby you and I can let the people in the broadcasting studio of our local station know just what we think of a particular item. By the mere pressing of a button on the receiving set we are to be able, so it is said, to discharge our radio bouquets—or bricks.

I cull this information from a lay paper and in these cases it is always a little difficult to disentangle the facts from the quaint words in which they are wrapped up. So far as I can see, though, the device would consist of a "fly-power" micro-wave transmitter incorporated in the receiving set itself. It would, I imagine, be permanently tuned to the wavelength of the local station.

The Applause Meter

BUT that is by no means all. In the studio is what we may call an applause (or the other thing) meter. Incoming impulses are received by special apparatus and the united impulses are then passed on to a reflecting galvanometer whose spot of light, moving over a scale, indicates the amount.

The idea is that at the end of a particular item the announcer will say: "Will those in favour please press button A?" Having observed the figure recorded on the scale, he then directs those against to press button B and then reads off the second figure. The people at the station then know immediately whether their listeners were pleased or not.

The only snag that I can see is that the output of all the midget transmitters would have to be absolutely standardised, for anyone with a wattage slightly on the high side would obtain several votes at once. Still, it's a great idea.

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Amazing Wireless Figures

IN the course of last year very nearly a million receiving sets were sold. When we take into consideration the fact that a large number was also built by home-constructors we find that about one listener in five stood himself a new set during the year.

The exact figures for ready-made apparatus were mains sets 523,000, battery sets 376,000, radiograms 67,000; a total of 966,000. The average price of mains sets fell from £16 in the previous year to £15.

On the other hand, the average for battery sets increased from £9 10s. 0d. in 1932 to £10 13s. 0d. in 1933. This was, of course, largely due to the increased popularity of the superheterodyne with its greater number of valves.

Battery sales totalled £4,845,000, and those of components and accessories, including valves, £3,631,000.

The grand total spent on wireless during the year was twenty-two and a half million pounds and on the production side alone no less than 75,000 people were employed in the wireless trade.

Radio is a great thing and the world owes a lot to it—in all walks of life.

Battery News Next Week!

SINCE this issue of "A.W." goes to press much earlier than usual on account of the Easter holidays I won't give the readings for the test batteries now. Next week you will be able to see how the five-bobbers have fared after a four weeks' run.

Meantime, I would just like to say something about the claims made by a reader some weeks ago for cheap batteries. If you remember, he stated that in a set requiring on the average 12 milliamperes and run for five hours a day these batteries gave him from three and a half to five months' service.

Some Service Life!

LET'S just see what these figures mean. Taking months at thirty days for simplicity's sake, they are equivalent to a service life of 105 to 150, or 525 to 750 hours. Suppose we strike an average of 600 hours and deal kindly with the current drain by assuming it to be 10 milliamperes instead of the 12 claimed. This would mean a total of 6 ampere hours from standard-capacity cells.

So far so good. Now we come to an interesting point. Every primary cell works by burning up zinc. So far as I know no better result than 1½ grams of zinc to the ampere hour has ever been obtained in practice. Very well then: for 6 ampere hours we require 9 grams of zinc at least.

BUT the weight of the average standard-capacity cell can is rather less than 9 grams, and that includes "useless" portions such as the part covered up by the top sealing and the double bit at the seam. Therefore, each cell of this amazing battery must actually have used up more zinc than it originally contained. I take off my hat to it.

Rash Service Claims

IT is a great pity that these rash claims are so often made for batteries. I know that they are made in all good faith. A parallel case is that of the man who assures you that his six-cylinder 20 horse-power car does 33 miles to the gallon. He honestly believes that it does, but he bases his assumptions on very rough and ready calculations. The only real test is to empty the tank, to put in one measured gallon and then to drive until the car stops.

So with batteries. The only test that is of value is that in which the current and the voltage are measured by precision instruments and an exact record is kept of the working hours.

You can very easily see whether your own claims will hold water if you remember (*a*) that 2 ampere hours would be an exceedingly good performance for a standard-capacity battery and (*b*) that you can find the ampere hours given by your battery if you multiply the service hours by the milliamperes expressed as decimals of an ampere. One milliamp is .001 ampere, and 10 milliamperes is .01 ampere.

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America's Midget Valves

SOME time ago I told you about the tiny valves no bigger than a flashlamp bulb which had been developed experimentally in the States for micro-wave working. Now I have news of another kind of miniature valve brought out in that country.

Curiously enough, it is of the Catkin type, the plate forming the envelope of the valve. It is, however, of tiny dimensions, simple valves measuring ⅜ inch in diameter by 1⅛ inches long over all, whilst pentodes with their greater number of bits and pieces inside are ¾ inch in diameter by 1¼ inches in length.

I believe that miniature tubes have been developed already in this country and I should not be surprised if we hear more of them in the near future. (See our exclusive news story about miniature valves on page 355—ED.)

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Grids Galore

THERE seems to be no limit nowadays to the number of grids that you can pack away inside a valve bulb. One of the latest valves—the octode—has a cathode, a plate and no less than six grids. If things go on at the present rate I foresee the coming of the triacontode with fifteen grids, fourteen plates and a heater, which will contain the entire valve outfit required for a superheterodyne including high-frequency, first detector, intermediate-frequency, second detector, automatic volume control and push-pull output stages.

In the old days of wireless, it used to be a case of:

"Come and see my new set; it's a pretty big affair with four valves."

"Oh, that's nothing. Mine's a a five-valver."

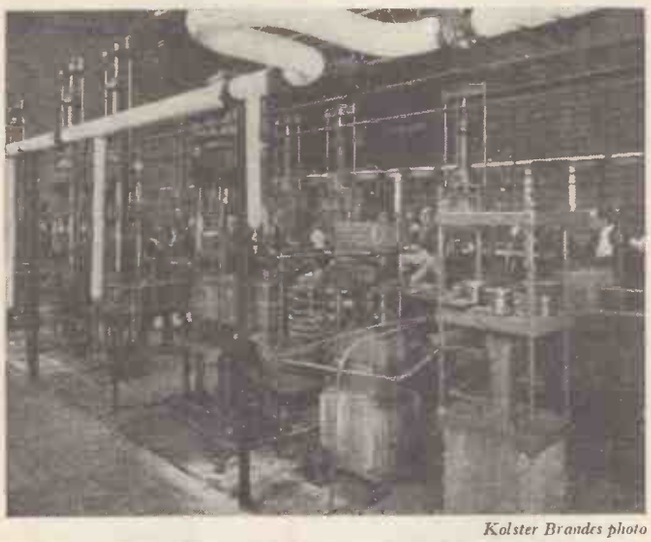
In a few years' time if the same two enthusiasts meet the conversation may run:

"My new set's good. Eleven stages and only two valves."

"A bit out of date, aren't you? I've just finished a fourteen stager with only one valve."

Stages To-day and Yesterday

EVEN to-day we whack things up a good bit in the matter of making one valve do the work of



Kolster Brandes photo

Sidelight on radio-set production—a moulding plant in one of Britain's leading wireless receiver factories

several, or in using gadgets to replace valves. For instance, I am just finishing a battery super-het which, though it contains but five valves, is a good deal more efficient than the old and tried friend scrapped to make room for it, which had no less than nine.

Here's how it works out.

The new set has a high-frequency pentode to begin with, followed by a heptode, which is both detector and oscillator in one. Then comes another pentode as I.F. amplifier followed by two Westectors, one of which is second detector, whilst the other looks after self-adjusting volume control. Only three valves so far. The last two are a driver and a class-B twin, which is of course two valves in one.

The old set had a variable-mu high-frequency valve, a screen-grid first detector, a triode oscillator, one variable-mu I.F., and separate valves for second detector and S.A.V.C. We have now got up to six. There followed a first-stage low-frequency valve and two power valves in push-pull for the output—total nine.

Think of the savings in space *and* in both low-tension and high-tension current.

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Wanted, the All-wave Set

AMERICA seems to have gone right ahead in the production of what are called all-wave receiving sets. Of course they don't really cover all waves, but they are capable of dealing efficiently with anything between about 13 and 2,000 metres.

They are big fellows of the super-het type containing as a rule from 10 to 16 valves (and that number of modern portmanteau valves really means something!). Quiet self-adjusting volume control is a feature of most of them and all have one-knob tuning.

I am quite sure that sets of this kind would be very popular in this country. I have a feeling that short-wave reception has so far failed to become as popular as it ought to have largely because of the lack of super-heterodyne receiving sets with S.A.V.C. suitable for the purpose. With the ordinary three-valve short-wave "straight" fading is a great nuisance and, as I have pointed out before, the effects of fading are intensified by a regenerative set.

Short Waves are Worth While

MOST listeners, even if they don't possess short-wave sets, can judge for themselves quite easily just how good short-wave reception can be if the most suitable apparatus is used. You have all heard the great "Round-the-World" Christmas broadcast.

The greetings from distant parts of the Empire come through clearly and well, except so far as I can remember in one case when there was a certain amount of very quick fading.

They were all picked up on first-rate short-wave sets and passed on to the B.B.C.'s network for relaying. Were receiving sets of the same kind available to listeners at reasonable prices I believe that there would very soon be a real boom in short-wave work.

Marconi photo

"Fair" treatment for a Catkin valve—its rugged construction enables you to take all sorts of liberties with it. New midget battery valves are described on page 355

It means a great deal, you know, to have half the world on tap for the mere turning of a wave-change switch and a tuning knob.

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Ridiculous Accumulators

IT is time someone protested about the absurdly small accumulators that are fitted to some battery sets nowadays. Yes, I know all about space-saving and portability and that kind of thing but what on earth's the use of making a set small and light if it means that your accumulator lasts on the average something under a week at one charge?

The worst case I have come across is that of a set whose filament battery won't give beyond four days with ordinary use. Besides being bad for the temper and the pocket of the user, this also means definitely a short life for the accumulator.

Generally speaking, in the type of accumulator used for wireless work the maximum load should be such that the battery runs at least sixty hours at one charge. Use such a small battery that it runs down in fourteen or fifteen hours and you can be pretty sure that the plates will drop to bits in a matter of months.

If only a little more commonsense had been used in the design of battery sets this season, their sales figures might well have been doubled. As it is, many manufacturers will not realise that low initial cost is not attractive unless it is combined with reasonable running costs.

Talking of portables, how do you like the idea of painting your portable some bright colour, as suggested in *Wireless Magazine* for a new set called the Spectrum? Quick-drying hard-surface paints are now available in a wide range of colours and are very easy to work on wood.

H.M.V. photo

"Scottie" does a spot of listening! Many dogs seem to have quite a penchant for listening, as this picture quaintly proves

The PENTA-QUESTER Is Coming!
See preliminary details on page 363

Radio Drama

DID you notice how cleverly the various characters of *The Seagull* were "presented" to listeners before the beginning of the play?

To a subdued background of Russian music each actor in turn came before the microphone, spoke a few words from his part, and then faded out. I thought it rather an interesting experiment, though the idea is obviously borrowed from the extracts one sees of "next week's" show at the local cinema. As a matter of fact there is plenty of room for more of this kind of technique in radio drama because, after all, when you can't actually see the actors, anything that helps to get their personality across is so much to the good.

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100 Per Cent. Modulation

A KEEN fan wants to know what exactly is meant by 100 per cent. modulation in broadcasting. The expression is perhaps a little misleading, as it certainly does not mean that the carrier wave disappears.

What does happen is that the applied signal causes the amplitude of the carrier to fluctuate between zero and double its normal value. Under these circumstances the sidebands carry 50 per cent. of the carrier power, but, since the changes in carrier current are then at a maximum, we call it 100 per cent. modulation.

Other things being equal, this gives a station the longest "reach," though the signal quality is not at its best. With 50 per cent. modulation, the total sideband power falls to one-eighth the radiated power, which usually means a shorter range but better grade reception.

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For Programme Sponsors

I HAVE always been rather surprised at the calm way in which Americans accept the advertising side of their broadcast programme service. Of course, it saves them the cost of our annual B.B.C. tax, and no doubt in time they learn to turn a deaf ear to the announcer when he is blurbing, say, Plugman's Pallid Pills for Pink People.

However, it seems that even the Americans can have too much of a good thing, for an inventor now claims to have perfected a device for automatically cutting out the reception of any publicity item. How exactly it is done is not explained, but one is left with a vague impression that either a fuse goes or the grid leak bursts immediately on the arrival of any advertising "slogan."

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A Howler

ENTERING a wireless shop from which he had recently purchased a wireless set, a man complained to the salesman that it was suffering from "anticipation."

Upon inquiring what he meant, the purchaser replied: "You know, *'an'ticipation*—when you put your 'and to the set, it 'owls."

Real-quality Series.—4

By Noel Bonavia-Hunt, M.A.

High-frequency Amplifiers for Real Quality

Photopress photo

Students at the Music Trades School, Northern Polytechnic, Holloway, busily at work on radio sets of all kinds

PROFESSOR : Last time we were together we discussed the question of the aerial and its tuned circuit, and we agreed that the highest quality results were to be obtained from a tapped aerial coil wound on a former in accordance with the older practice instead of using an iron-core inductance coil.

AMATEUR : That is so. But you never said a word about the actual former itself, its material and size, or the kind of wire recommended for the coil winding.

Dimensions for Tuning Coil

PROFESSOR : No, I didn't. As a matter of fact, we can settle these small points right away. The former can be made of Paxolin, 1½ to 3 in. in diameter, and wound with No. 28 gauge D.C.C. wire for the medium waveband.

AMATEUR : What about Litz wire?

PROFESSOR : This is more selective than D.C.C. wire, and is really the best wire of all, though rather expensive. But if you do use it, the former must not under any circumstances be less than 2 in. in diameter, and in fact a better signal strength results from a 3-in. former, which shows that the diameter of the winding is of importance.

It is safe to say that the present narrow-diameter coils lose a lot in actual signal volts, and that the iron core loses even more. That would not matter if it were possible to make up these losses by increasing the high-frequency amplification.

AMATEUR : But why can't you?

PROFESSOR : Well, you see, the amplification of high frequencies has to include unwanted as well as the wanted signals; it brings in a noisy background which upsets all our careful designs for high quality.

AMATEUR : Then it *is* possible to amplify the pure signal without including the background noises?

PROFESSOR : It would be safer to say that the ratio of unwanted to wanted signals can be reduced to a negligible point in the majority of districts under existing conditions. It is most important to encourage the signals in the first tuned circuit of the receiver, and not to rely on a big amplifying system after this stage has been passed.

AMATEUR : The ideal aerial coil, then, is a Litz-wound Paxolin former of 3 in. diameter, with a tapping at a fraction of the total number of turns from the bottom end, if so desired.

PROFESSOR : That is for the medium-wave coil. However, before pursuing this question further, we must switch on to the high-frequency amplifier. I have already made it clear that if a band-pass filter circuit is introduced, as may be necessary in unfavourable conditions, this should be worked in *after* the first valve and as part of the coupling between the high-frequency valve and the detector.

The reason for this is that we want a reasonably constant characteristic input over the tuning range before the signals are amplified by the high-frequency valve. A constant load, in other words, is much to be desired in the aerial circuit. So let us take the circuit with which we are already familiar (*see Fig.* 1), and work from this point onwards.

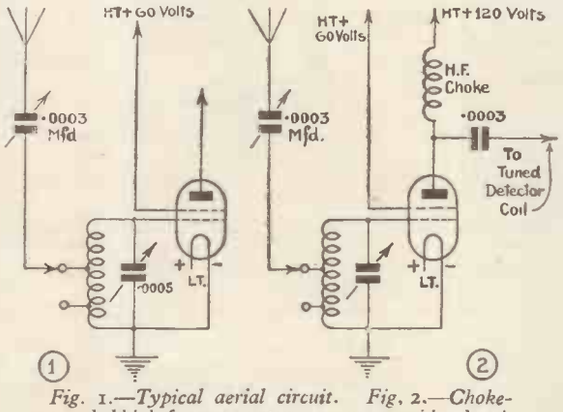


Fig. 1.—*Typical aerial circuit.* *Fig.* 2.—*Choke-coupled high-frequency stage; a screen-grid valve is used*

AMATEUR : Right you are. I take it we are to be content, for the purposes of this discussion, with a single stage of high-frequency amplification?

PROFESSOR : Yes, I think so. As I have already hinted, if the demands of selectivity insist on two stages of high frequency, it is easy enough to add the extra stage. In most cases a single stage will answer the purpose.

AMATEUR : Shall we deal with the high-frequency valve first?

PROFESSOR : Just as you please. Now the great point to notice in this connection is the lamentable fact that it is not possible in the present stage of wireless development to make anything like full use of the amplification factor of a modern screen-grid valve, owing to the necessity of screening the tuned coils.

There is naturally a limit to the size of our wireless cabinet, and we are therefore compelled to place the coils reasonably close to one another. This means screening to prevent unwanted couplings, or what is called interaction. The latter causes instability, as you know full well; so we are driven to the expedient of screening to hold the circuits down.

AMATEUR : All that is quite clear. But there is no reason why we should not choose for our high-frequency valve the one that has the best characteristics, is there?

PROFESSOR : I suppose you mean the highest amplification factor?

AMATEUR : Well yes, I do.

Importance of Impedance

PROFESSOR : Then I must warn you that this is not the criterion at all. What we have to consider is the impedance or A.C. resistance of the valve. You must remember that a valve by itself is a perfectly useless component; it can never be regarded apart from the coupling circuit with which it is associated.

Now, we have to couple our screen-grid to the detector, and coupling circuits have their limitations. For instance, it is not easy to wind a suitable coil possessing an inductance of more than 350,000 microhenries, because we have to keep the resistance down as low as possible.

The impedance of a screen-grid valve can be as high as 1,500,000 ohms, though some have the much lower impedance of 200,000 ohms. An attempt should be made to match the impedance of both valve and coil, and herein is our problem.

AMATEUR : I am afraid I don't quite understand. What coil are you referring to?

PROFESSOR : I wanted to ask you that question! The whole point is that the coil used in the anode circuit of the screen-grid valve (as in other types of valve) must bear some relation to the internal impedance of that valve. In the case of the screen-grid valve that relationship should be measurable in both ohms and microhenries. Thus, the D.C. resistance

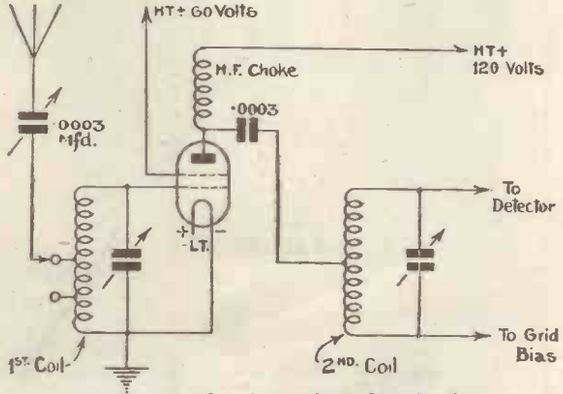


Fig. 3.—*Use of tapped tuned-grid coil*

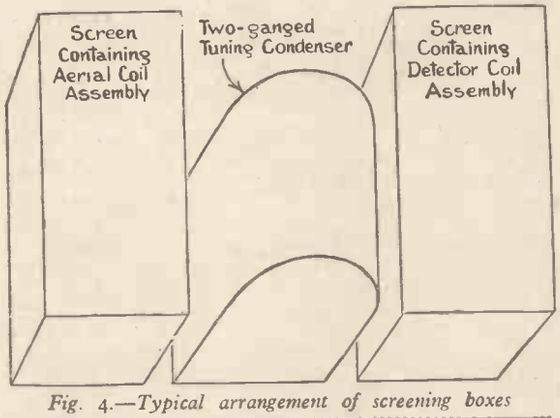


Fig. 4.—Typical arrangement of screening boxes

of the coil should not be more than a thousandth part of the A.C. resistance of the valve, while the inductance of the coil should be approximately the same in microhenries as the resistance of the valve in ohms.

If this very simple rule is carried out, we shall find that the high-frequency amplifier is capable of responding to all frequencies between, say, 23 and 10,000 cycles with ease, and further that it can do so without distortion.

AMATEUR: Very interesting, I am sure; but even now you do not make it quite clear to me what coupling you recommend between the high-frequency valve and the detector.

PROFESSOR: What I am driving at is this; there are, as you probably know, three main types of coupling adopted in modern high-frequency circuits—transformer, tuned-anode, and choke coupling. In the case of the first, it is not possible to use a sufficiently large primary winding to suit the internal impedance of a screen-grid valve; so this is ruled out.

Objections to Tuned Anode

In tuned-anode coupling the same objection applies, since the tuning varies the characteristics of the coil, which is too dreadful to think about. Also the coil has to be too small for the valve impedance, as otherwise it could not be tuned in to the medium wavelengths. This leaves us choke coupling, which fills the bill admirably.

AMATEUR: So choke coupling is necessary to good results as far as quality is concerned?

PROFESSOR: That is so. Now, as I need not tell you, with this form of coupling we use a high-frequency choke in the anode circuit of the valve, that is, between high-tension positive and the plate of the valve. Being untuned it does not vary the external load while stations are tuned in, and consequently the valve is not upset by the tuning as in the case of tuned-anode coupling.

We next place a fixed condenser between the plate of the valve and the tuned coil of the detector. The latter coil can be tapped, of course, as the aerial coil was, though, if a tapping is used, it is better to make it half way. Here is the complete circuit of the coupling (*see Fig.* 2). It is quite a well-known one.

Choke Requirements

AMATEUR: What choke should be used here?

PROFESSOR: I have already given you the requisite data for this.

AMATEUR: Oh yes; I note that most high-frequency chokes have an inductance of approximately 200,000 to 255,000 microhenries, and a resistance of from 250 to 300 ohms. So I suppose it would be easier to select a screen-grid valve to match the choke than vice versa.

PROFESSOR: I agree with you. If you choose a valve with an impedance of 200,000 to 350,000 ohms, you will be pretty safe. There are plenty of such valves in the 2-volt class as well as in the A.C. indirectly-heated class.

AMATEUR: That's that. You do not mention the capacity of the coupling condenser.

PROFESSOR: As far as quality is concerned, the value is not critical. But we may as well ensure that the circuit is as selective as possible without affecting quality, and to do this we must keep the capacity of this condenser fairly low. A very good value is .0003 microfarad, so I will mark this value in the diagram (*see Fig.* 2).

AMATEUR: What about the tuned coil in the detector circuit?

PROFESSOR: I do not suggest the use of Litz wire for this. D.C.C. wire of No. 28 gauge wound on a Paxolin former of the same diameter as that employed for the aerial coil will answer the purpose admirably. For selectivity I recommend a tapping at half way. In this diagram (*see Fig.* 3) you will see that the coupling condenser is shown connected to this tapping.

AMATEUR: Does it matter what gauge of Litz wire is used for the aerial coil?

PROFESSOR: No, not really. We can use what is called "9/40 gauge."

AMATEUR: With regard to the screen-grid valve, you have not told me whether you prefer the ordinary type to the variable-mu type.

PROFESSOR: I much prefer the fixed-mu type. It lends itself to matching the coil circuit, it consumes far less anode current, and is altogether simpler in its biasing arrangement.

AMATEUR: I presume that you are in favour of screening the tuned coils and other components that make up the high-frequency amplifier?

PROFESSOR: Screening is a necessary evil in the present stage of radio development. We have already seen that stability, which is essential to quality, can only be obtained by screening. But if a single stage of high frequency is adopted, the screening need not be so thoroughly carried out as in the case of two or more stages.

It is only necessary to screen the tuned coils and their tuning condensers. The valve can be of the metallised type, and the choke can be one of the canned type.

AMATEUR: Do you believe in the modern system of "canning" each coil separately and tuning them simultaneously by means of a gang condenser?

PROFESSOR: This is, of course, a convenient method for the set owner. As far as quality is concerned I deprecate the canning of tuned coils. In our single-stage high-frequency amplifier I should much prefer to employ a screened two-gang condenser, and to place on either side of it a separate screen box containing the aerial and detector coils respectively.

Arrangement of Screen Boxes

The size of these two screen boxes will depend on the size of the coils. The aerial coil is, as we have seen, best wound on a 3-in. former, the length of which would be about 4 in. To this must be added the long-wave coil; and as we want to avoid a break-through of the medium waves on the long, it is safest to wind the latter coil on a separate former, using a slotted bakelite former for the purpose.

This must be placed at right angles to the medium-wave coil to prevent break-through, and therefore the size of the screen box cannot be less than 6 in. by 6 in. by 4½ in. The other screen box will be a replica of the first and will contain a similar set of coils. The boxes are best made of aluminium—and earthed. (*Fig.* 4).

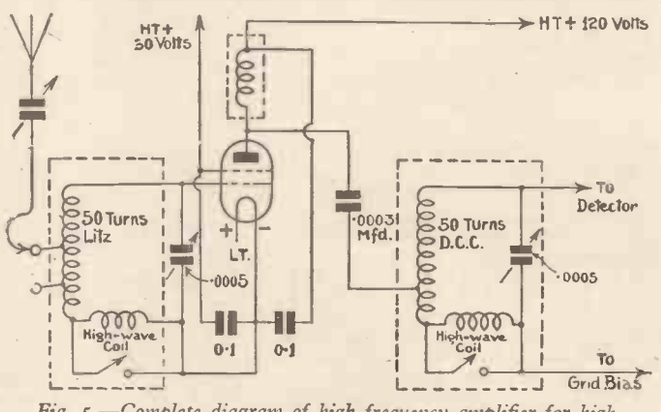


Fig. 5.—Complete diagram of high-frequency amplifier for high-quality receiver

AMATEUR: How many turns of wire do you suggest for the medium-wave coils in each case?

PROFESSOR: Fifty turns for each, the detector coil having a tapping half way, and the aerial having two taps at the twelfth and twenty-fifth turn respectively. You would only use one of these tappings after ascertaining which one suited your particular conditions best. With an indoor aerial the half tap would probably work quite well. A variable series condenser in the aerial lead will also help matters.

AMATEUR: And what about the band-pass filter?

Complete Arrangement

PROFESSOR: We will hope it is not needed. If it should be, it will take the place of the tuned detector coil, the circuit having been already given you when we had our chat about aerials. Here is the complete diagram of the proposed high-frequency amplifier which forms part of the high-quality receiver we are discussing. (*See Fig.* 5.)

The high and low tension, also grid bias, are derived from batteries, though of course, it is quite easy to substitute an A.C. mains unit.

To be continued in the next issue

Gulliland photo

Making wire-wound resistances in a Continental factory

The PENTA-QUESTER Is Coming!

We Announce Something Entirely New in Three-valvers

QUIETLY during the past two or three months our research men have been working on the design of a really "hot" three-valver. They have gone through the gamut of all the possible circuits, rejecting one after another because they were not satisfied that they had hit on the "hottest" possible three.

Really, it was not a question of hitting on the right circuit. The way our men went about the job was much too systematic to allow hit-and-miss methods to enter into the business.

Exciting Quest!

It was an exciting quest. The quest for the hottest thing in threes. Needless to say, if they had not found the right combination you would not now be reading this preliminary article.

Here we are not attempting to go into the technical details of the set. All we want to do is to draw your attention to the coming of the set—to the production in our pages of every working detail needed to make the hottest three in history.

Now don't run away with the idea that the set we are introducing to you is a tricky hotted-up affair. It is the most stable set we have yet tried out—yet it holds in hand a truly enormous reserve of power.

How has this miraculous increase in power been obtained? Quite simply by making full use of the latest developments in valve technique.

This new three is an all-pentode three.

Pentode Power All the Way!

Just think out what that means. It means pentode power for high-frequency amplification. Pentode power for detection. Pentode power for the loud-speaker stage.

Power—almost unheard-of power—all the way through, from aerial to loud-speaker.

We have called it the Penta-quester. A name derived partly from the all-pentode nature of the set. But also from the fact that this set represents at once the culmination of a quest by our technical men, and a set that will always be ready to set out on a quest in the ether.

That questing will always be an exciting and remunerative affair. In your quest for foreign stations to amuse you this new set will never let you down. It will always be ready to unleash some of its phenomenal power—no matter what demands you make upon it.

The Penta-quester represents the ultimate to date in threes. You cannot build a hotter three, no matter what circuit you try, or what components you buy.

True to its essentially modern note, the Penta-quester is a wood-chassis set. A set that has all the advantages in neatness and efficiency of the old metal-chassis set with none of the disadvantages of difficult construction.

The chassis is the heart of the set, but not the whole. Many a set in the past has been spoilt by insufficient attention to the cabinet work. That is why we say that the Penta-quester chassis, for all its circuit and constructional attractions, is not the end of the story.

We have clothed our chassis in a cabinet that strikes out into a bold new line. Great imagination has been displayed by the designers in their successful attempt to make this radio cabinet of real family appeal.

Something entirely new in tuning dials takes the centre place in this cabinet. It is a tuning dial designed like a clock face—a dial that will appeal at once to the keen constructor and to his non-technical family. More about the dial we will not say this week—but you can take it from us that it does strike a really novel note.

Modernity is exemplified in the cabinet design by the striking vertical chromium-plated bars at each side. Ornamental to a degree, they have as well a practical function in the set's operation.

These bars are ingeniously arranged so that they form a unique form of local-station aerial. In this way the cabinet set can be made entirely self-contained for reception of local and nearby stations.

Now that the Lucerne plan has worked out so well on the medium waves it behoves everyone to see that his set is worthy of the new conditions. The modern set, to do the Lucerne plan justice, *must* be selective.

The Penta-quester *is* selective—more so than the average three-valver. Its selectivity is genuine—obtained from two well-designed iron-core coils and a two-gang tuning condenser.

Points that will appeal to the technical readers include a high-frequency transformer for coupling the first two pentodes, and a differential aerial condenser for volume control.

The Penta-quester abounds in subtle technical advantages, all of which combine to make it, as we claim, the hottest three yet designed.

In view of all the controversy about the life of high-tension batteries, it is interesting to note that the Penta-quester makes use of the very latest method of ensuring maximum volume output with minimum anode current drain.

Pentode push-pull amplification is incorporated at the output stage—the latest phase of Q.P.P. and push-pull systems.

Coupling this output stage to the pentode detector is a high-ratio low-frequency transformer—another potent example of the enormous amplification gained at every point in this set.

And so we could go on, elaborating the many features that you will see for yourself when the full story is disclosed next week.

The Penta-quester is a three that more than lives up to the enviable name AMATEUR WIRELESS has earned for its "boom" sets in the past few years. It is a set that represents a great deal of hard work on the part of our research and constructional departments.

They have put all they know into making the Penta-quester an outstanding three-valver. Tests already conducted on the finished job show that they have made a startling success. The Penta-quester, on results alone, justifies your very serious attention. But when you consider its many detailed points of development you will in any case be attracted to it.

This spring we expect thousands of amateurs will go "penta-questing" for foreigners. And, judging again by our prodigious logs on test, they will not quest in vain.

Easy For the Amateur

One of the happiest aspects of the new design is the ease with which the amateur can make it up. Our working drawings will show you the way, profuse illustrations helping you to visualise the set at every stage in its construction.

For example, there will be given in our pages next week a clear working layout diagram, from which you will be able to see the simplicity of the arrangement of the components on the wooden chassis.

This will also help you to follow the wiring, which, as with all our sets, is numbered in a most convenient sequence, so that as you go along you can cross out the wires on the diagram or blueprint as they are actually made in your own set. In addition, our photographer has taken special pains to "catch" the Penta-quester from every useful angle.

These pictures, studied in conjunction with the very complete story of the set, will enable every reader to build the Penta-quester with the very minimum of trouble.

Just make a note, then, and tell your keen amateur friends—the Penta-quester is coming!

Extracts from a Preliminary Report on the Penta-quester, by Capt. E. H. Robinson:

"The set is completely stable at all wavelengths. . . . The aerial-coupling condenser works satisfactorily as a volume control. . . . The steady no-signal current is between 9 and 10 milliamperes. . . . The voltage amplification seems to be correctly proportioned, that is to say, the detector is in no circumstances overloaded before the output valve is overloaded. . . . Considering the extreme simplicity of the circuit and the small number of components used, the performance of this set is very good."

A member of the AMATEUR WIRELESS *Technical Staff at work in our Fetter Lane laboratories. Look out for full details of the Penta-quester next week*

A Chat with CLAUDE HU —Comedian

HIS FIRST CRYSTAL SET :: CRAZE FOR SHORT WAVES :: BEDSIDE

Exclusive Interview with ALAN HUNTER

CAN you imagine what a chat with Claude Hulbert is like—about any subject under the sun? If you have listened to him on the wireless with his wife Enid Trevor, or seen him acting the fool on the films, or heard him on a gramophone record—if, in a word, you have "experienced" Claude Hulbert, you can imagine just what happens when you go to chat with him.

Yes, it *is* a scream, from start to finish. Only there doesn't seem to be a start. And as for the finish that depends on you, not on Claude. He would go joyfully babbling on forever, I think. Unless dear Enid, his wife, put down her dainty little foot.

Enid Trevor has to be considered in the Hulbert *ménage*, believe me. Claude would, I imagine, be rather lost if she weren't forever there to sort him out.

Well, this is not getting on with my chat. I arrived on one of those pouring wet mornings recently at Claude Hulbert's place in West Kensington—half an hour late owing to a slight misunderstanding on the tube railway. Claude was toasting his toes with a mournful air before a huge coal fire, absent-mindedly prodding Wolf, his long-suffering Alsatian, whose huge bulk stretched negligently across the hearth rug.

Radio Star—And All That!

Claude Hulbert, radio star, film star, recording star, brother of Jack Hulbert, the also stellar-famed, greeted me with what I thought was a *wan* smile. But he was really glad to see me, only the wet weather had upset everything. Hence the slightly dejected air. Hurried consultations with Enid seemed to clear the air, metaphorically if not literally, and Claude warmed visibly.

I set the interview ball rolling. "My friend Whitaker-Wilson tells me you blurted out to him that you were a dab at set-building. Can this be true, Claude, and if so, wilt thou spill the proverbial beans?"

"Oh, yes, rather," exclaimed Claude, "I should jolly well think I *am* a radio fan.

"How did it all begin? Ah, now your asking me.

"It must have been when I was touring in Manchester—years and years ago. Why, yes, of course, it *was* in Manchester—must have been, because my very first station was the old 2ZY.

"What sort of set? Oh, yes, of course. A crystal set, you know. No, I hadn't got the craze enough then to make one. I bought it for some fabulous price—at least it seemed so at the time.

"At first I had *terrific* difficulty about the aerial—or rather lack of the aerial. Couldn't put up one, you see, I was on tour—in Manchester, too.

"Then some silly ass or other had what he thought was a brain wave. He said why not use your bedroom mattress as an aerial? This seemed dashed silly to me, but I was jolly keen to get my crystal set going, so I tried out the scheme.

"Of course I had a bit of a fight with my wife, but I persisted, and, well, I got Manchester—you can bet I was pleased with myself.

"All went well until my landlady got wind of my experiments. Then there was the most *terrific* row. She wanted to know what the devil I meant by unmaking her bed every time she made it.

"Of course, the poor old soul couldn't possibly be expected to know what it was all about. Little did she realise

H.M.V. photo

Claude Hulbert and Eve Beck making a new gramophone record to amuse you

"A.W." photo

This is the desk at which Claude Hulbert, the famous radio and film star, composes his new acts. Our photographer catches him in thoughtful mood. Actually, he was working at that moment on a new turn for the microphone

LBERT
and Radio Constructor

LABORATORY :: HIPPODROME AERIAL MAST

"A.W." photo

Claude Hulbert—radio constructor! Here he is in his wireless den, dismantling an old set ready for the next. He likes our blueprints because they are so easy to follow!

what it was all going to mean—nor did I, for that matter!"

Now comes a statement I am most delighted to be able to make. Claude, fired with his success on the crystal set, decided to read up wireless—and forthwith blued threepence on a copy of AMATEUR WIRELESS.

"It's a fact," emphasised Claude, noting perhaps my surprised look, "I bought your jolly old paper and started to mug up the game.

"What I specially liked were your *blueprints*. I knew nothing about wireless, of course, but I found I could trace out the connections quite easily with these prints. I decided that the veriest silly fool could make a set if he followed your plans—and so, er, I made a set myself.

"Yes, and you needn't laugh, I got the thing to work, too!

"You can imagine what happened after that. I built all *kinds* of sets. Went straight over from my humble crystal to a one-valver, added amplifiers, built bigger and bigger sets—and then I switched over to the short waves."

Can you imagine that, readers? Claude Hulbert a short-wave fan? Well, he was—and is still, judging by the super short-waver I saw in his rooms.

Claude Hulbert on Short Waves!

"Yes, I became in due course a short-wave *specialist*," he continued, "which means that I never went to bed at all. Enid? Oh, *she* went to bed all right. At first she said she didn't mind me mucking about as long as I didn't make too much noise.

"But that didn't last long. There was a simply terrific row. Enid said it was *disgraceful* sitting up all night making myself ill. She said she wouldn't put up with it.

"'All right, darling,' I said, 'there is only one thing to do—I must bring my short-wave set into the bedroom.' That caused another row. I tell you, I had to fight for my radio rights.

"Enid said *she* wasn't going to have the bedroom turned into a blessed workshop for *anyone*. But, well, in the end she agreed to let me try the idea—on one condition—that I kept the apparatus on my side of the bed, and that it was kept all nice and tidy.

"Well, that lasted about one night. The tidiness, I mean. Then the room began to be smothered in gadgets and wires and things. I was much too interested to bother about such trivial matters. I was preparing for a great moment in my life—the Dempsey-Tunney fight.

"My short-waver was all tuned up ready for it, but unfortunately the relay was not due until 3 a.m. in the morning. That was a snag, because my wife simply would not let me sit up and wait all that time.

"So I arranged with my sister-in-law, who was staying with us at the time, to set her alarm at 2.30 and to call me then without waking Enid. That would give me half an hour to fiddle around with the tuning, I thought.

The Fight on Two Headphones!

"Well, I got it—the fight, I mean. It came through very well indeed on two pairs of 'phones. I had one pair and my sister-in-law had half the other pair.

"The excitement was too much. I simply *had* to wake Enid. She was absolutely *furious* with me. But I made her listen with the other earphone.

"Then she got cramp and I arranged the 'phone so that she could lie down on her pillow and listen in comfort. But right in the middle of the fight she fell asleep and pulled the whole blessed set down off the table.

"That settled it. I said there was only one thing for it—we must move into a bigger house, so that I could have a room for my wireless.

"While I was busy moving some of my things my darling wife Enid paid a man ten shillings to take away all my wireless apparatus—old muck, she called it. Can you believe that?"

I could. Women are terribly tidy-minded. Wireless mess seems to drive them mad. Some of my best sets have been ruined by maids and womenfolk doing a bit of tidying up.

"Well, when I discovered what my wife had done," went on Claude, "I said 'ha, ha, now I'll have to buy all new stuff, my dear.' I took this chance to build a decent set with a screen-grid stage.

"And then I thought it would be a good idea to put up a really efficient aerial."

At this moment Claude was called away to the 'phone, and his wife, Enid Trevor, took up the tale.

"One day we came home on a wet afternoon and found one of the rooms swimming in water," she told me, "and when the landlord came to see where the leak was he found that someone had been putting his feet through the slates!"

Then Claude came back, all unsuspecting-like. "It was a good aerial," he mused, "but it took a lot of trouble to get it up. I got a long batten from the Hippodrome, where I was working at the time—I thought it would make a fine aerial mast.

"Problem was how to get it home. I eventually tied it to the car, with one end hanging over the front of the windscreen. But then I had the deuce of a job turning the car."

I will draw a veil over the journey home with that mast. Claude had us in fits describing it.

"When I got the batten home I had a ghastly job getting it up," went on Claude, "in fact in the end I decided that the only way to get it up was through the skylight. Somehow or other a lot of glass got broken, I remember."

"A.W." photo

In spite of the "rows" so frequently mentioned in this special interview, Claude Hulbert leads a life of real domestic bliss. Here you see him with his wife Enid Trevor their youngest daughter, and, of course, Wolf the dog

Settling Down to Wireless

Gradually, in their new home, the Claude Hulberts settled down to this wireless business. Claude was by then not only an experimenter but also a radio star.

His wife still suffered from the drawback of so many wives of experimenters—whenever she wanted a special item the set was being disemboweled to take a new gadget.

"Enid said the only thing to do was to buy her a set so that she could get London when she wanted it. 'Very well, darling,' I replied, 'but first we shall have to move—there is no room here for your set and mine.'

"And that's how we came here, as a matter of fact. I have noticed, by the way, that as the craze has worn off a little my wife has become more *friendly*, for some reason. Can you explain that?"

I could. I have noticed the same thing at my home. When the family eventually got its own set there was an end to all domestic troubles.

And so I found these Hulberts at peace with the world, a glorious automatic-record-changing radio-gramophone in one corner and a super short-waver in the other.

In Claude's Wireless Den

Downstairs Claude has a den crammed full of many an old set relic. Gallant "twos" and "threes" of the past had found a resting place among the home-cine junk and the children's dolls' house.

"Pity about that dolls' house," remarked Claude, "the cat has just had kittens in it."

Which is just the sort of rollicking fun that seems inseparable from Claude—the radio star known to you all, the radio constructor you probably never suspected. He's one of us!

PONG!

By VALVEMAN

The old type KL1—the first indirectly-heated cathode mains valve

"DRAT these valves! They are just as microphonic as my old detector was four or five years ago. Why can't valve makers get down to it and make a really quiet valve to suit modern sets!".

I can imagine Thermion saying this before writing his notes; and, what is more, I sympathise with him, or with any other sufferer from this annoying trouble. But there it ends, for I definitely refuse to accept the imputation that nothing has been done to effect a cure.

You all know what we mean by microphony. It is caused by the sound waves from the loud-speaker reaching a valve and setting some part of the electrode system in vibration. This vibration produces a change in the clearances between the electrodes, and hence varies the valve's internal impedance.

This variation in turn gives rise to changes in the anode current, which are passed on to the next valve, amplified, and thence reach the loud-speaker windings.

Valve-bulb Vibration

Now, if these vibrations take place at a frequency within the audible range, the loud-speaker reproduces a steady note, generally of medium pitch. This note sets up a steady train of pressure waves on the bulb of the offending valve at exactly the same frequency.

So the snowball grows, until you hear that faint "pong" building up and up in intensity; colouring the music or speech with its tone; finally bursting through and subduing everything in a glorious ringing hoot!

I said a moment ago that electrode vibration in the valve was the root of this evil. Let us be more explicit, and determine exactly what the phrase means.

The first picture which springs to mind is that of a delicate filament, quivering at every note from the loud-speaker, and resonating like a violin string under the caress of the bow. That is the traditional cause of microphony, true in fact a few years ago, and still partly responsible to-day; but the changes that have occurred in valve and receiver design have increased the importance of other modes of electrode vibration, equally difficult to deal with, and even now often troublesome.

If any confirmation of this fact is necessary, one need look no farther than mains valves, which certainly look rigid enough, yet do not escape criticism. The truth is that microphony is a relative phenomenon dependent on a number of widely varying factors, many of which are entirely outside the valve maker's control.

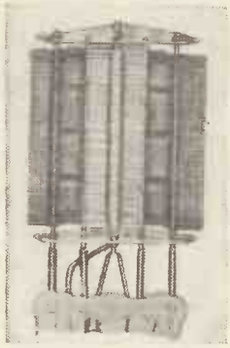
READ ABOUT MIDGET VALVES ON PAGE 355

One of the original R (bright-emitter) valves

Filament vibration depends on the unsupported length, the thickness, the stiffness, the tension, the temperature and the type of coating. Our early valves had short, straight filaments of relatively heavy wire under moderate tension, and were actually not too bad.

When the first low-current dull-emitters arrived, the trouble started, but we were still able to carry on because loud-speakers were outside the set and power output was small.

Then came the change to the V-filament, with higher slopes and smaller clearances, both factors which increase the risk of microphony. The high-slope valve will show a greater change of anode current for a given filament vibration, hence producing a greater "microphonic voltage" on the grid of the following valve. Similarly, the less the clearance between grid and filament, the more important any movement of either becomes.

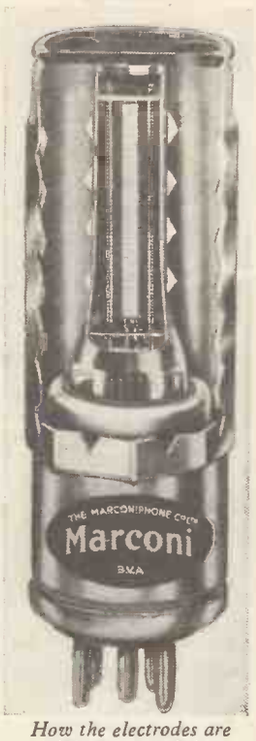


Electrode assembly of latest type of indirectly-heated mains valve. Showing rigid assembly, cross-braced anode and mica spacing pieces at top and bottom

Added to this, larger output created a demand for more power, which again stiffened the task of avoiding microphony. And when designers began to make portable sets and table models with the loud-speakers in the cabinet, no more than 6 in. from the valves themselves, valve makers had ample grounds for throwing up their hands in despair!

But of course they didn't. They set to work and produced a new construction which included better methods of springing, shorter unsupported lengths of wire, and more rigid supports.

Since then, the valve man's life has been one long struggle against increasingly severe demands, culminating in the modern set where anything up to 4 watts of energy is let loose in a box some 18 in. square by 8 in. deep; the valves are of high efficiency, in high-gain circuits, and are mounted in rigid holders placed in a row against a thin, resonant back panel.



How the electrodes are rigidly arranged in a Catkin valve

Strictly, it is not so much surprising that one does meet an occasional microphonic specimen, as that there are so few of these cases.

The result of all the work done is clearly seen by comparing old valves with the new types. Compare the general structure of the first battery types with recent productions. Clearly, the filament has long ceased to be the only important factor; to-day every electrode has to be stiffened and the whole system held rigidly together.

Mica spacers and glass beads prevent relative movement; anodes are ribbed; grid supports are much heavier; the filament itself is made of an alloy having less elasticity than tungsten, and is supported at five or seven points, with insulated hooks or mica strips.

Then mains types: Compare an old valve with a new type and see the same tale over again in a different form, culminating in the new cylindrical metal anode valve where rigidity is such that a 6-ft. drop, or even more, will not displace the electrodes by a fraction of a millimetre.

The producer of such a construction may be tempted to take a breather, but he dare not for, as surely as in the past, someone is going to design an amplifier which calls for higher gain and more output; which must be rigidly fixed within an inch of a loud-speaker diaphragm vibrating at greater amplitudes—and when he hears that first faint "pong," he is going to say "Drat these valves! They are just as microphonic as my old detectors were four or five years ago!"

What Is an Electron?

SOME remarkable facts were divulged recently by C. C. Paterson, director of the research laboratories of the General Electric Co., Ltd., in the course of a lecture to members of the Institution of Electrical Engineers.

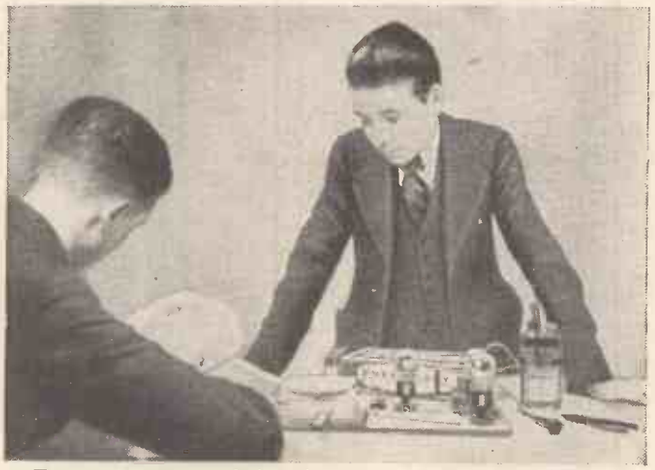
The lecturer explained that it would be erroneous to think that we understood all about the electron. To-day we know we do not understand it so well as we thought we did three or four years ago. Nevertheless, we know its speeds of travel. We know its weight as a travelling missile. We know how many there are in any given quantity of electricity and the exact number which go to form the elemental structure of every substance we know of. And we know it is only one hundred millionth of the size of the smallest particle whose shape the most powerful microscope would reveal. But there was one very disturbing enigma about the electron. We had difficulty in satisfying ourselves as to its form and substance.

We had spoken of it as if it were a minute particle, which might look like a little sphere of glass if it could be magnified up sufficiently. It was true that it sometimes or often behaved as if it were as solid and definite a particle as this. But under other conditions its behaviour was such as to make it necessary to picture it as if each electron were a minute packet or group of undulations or waves, and the puzzle was that it appeared to be entirely indifferent whether it had the particle or the wave characteristics.

Whenever the electron acted on or influenced anything else at a distance it had to be treated as a wave.

More Home-made Parts for the Schoolboy's Three

Last week PERCY W. HARRIS, M.INST.RAD.E., described the construction of a simple three-valver, most of the parts being home-made. This week he shows how still more of the components can be made at home with a few simple materials. He also explains how to add detector decoupling and substitute a transformer for the resistance-capacity low-frequency coupling



Two youngsters completing the construction of the Schoolboy's Three—a detector and two low-frequency combination

WE have had great fun with the schoolboy's set described last week. It has a fascination of its own and as soon as you have put it together you will find a number of different ways of working it.

Naturally it wants a little practice to get the best out of it—otherwise what would be the advantage of the more elaborate sets which sell for high prices?—but all the same, as you will have found by now, it works very well indeed with a little care and adjustment.

Typicel pre-set condenser. One of these can be used for reaction control

You will notice in the drawings that the aerial comes straight to the coil, which is tapped about a third of the way from the bottom, and this coupling may not suit all aerials. For example if you have a big aerial, it is a help to put a small fixed condenser in series with the aerial tapping. (Note, by the way, that the coil should have only fifty turns and not sixty-five as I indicated last week.)

This is very easily done by taking two pieces of insulated wire about a foot long each and twisting them together, joining the aerial itself to one end of one of the wires and the aerial wire of the Schoolboy's Three to the other end of the *other*.

In this way there will be no direct connection between the aerial and the set but there will be a good radio path by means of the condenser formed between the two pieces of twisted wire. Be sure that both aerial and set are not connected to the *same* wire, otherwise you will not get this condenser action.

Sharpening-up the Tuning

The effect of the small condenser will be to sharpen up the tuning and in some cases will make reaction easier. Careful adjustment of the reaction is necessary in order to get the best signals from the more distant stations (don't expect to get the *whole* of Europe,) or else you will make the set oscillate and disturb your neighbours.

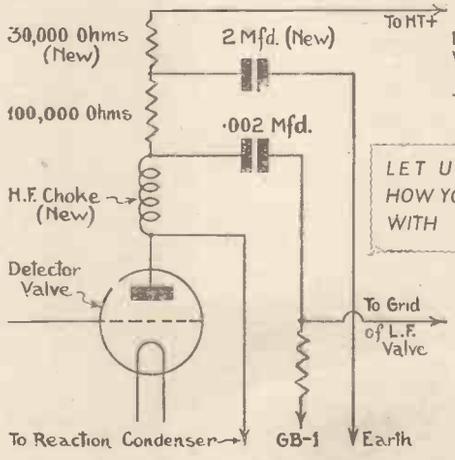
I have proportioned the windings and the capacity of the condenser so that there is a fairly constant reaction over the whole tuning range, but to get the utmost refinement here some form of accurately variable condenser is needed. Look around among your odds and ends and see if you have a .0002- or .0003-microfarad compression condenser such as is often used for inserting in the aerial lead of a set. If you haven't one you can buy one for about 9d. (they are often called pre-set condensers) and use this in place of the wooden sliding condenser I described last week.

All you have to do is to disconnect the two wires from the tinfoil on the set and connect them to the two terminals of this fresh condenser, which should be screwed down to the baseboard to hold it firmly. You will then be able to make a very accurate setting of the reaction by turning the knob of the pre-set condenser.

With regard to the variable condenser for tuning, the maximum capacity of this will depend on the space between the two tinfoil coatings, and if the wood is slightly warped or the baseboard a little irregular you may not get the maximum capacity possible with just the weight of the wood.

If therefore at the top end of the scale you find that you are not reaching high enough up in wavelength just place a rather heavy weight on top of the sliding piece of wood and then make your adjustments again. This will increase the capacity by reducing the space between the two plates and thereby will increase the tuning range.

Some readers may ask why I did not describe how to make the fixed condensers and the anode resistances, which are shown in the design as being ready made. Well, I spent a lot of time thinking about this for both the condensers and the anode resistances *can* be made at home quite conveniently but I did not want too many critical items to be home-made at first.



Adding decoupling to the detector stage of the Schoolboy's Three

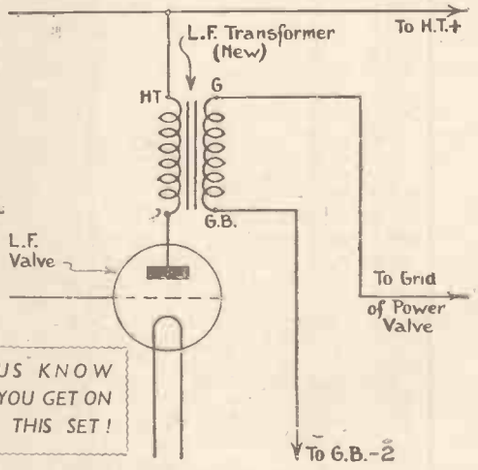
I want all readers who build this to get good results from the start without having to spend a great deal of time testing out various parts which may have gone wrong, and as all of the parts so far described are not only simply made but very unlikely to give trouble, the risks of the set not working are few.

Now that your set is working, you will, I am sure, be interested to try the substitution of home-made parts for those you have already used in manufactured form. Let us see what we can do.

Making Anode Resistances

The anode resistances can be made in the same way as the grid leaks except that you will want more sheets of paper. Take ten strips of paper the same size as those described last week for the grid leaks, soak them in Indian ink and let them dry thoroughly, then lay them on top of one another and roll them up into the tightest possible little roll, but do *not* use any adhesive anywhere.

Now with this little roll quite tight, bind it with string in the middle only, so as to prevent it unrolling, and then wrap tinfoil round the ends in just the same way as I described for the grid leaks. Make the spacing between the tinfoil about half of that for the grid leak and,



Substituting a low-frequency transformer for the resistance-capacity coupling

finally, add an extra piece of tinfoil at each end with enough projecting to enable you to make electrical contact with each end just as you did with the grid leak.

Make both of the anode resistances in the same way and attach them to a convenient part of the baseboard near the .002-microfarad fixed condensers.

Tuning in stations with the Schoolboy's Three, which is both cheap and simple to make. Full constructional details were given in last week's AMATEUR WIRELESS

When I am using manufactured anode resistances I make the values those shown, but as you will not be able to make your own accurately enough to match particular values it is just as well to make them of the same size. Substitute one (either first or second) for the manufactured resistance, and if it works satisfactorily substitute the other.

Mica-dielectric Condenser

Now the fixed condenser for a resistance amplifier of this kind must be of high quality and I do not recommend the use of anything but mica as the dielectric here. Fixed condensers could be made by interleaving pieces of metal foil and pieces of mica with the right degree of overlap, but as the various sheets of mica that you can get differ in thickness it will be very difficult to tell you exactly how to make these condensers and still have the values anywhere near the right figure.

You might try making the .0002-microfarad fixed condenser for the detector as this is not quite so important as the .002-microfarad fixed condensers used for coupling. Take two strips of tinfoil from a cigarette packet, ½ in. wide and about 2 in. long, and take a piece of wax paper ¾ in. wide and about 1½ in. long.

Lay the first piece of foil upon this wax paper so that there is an equal space each side of it (⅛ in.), but with the foil projecting from the paper at one end. Now lay another piece of wax paper on top of this and a second piece of foil projecting from the *other* and so that the overlap of the foil with the paper between it is about 1 in.

Lay a third piece of paper on top of this and a third piece of foil, this time exactly over the first piece. A fourth piece of wax paper can be now placed on top and the whole condenser so formed gripped tightly between two pieces of wood, which should be of such a size as to overlap the paper at each side so as to enable two screws to go through the wood alone and hold the whole device tight.

You will now have three pieces of foil projecting, two at one side and one at the other side.

Make the electrical connections to these just as I have described for the grid leaks, and this condenser can then take the place of the .0002-microfarad fixed condenser used before the detector valve.

Almost any odd wireless parts that you happen to have around can be worked into this set. For example, if you have a low-frequency transformer and you want to try transformer coupling, all you have to do is to take out the second anode resistance and the second .002-microfarad fixed condenser and make new connections as follows :—

Plate of the second valve to plate terminal of transformer; high-tension positive terminal of transformer to high-tension battery; grid terminal of transformer to grid of the third valve; and grid-bias terminal to the grid-bias plug of the second valve.

Decoupling the Detector

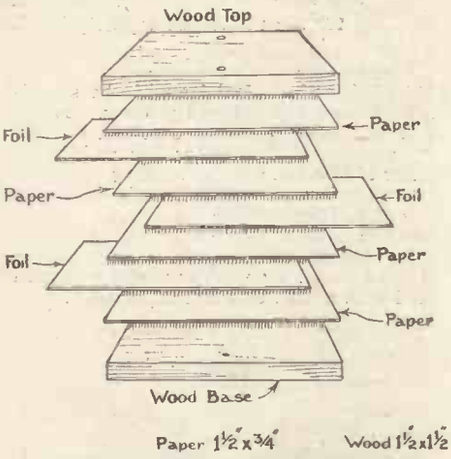
Improved results with this, as with practically all other sets, will come by decoupling the detector. To introduce decoupling into this set you want a further anode resistance with a value of about 30,000 ohms and a 2-microfarad condenser.

All you have to do, then, is to disconnect the wire going from the first anode resistance to the other and to high tension and join it to the new anode resistance, the other terminal of which is now joined as before to the high-tension positive lead and to the second resistance. At the point of junction between the two detector anode resistances, connect one terminal of the 2-microfarad condenser, the other terminal of which should be joined to earth.

Better Quality—and Louder

This change will improve the quality and enable you to get a louder signal without distortion and reaction will be further improved.

If you have an old radio-frequency choke, this can be inserted between the anode terminal of the detector valve and the first terminal of



Details for making a .0002-microfarad approximately, fixed condenser

the anode resistance. The connection to the .002-microfarad condenser should then be taken from the point of junction between the radio-frequency choke and the anode resistance, the reaction condenser being taken from the plate terminal of the valve as before.

And so you can add various parts as you desire, but you will find the set as described last week will give quite good results. If it has taught you how simple a wireless set can be, and if you have found out from it just what the various parts do, it will have served its purpose.

The ABC of Mains High Tension

Continued from page 357

has not been mentioned, the 2-microfarad fixed condenser in series with the earth terminal on the unit and the negative side of the mains. You must remove the earth connection from your set and connect it to the earth terminal on the mains unit. Leave the set's earth terminal blank.

The set is then earthed via the 2-microfarad fixed condenser, which is put in the unit to prevent a short circuit should the positive side of the mains happen to be earthed.

Adding an A.C. Rectifier

In our next article on mains working we will describe how to add the rectifier if you want to get your high tension from A.C. mains. Remember that all the existing unit will be needed, so if you like you can go ahead now. And, of course, those with D.C. mains have here a complete unit ready for use with their sets.

Although the chokes for this D.C. mains can, of course, be bought already made, you may like to tackle a little job of work for yourself. If so, the bobbins and other materials for home assembly of the chokes can be obtained from several firms advertising in this journal.

Complete kits of parts can be obtained from McDaniel & Co., Ohmic Accessories, and Peto Scott, Ltd. These kits are absolutely complete, and with them you can easily make up your own chokes as shown clearly by our diagrams this week.

You will find that the bobbin with all the wire is already wound for you. It consists of 10,000 turns of No. 38 wire. That is why we recommend you not to wind your own—it is not a job for the ordinary amateur to tackle without good experience of this sort of thing.

The only real job you have to do is to fit the laminations of iron into the bobbin. You are supplied with T and U shaped pieces—just as with that little low-frequency transformer we described a few weeks ago. These are No. 111 irons—in case by any chance you want to buy them separately.

Having put in alternate U's and T's in each side of the bobbin until the whole lamination assembly is complete, you will have only to fix the outside iron supports, feet and terminal strip to complete the construction.

COMPONENTS NEEDED FOR THE D.C. MAINS UNIT

BASEBOARD
1—12 in. by 7 in.

CHOKES, LOW-FREQUENCY
2—As described in article.

CONDENSERS, FIXED
4—1-microfarad, 250-volt D.C. peak.
1—2-microfarad, 250-volt D.C. peak.
1—4-microfarad, type electrolytic.

HOLDER, FUSE
1—Twin, complete with fuses.

PLUGS, TERMINALS, ETC.
6—Plugs and sockets, shrouded type, marked :— H.T.+, H.T.+1, H.T.+2, H.T.+3, H.T.+4, H.T.—.
1—Terminal marked "Earth."

RESISTANCES, FIXED
1—20,000-ohm.
1—75,000-ohm.

RESISTANCES, VARIABLE
1—5,000-ohm.
1—100,000-ohm.

SUNDRIES
Connecting wire and sleeving.
1—Condenser mounting bracket.
Ebonite strip, 7 in. by 3 in.

SWITCH
1—On-off toggle.

Calling the World with Half-a-million Watts

First Details of W8XO, Cincinnati, by ALAN HUNTER

HAVE you heard W8XO yet? The Cincinnati giant, as it deserves to be called, is now testing on a wavelength of 428 metres every night except Sunday, from 5 until 11 a.m. G.M.T.

Many listeners have reported reception early in the morning, one reader having logged W8XO on an ordinary portable receiver.

By far the most powerful broadcasting station at present transmitting in any part of the world, W8XO is the latest phase in the pioneer developments of the Crosley Radio Corporation of Cincinnati, U.S.A.

This organisation has been famed for many years in the States on account of WLW, "The Nation's Station" as it is justly known, a 50-kilowatt station that led the way in high-power broadcasting at a time when 5 kilowatts was considered good going.

And now comes the successor to WLW, a transmitter ten times as strong—500 *kilowatts*! W8XO aims at an enormous service area, a possible reception area with a minimum radius of 5,000 miles. This embraces the whole of the States, and, of course, the British Isles.

Next month

At present only testing, the new giant station will come regularly on the air next month. It is therefore opportune to give you a few inside facts about this amazing development in broadcasting.

At Mason, Ohio, about 22 miles north of the studios in Cincinnati, the 500-kilowatt equipment has been erected on the site of the present Crosley WLW transmitter. Overshadowing the plant is an enormous tower, 831 feet high. This consists of a new-type vertical-radiator aerial, which is already in regular use for WLW, having increased the signal strength by at least 50 per cent.

Foundations for this huge tower go down into the ground 70 feet. The steel weighs 136 tons. The total load on the base insulator is 450 tons. The tower is insulated from the ground, for it is itself the aerial. It reminds me somewhat of the Budapest aerial.

Technical features are naturally out of the ordinary. One hundred per cent. modulation, a frequency characteristic substantially flat from 30 to 10,000 cycles, low harmonic radiation, and class-B low-frequency amplification; these are just a few of the big points.

Joseph A. Chambers, technical supervisor to Crosley's, comments on the possible range of the new station. "The signal strength will be 3¼ times as strong as at present. The increase will not be noticeable where WLW is now well received, but where WLW is now only comparable to the static level listeners will get good reception *in spite of the noises*."

The main reason for putting up this 500-kilowatt giant is to further Mr. Powel Crosley's aim to serve those parts of the States not well covered by a local station.

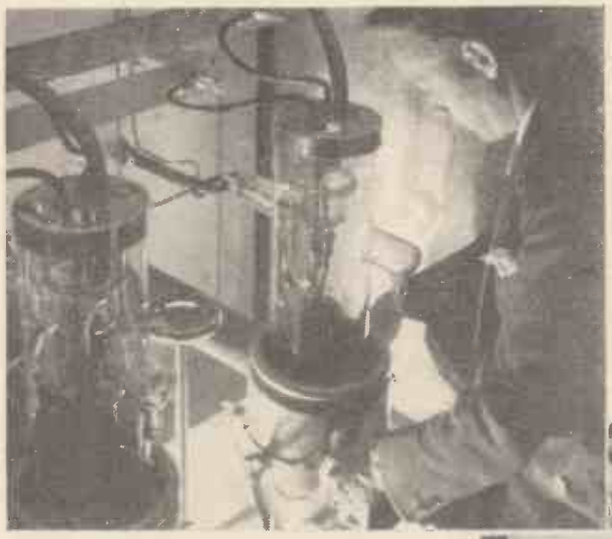
According to Barkley Schroeder, Publicity Director of Crosley's, "the reliable service area will be expanded to include a gigantic circle whose diameter is more than 5,000 miles. Mr. Crosley adds, though, that his station will have thousands of listeners *beyond* these limits. With a good set and a good location a listener should be able to hear the new WLW *anywhere in the world*."

Powel Crosley believes that the only way to wipe out static effects is to "over-ride" them with really high-power signals. He has for this reason been the champion of high-power broadcasting for many years.

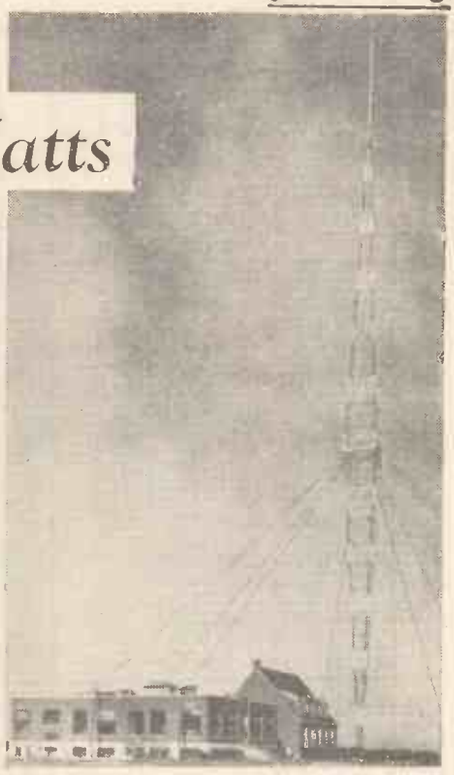
Grand Story of Progress

It is a grand story of progress that this man Crosley can tell. He started in 1922 with a 20-watt transmitter; then followed successive increases through 50 watts, 500 watts, the pioneer 5,000-watt remote-controlled station, the first 50,000-watt station, known as WLW, and now this 500,000-watt transmitter.

Will this giant upset other stations in America—even European stations? Mr. Crosley thinks not. "It has been definitely disproved over a period of years through the many power increases of WLW," he claims. "Listeners may expect all-round improvement without any sacrifice."



Joseph Chambers, technical supervisor of the Crosley stations, handling one of the twenty giant 100,000-watt water-cooled valves of W8XO at Cincinnati, U.S.A.



For the Cincinnati giant transmitter this vertical-radiator aerial has been erected. The steel mast is 831 feet high

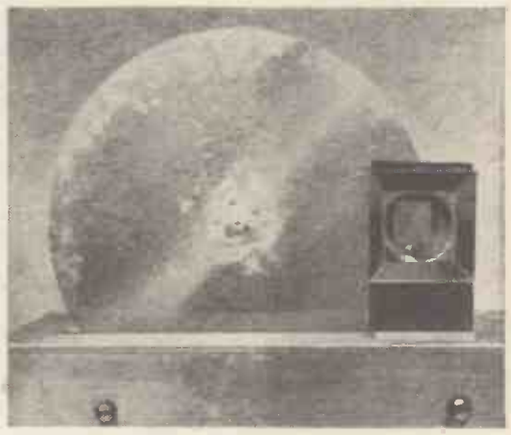
In the main transmitter hall of W8XO, the half-a-million-watt Cincinnati giant station now testing

Powel Crosley, jun., president and founder of the Crosley Radio Corporation, pressing the switch that brought W8XO on the air for the first time

AMATEUR TELEVISION — Conducted by H. CORBISHLEY

Making a Television Receiver to Suit Your Purse

By Kenneth Jowers



Front view of simple disc receiver, showing position of hooded lens

COMPONENTS NEEDED FOR DISC TELEVISION RECEIVER

CHASSIS
1—Peto-Scott to specification.

DISC
1—Peto-Scott 20-in. diameter (or Mervyn).

HOLDER, LAMP
1—China type screw-in.

HOLDER, LENS
1—Bennett double adjustable type, complete with two lenses.

MOTOR
1—Peto-Scott 6-volt type (or Saunders).

RESISTANCE, VARIABLE
1—2-ohm.
1—2,000-ohm.

SUNDRIES
1—Osram neon lamp, beehive type without resistance.
Wire and sleeving for connecting.
Aluminium strip 9 in. by 2 in.

TERMINALS
4—Belling-Lee, type B, marked: L.T.+, L.T.—. Output (two).

IN describing how to construct a simple disc television receiver I am not going to tie you down to any definite components unless it is essential. If I did so some of you might not be able to afford to build a machine; but you might be quite prepared to use cheaper parts, although knowing full well that the results would not be quite so good.

The More You Spend the Better

After reading the preliminary details last week, you will have realised that the more money you spend, up to a point, the better will be the results obtained, but even with the cheapest components fair pictures will be obtained.

The one component that you really can make at home is the wooden chassis which is only an inverted box with a slit in the top for the scanning disc. The box is made of three-ply and is of the following dimensions. Overall length, 28 in., with an outside height of 7½ in. and a width of 12 in. This chassis can be easily made even with the simplest of tools.

A point you must remember is that although you are using a 20-in. disc, you do not cut a 20-in. slit in the top of the chassis. As the disc is raised above the top the disc need only be 18 in. long and 1½ in. wide.

Having made the chassis, the next thing to do is to mount the motor. You will want for this a block of wood 3½ in. wide, 2 in. deep and about 6 in. high. Hollow out the top until you form a cradle into which the motor can rest. The spindle of the motor, when it is fitted into the cradle, should be exactly 5½ in. above the top of the chassis, so you must scoop out the cradle until it drops to this level.

A piece of aluminium 9 in. by 2 in. is then nailed to one side of the woodwork, pulled over the body of the motor and firmly secured on the other side. The fixing of the motor must be very carefully done, otherwise there may be slight movement, which would ruin the pictures.

We now come to the point where you must use your own discretion. The most expensive but at the same time the most important component in a disc machine is the motor. To obtain perfect pictures it must be capable of revolving the disc 750 times a minute and keep that speed constant. If it varies in speed (which may increase with a rise in temperature) then it is not worth having. You can pay as much as four or five guineas for a motor of this kind or, on the other hand, it is possible to obtain them for as little as 15s. I have tried a Peto-Scott motor at 30s., and a Saunders motor at three guineas and both are very satisfactory.

The next component to fit is the neon lamp and here again you have two alternatives, the standard beehive or the ½-watt indicator type. Last week we illustrated a disc receiver using an indicator type of neon. You can see from this the best method of mounting—simply a batten holder fixed horizontally on a piece of wood so that the centre of the neon anode is exactly 5 in. up from the top of the chassis.

The end of the neon bulb should be as close as possible to the face of the disc, but remember that at slow speeds the disc will wobble so that if the lamp is too close they may touch.

Set the disc running by hand, if you like, and fix the block to hold the neon as close as you can to the disc.

If you use the beehive type of neon you can either use the batten or screw type of holder. This type of lamp is mounted vertically and should be raised by means of a block until the anode is again 5 in. above the top of the chassis.

Mounting the Lens Holder

The same sort of trouble applies to the lens holder. If you use the Bennett, or any other type of double lens holder, this should be so fitted that it comes as closely as possible to the face of the disc.

When fitting the neon lamp it is advisable to apply 200 volts or so, either from batteries or mains, so that it begins to glow. Then adjust it until you can see the glow through all the holes in the scanning disc.

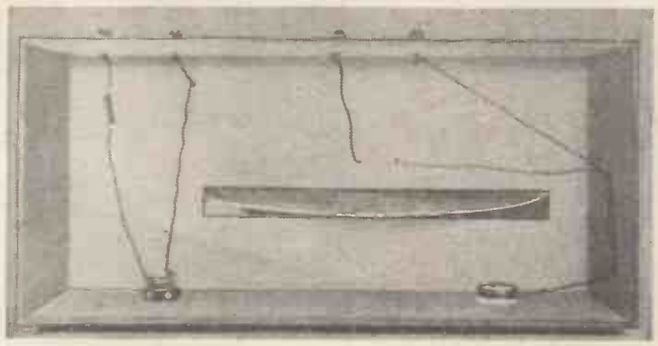
Rear view of machine, showing the neon lamp and the driving motor

If you examine these holes you will find that they are all at a different distance from the edge of the disc. The first one is approximately ½ in. from the edge, whereas the last one is a little under 1⅛ in. from the edge. Adjust the neon from side to side until you see the glow through all the holes.

Keep the neon glowing and then adjust the placing of the lenses. You should be able to see the hole nearest the edge of the disc in the top right-hand corner of the lens and the innermost hole in the bottom left-hand corner.

Now come the two variable resistances. On the right-hand side (you can see the position from the underneath view) is the 2-ohm variable resistance for controlling the speed of the motor. On the left-hand side, underneath the lenses, is a 2,000-ohm variable resistance which slightly varies the voltage applied to the neon lamp and thus controls the definition.

Except for four terminals at the back of the chassis, that is all the fixing you have to do. The two terminals marked low-tension positive and negative are fixed about 4 in. apart and fairly close to the motor. The other two terminals are for the neon-lamp connections.



Underneath view of the chassis, showing the variable resistances used for controlling the neon voltage (left) and the speed of the motor (right)

To be continued

More Favourable Wavelength Channels

By JAY COOTE

AS could be foreseen, the mere suggestion that more favourable channels could be found for broadcasters in the long-wave band was enough to prompt some of the stations to take up their new allocations without further delay.

No Flourish of Trumpets

Motala, one of the most worried of the transmitters since the change-over, is already on 1,389 metres (216 kilocycles), and Radio Paris, without any flourish of trumpets, has slipped into its new position on 1,648.3 metres (182 kilocycles), leaving the 1,796 metre wavelength to the tender care of Lahti.

No doubt it would have been better if all the new moves had been made on the same date, as to all appearances it will still take some little time before the mess is cleared up.

At time of writing I learn that when the Dutch studios exchange transmitters on April 1, Kootwijk may be found working on 1 kilocycle less than hitherto, namely, 1,886.7 metres, which doubtless will involve a corresponding alteration in the channel used by Kaunas, 1,948 metres instead of 1,935 metres.

Complicating the Question

Moscow (1), in view of Radio Paris, is also going to 1,724.1 metres. The presence of the Eiffel Tower which, for a few days, was working on almost the same channel as Motala, is still complicating the question, and it is hoped that it may be withdrawn from the long band at an earlier date than originally promised.

◆ ◆ ◆

Interference I had noticed on the Vienna transmissions lately and since confirmed by Austrian engineers is said to be caused by a Russian transmitter, but whether Archangel or Astrakhan has not yet been made clear—neither of these stations should be in that portion of the band; Murmansk is the only Soviet transmitter in that section, and is said to be working on 491.8 metres or 12 kilocycles away.

Another violent deviation is also registered in Budapest (2) which, as in the past, is operating on 840 metres. As it happens, Hungarian listeners complain of this channel, and the authorities may choose another wavelength.

◆ ◆ ◆

The increase in power of stations in neighbouring states is prompting Switzerland to place her transmitters on an equal footing, and work is to be started at once on the reconstruction of both Beromünster and Sottens to bring them respectively up to 100 and 50 kilowatts.

So far, no decision has been taken regarding Monte Ceneri. It may be recalled that Switzerland was anxious to secure a long-wave channel, but was unable to get one; increased power of her stations might act as compensation.

◆ ◆ ◆

Kaunas is a station which can be heard in London at fairly good strength as the channel is at the very top of the band and mostly clear from broadcast interference. Its power—now 7 kilowatts—is likely to be much higher by the end of this year, as the Lithuanian Government is planning the purchase of a 100- or 120- kilowatt transmitter.

Look for Memel

Whether it will be installed near Kaunas is not quite clear, as there is a question of erecting a relay at Klaipeda, on the Baltic, to work on 222.6 metres. (If you want to find Klaipeda on pre-War maps look for Memel, of which it is the native name.) Possibly if this scheme is carried out the high-power station would be installed at a site further east than its present position.

◆ ◆ ◆

No doubt you have heard of the Oberammergau Passion Play which has been regularly performed every ten years since 1634. This summer will mark its tercentenary, and to commemorate the historical event the Germans, at some date in May, propose to relay an excerpt to all their stations as well as to any other European and American transmitters who care to take it. So far, the inhabitants of the village of Oberammergau who take part in this sacred play have zealously guarded their rights and the performance was only available to actual visitors.

Running Commentary

I believe I am right in stating that although on the last occasion a very substantial sum was offered to secure the filming rights, the permission to do so was unanimously refused. However, if you cannot see it, at least you will be able to hear what it sounds like. I expect arrangements will be made for a running commentary or at least a verbal description of the event.

Sets of the Season Tested

Pye Super-het Radio Gramophone

Lawrence Wright, the music publisher, tries out the Pye model E/RG/AC super-het radiogram

IT is surprising, in view of the size of the average house, that the modern radio gramophone should be supplied in such a massive cabinet. There are exceptions to this rule, but the average radiogramophone has been rather on the large side and much too big for the normal house. It has not been until this season that any attempt has been made to introduce receivers of this kind that are comparable in size to the ordinary acoustic instruments.

Reasonable Size

One of the first radio gramophones of reasonable size that we had the opportunity of testing was the Pye E/RG/AC which used the popular five-valve super-het radio chassis. When this outfit was introduced at the popular price of twenty-six guineas it was immediately in great demand.

We have been able to give this receiver a very extensive test under average conditions, and have no hesitation in saying that it is one of the most suitable sets of its kind for use in moderate-sized houses.

This view shows the layout of all the controls on the Pye set

The cabinet, always the most striking point—at any rate for the first few weeks—is constructed of dark walnut-grained oak and is exceptionally well finished. One is immediately impressed with the size, neither too large nor too small. Manufacturers are inclined, in bringing out new models, to go from one extreme to the other when considering economy, and so produce a model which looks as if it has been made to a price. This is the last thing that can be said of the Pye model, while the design and workmanship are above reproach.

The width is about 30 in., with a depth of 16 in. and an overall height of 36 in. while it is of the horizontal type with the gramophone motor and pick-up and radio controls side by side on the top. The loud-speaker is internal, the fret being in the centre of the cabinet. Just above this is the master volume control, so that when either gramophone or radio is in use, the lid can be shut down and volume adjusted externally.

Simplicity of control has always been a feature of Pye receivers and, if anything this model is slightly better than usual in this respect. The controls are grouped consisting of a master tuner, tone corrector, combined wavechange and gramophone switch.

The tone corrector takes the form of a variable condenser and is very smooth and effective in operation. When listening to the radio it will cut out both background noises and high-pitched heterodyne whistles while for gramophone work it will reduce needle scratch from the gramophone pick-up to a very low level.

The tuning scale is calibrated in wavelengths and station names. On medium waves the waveband covered is between 196 and 558 metres and on the long waves between 900 and 2,000 metres. This means that the lower wavelength English relay stations and Radio Normandy can be obtained without trouble, while on the long waves the transmissions from Croydon are received very strongly.

We have found in the majority of receivers that the dial light is inclined to be rather unreliable and sometimes when they burn out are not too easy to replace. Although we did not have any lamp troubles during our tests we were intrigued by a novel feature which we have illustrated on this page. We refer to the dial lamp holder which consists of a metal tube 4 in. or 5 in. long with a bulb fitted in one end. This tube is held in the bracket so that it can be pushed into the tuning dial without any difficulty.

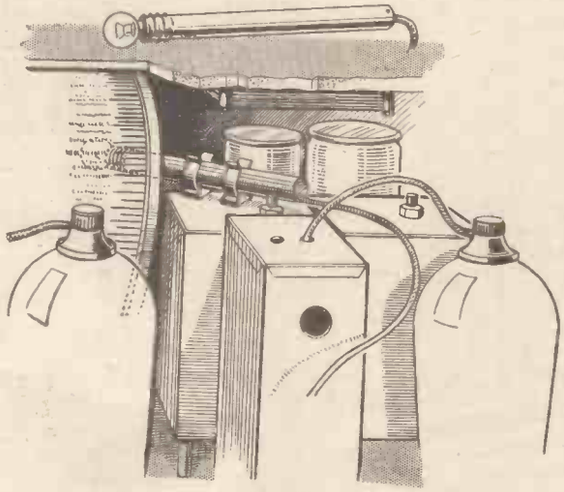
The first valve is a high-frequency amplifier followed by a high-frequency pentode as the frequency changer. The intermediate-frequency fransformers are tuned to 114 kilocycles and the third valve, the single intermediate-frequency amplifier is a steep-slope variable-mu screen-grid. For second detector and automatic volume control, a Mazda double-diode-triode is used which gives distortionless rectification. This valve is in turn coupled to an output triode by means of a parafed transformer of special design which gives partial tone correction. In their endeavour to keep quality at the highest possible level the Pye Company have used a Mazda PP3/250 triode output valve which gives approximately 2,500 milliwatts, for only 5 per cent. second harmonic distortion.

A Pye loud-speaker of the energised type with a 7-in. cone gives very level reproduction.

Mains rectification is by means of a Westinghouse metal rectifier and a distinctive feature is the almost entire freedom from mains hum. Actually on a 200-volt A.C. supply, the amount of hum in milliwatts is approximately .12.

Sensitivity is very good and, what is more, level over both wavebands. For example, at 330 metres it is 6.3 microvolts per metre, rising to 3 microvolts per metre at 500 metres. On the long waves sensitivity is approximately 10 microvolts per metre at 1,500 metres, dropping slightly to 11 microvolts at 1,755 metres.

On test with an aerial of approximately 40-ft. total length and at a distance of 30 miles from Brookmans Park the selectivity was a little better than 9 kilocycles, sufficient to separate most of the stations under the Lucerne Plan. Due to the pre-first detector high-frequency stage the range was exceptionally good, 70 stations being a normal evening's log.



The bulb lighting up the tuning scale is mounted so as to provide easy removal and adjustment

With Indoor Aerial

Even with an indoor aerial very little difference was noticed except perhaps a slight increase in background noise.

We had no difficulty in receiving several American stations at good loud-speaker strength, and, what is more, owing to the low background noise level they were well worth hearing.

With a pick-up, volume was sufficient for small parties of fifteen or twenty couples dancing, so that altogether this Pye model can be summed up as an efficient set at a reasonable figure.

IN A NUTSHELL

Makers : Pye Radio, Ltd.
Model : E/RG/AC.
Price : £27 6s. 0d.
Valve Specification : High-frequency stage, Mazda AC/SGVM, frequency-changer, Mazda AC/S2/Pen, intermediate-frequency stage, AC/SVM, second detector, double-diode,triode, Mazda AC/HL/DD triode output, Mazda PP/350.
Power Supply : A.C. mains 200-250 volts, 40-60 cycles.
Type : Super-het radio gramophone.
Remarks : An excellently designed receiver at a very low figure.

Criticisms by WHITAKER-WILSON

My Broadcasting Diary

Monday

CHARLOT, sweet Charlot, but do something about your funny lines. They taxed even Leonard Henry. My Uncle Andre has let me down a little. Feel I must tell him so. Oh, what a naughty nephew am I!

Still, there it is. Not nearly so good as I thought it would be. "Jane" out-Janed herself so much that I am afraid I said "Bother the child!" half-way through.

Tuesday

ABSOLUTELY the high-spot of the year so far as drama is concerned. *The Seagull* is one of the most intensely lovely plays I have heard thus far.

Profound respects to Barbara Burnham for her adaptation and producing. A tip-top cast.

That scene between Madame Treplov and Boris Trigorin (where she makes love to him) was a perfect piece of high-comedy acting. Tickled to death at the idea of Jeanne de Casalis making love to Val Gielgud, all the same. A word, also, for Gwendolen Evans and Ronald Simpson. Both first rate.

The length of the play was perhaps against it, but for once in a way it must be excused because of the delicious writing in it. That's the way: we grumble at long plays when we are not absolutely thrilled by them, and forgive everybody everything when we are. A fine play, finely acted.

Wednesday

WAITING for Mr. Lloyd George, I chanced upon the end of the Wireless Military Band programme, and wished I had heard more. Liked the Gerrard Williams piece immensely. Listen to this band, some of you—but you do, surely?

◆ ◆ ◆

I imagine most listeners were deeply impressed by Mr. Lloyd George's talk in the *Whither Britain?* series. He left me with something to think about. Even if he had talked at random I should have been impressed simply because he is an orator. The test always comes, though, when one reads the report in cold print. This I did, as a matter of fact, and was *still* impressed!

◆ ◆ ◆

Did a bit of dashing about to-night. Wanted to hear Adolph Busch play the Elgar violin concerto, and yet not to miss Gillie Potter in "Whither Hogsnorton." Likewise George Graves speaking that *'Ole in the Road.*

To enjoy three such differing types of broadcast needs a mental switch. I have developed one since I took up radio criticism and used it to-night.

The concerto attracted me as it always does, and I found in Busch a satisfying interpreter. Vastly different in places from any I have heard before—but then he is a very individual violinist.

Gillie amused me intensely. He got "socked" for his last broadcast by nearly all the critics, but he is now forgiven, I imagine, and restored to favour. He was very funny.

So was George!

Thursday

THE London Pavilion edition of the Old Music-Halls series very surprising and decidedly entertaining. Dear old Marie Kendal, still at it after forty years of variety work. She deserved every moment of the reception accorded her. All the best to her.

Bertha Wilmott and Tessa Deane tip-top in their contributions. Also John Rorke. Felt sorry for Denis O'Neil: he had a shocking cold, but did admirably considering.

Friday

SOME good singing to-night. Elsie Suddaby and Stuart Robertson in songs by Sir Walford Davies. Very charming, and very English.

Saturday

I HEARD only the last part of the Elgar Memorial Concert—where Astra Desmond was singing at the end of the *Dream of Gerontius*. No one supposes the *Dream* is everyone's dream, but it is one of our loveliest English choral works.

◆ ◆ ◆

In Town To-night quite sprightly to-night. What with Compton Mackenzie as well as a Piccadilly shoe-black, it was quite varied enough for anyone. This feature is now thoroughly established.

◆ ◆ ◆

The Music-Hall very good where it was good at all. On the other hand, there were no really bad turns. I enjoyed Stanelli and Edgar. They were amusing, and their clever imitation of the Boy Scouts on their fiddles was exceedingly clever. None but good violinists could bring off such things.

High-brows may object to the desecration of a serious instrument, but for vaudeville an occasional piece of good fun of this description cannot be objected to, surely?

Norman Long as trustworthy as ever. I loved his song, "I've brought you some Narcisssissis." Like the way it looks in print, too.

Roy Fox's band, of course, was excellent. None of the tunes have remained with me. I used to say I never forgot music once I heard it. Nowadays, I try to forget some of it.

Broadcast Wavelengths

This week we give details of the principal short-wavers and the European long-wave stations. Next week we shall publish a list of medium-wave transmitters.

Principal Short-wavers

Metres	Kilo-cycles	Station and Call Sign	Country
16.86	17,790	Daventry (GSG)	Great Britain
16.878	17,772	Boundbrook (W3XAL) NJ	United States
16.89	17,760	Zeesen (DJE)	Germany
19.55	15,340	Schenectady (W2XAD)	United States
19.68	15,234	Paris (Colonial) (FYA)	France
19.71	15,210	East Pittsburgh (W8XK)	United States
19.73	15,200	Zeesen (DJB)	Germany
19.82	15,140	Daventry (GSF)	Great Britain
19.84	15,120	Vatican (HVJ)	Italy
25.00	12,000	Moscow (RNE)	U.S.S.R.
25.25	11,880	Paris (FYA)	France
25.25	11,870	E. Pittsburgh (W8XK)	United States
25.28	11,865	Daventry (GSE)	Great Britain
25.32	11,840	Wayne (W2XE)	United States
25.40	11,810	Rome (2RO)	Italy
25.53	11,750	Daventry (GSD)	Great Britain
25.57	11,730	Huizen (PHI)	Holland
25.58	11,720	Middlechurch (VE9JR)	Canada
25.63	11,705	Paris (Colonial)	France
30.0	10,000	Madrid (EAQ)	Spain
31.25	9,600	Lisbon (CT1AA)	Portugal
31.26	9,590	Philadelphia (W3XAU)	United States
31.26	9,590	Sydney (VK2ME)	New South Wales
31.297	9,585	Daventry (GSC)	Great Britain
31.33	9,570	Boston (WIXAZ)	United States
31.38	9,560	Zeesen (DJA)	Germany
31.46	9,530	Schenectady (W2XAF)	United States
31.545	9,510	Daventry (GSB)	Great Britain
31.55	9,510	Caracas (YV3BC)	Venezuela
37.33	8,035	Rabat (CNR)	Morocco
38.47	7,797	Radio Nations (HBP)	Switzerland
42.92	6,880	Oslo (LCL)	Norway
43.86	6,840	Budapest (HAT2)	Hungary
45.38	6,610	Moscow (RW72)	U.S.S.R.
46.5	6,451	Barranquilla (HJIABB)	Colombia
46.66	6,425	Boundbrook (W3XL)	United States
48.86	6,140	Pittsburgh (W8XK)	United States
49.02	6,120	Wayne (W2XE)	United States
49.07	6,110	Halifax (VE9HX)	Nova Scotia
49.08	6,112	Caracas (YVIBC)	Venezuela
49.15	6,110	Chicago (W9XF)	United States
49.15	6,110	Boundbrook (W3XAL)	United States
49.19	6,095	Bowmanville (VE9GW)	Canada
49.23	6,090	St. John (NB) VE9BJ	Canada
49.31	6,080	Chicago (W9XAA)	United States
49.39	6,070	Vancouver (VE9CS)	Brit. Columbia
49.4	6,073	Skamlebaek (OXY)	Denmark
49.41	6,072	Maracaibo (YV2AM)	Venezuela
49.47	6,065	Nairobi (VQ7LO)	Kenya Colony
49.48	6,060	Byberry (W3XAV)	United States
49.48	6,060	Mason (W8XAL)	United States
49.5	6,060	La Paz (CP5)	Bolivia
49.59	6,050	Daventry (GSA)	Great Britain
49.83	6,020	Zeesen (DJC)	Germany
49.93	6,005	Montreal (VE9DR)	Canada
50.0	6,000	Moscow (RNE)	U.S.S.R.
50.26	5,969	Vatican (HVJ)	Italy

Long-wave Stations

Metres	Kilo-cycles	Station and Call Sign	Country	Power (Kw.)
1,107	271	Moscow (RCZ)	U.S.S.R.	100
1,176	255	Oslo *	Norway	60
1,224	245	Leningrad *	U.S.S.R.	100.0
1,250	240	Vienna (Exp)	Austria	3.0
1,250	240	Kalundborg	Denmark	30
1,304	230	Radio Luxembourg	Grand Duchy	200.0
1,345	223	Kharkov *	U.S.S.R.	35.0
1,389	216	Motala	Sweden	30
1,389	216	Eiffel Tower (Paris)	France	8.0
1,415	212	Warsaw *	Poland	120
1,442	208	Minsk	U.S.S.R.	35.0
1,500	200	Daventry National	Great Britain	30
1,554	193	Ankara	Turkey	7
1,570.7	191	Konigswusterhausen	Germany	60
1,613	186	Istanbul	Turkey	5.0
1,639	183	Reykjavik	Iceland	21
1,648.3	182	Radio Paris	France	50.0
1,724.1	174	Moscow (1) *	U.S.S.R.	500
1,807.2	166	Lahti *	Finland	40
1,886.7	159	Kootwijk (Huizen prog.)	Holland	50
1,886.7	159	Brasov	Roumania	20.0
1,948	154	Kaunas	Lithuania	7

* Will probably be heard testing on another wavelength after broadcasting hours.

Listeners' Letters

QUALITY APPRECIATION

To the Editor, AMATEUR WIRELESS.

PLEASE allow me to thank you for, and to congratulate you on, getting Mr. Bonavia-Hunt to contribute the articles on "Real Quality" which are appearing in AMATEUR WIRELESS.

Now that wireless has existed long enough for people to get over the first fine enthusiasm which enabled them to listen on just the "average" kind of set, I think you are performing a great service in pointing out that real quality reproduction which will maintain interest.

I hope you will get Mr. Bonavia-Hunt to give full details of the construction of a mains set for real quality, with self-adjusting volume control, of course.

Best wishes for continued success.

J. BENNETT.

Merton Park, S.W.19. [1047

A READER REPLIES

PERHAPS you will give me space to reply as the "Old Hand" to "New Reader's" letter No. 1044.

I value Thermion's opinion of me too much to trouble about "New Reader's." At the same time I might point out that I knew, and told the makers, what was the matter, but as they twice refused to believe me and returned the coils as O.K.—their expression—it became necessary to consult an independent expert, whose report they were practically bound to accept and, in fact, did so on the third return of the coils.

"OLD HAND."

S. Devon. [1048

A HINT FROM SCOTLAND

THE idea of using the same chief components such as coils, etc., for a two-, a three- and a four-valve set is one that will commend itself to your readers.

After all, it is patent to the least thoughtful that the average amateur constructor is not in a position to purchase a new set of "specified" components for every other circuit published.

With "The Experimenters" idea of interchangeability, the amateur can indulge fully in his hobby. If this policy were pursued, it would do more to encourage home construction than anything else.

It is the idea the amateur himself has tried to carry out, not too successfully, perhaps. With your guidance, he can do it.

Now you've hit on the big idea keep it going and *lead* the way in home construction.

J. DICK.

Glasgow, E.2. [1049

NEED FOR A RELAY STATION

IT is probably hoping too much to expect that the B.B.C. will bother at all about the recent pirate transmissions from Norwich. But, to my mind, it emphasises a fact which I have held in view for the last three years—namely the necessity for a relay station in the northern part of the Eastern Counties.

It is absolutely true to say that there is no English transmitter on the medium waveband that can be received without fading after dark on any but the most expensive sets; moreover, only a super-het is selective enough for this district and, believe me, I am not exaggerating when I state that, unless one owns a super-het, listening-in after about 7 p.m. is frankly impossible.

One presumes that the B.B.C. thought that the claims of the Eastern Counties were dealt with by the erection of the London Regional and Daventry National stations. Admittedly, when Droitwich is completed, the National programme will be easily receivable but, unless a station at Norwich relaying the Regional programme is provided, listeners in Norfolk and East Suffolk will have no alternative programme.

Surely, if Bournemouth is allowed a relay, Norwich should be entitled to one—the more so as a reference to the B.B.C. service area map will reveal that the greater part of Norfolk and East Suffolk are outside the service area of any station. *This state of affairs must be remedied—and very soon, too.*

J. G. DEAN.

Southwold, Suffolk. [1050

CHEAP HIGH-TENSION BATTERIES

AT the risk of trespassing on your valuable space, I venture to give the result of my test of a five-bob battery. This battery was used precisely in the same way as the standard battery I previously commented upon, and had a life of seven weeks. This, when compared with the life obtained from standard batteries, justifies at first sight Thermion's contention regarding cheap batteries but, when reduced to money value, tells a different story.

My results, reduced to a money basis, which, after all, is the final test, are :—

Standard life, say 9 weeks, cost 9s. — 1s. per week.

Five-bob life, say 7 weeks, cost 5s. — 8½d. per week.

The "five-bob" battery scores considerably on this count, and as cost, other things being equal, should be the final test, my contention that standard batteries do not give the performance claimed by the makers is justified.

In conclusion, I should like to thank you very much for your kindness in allowing me to air my views in your invaluable paper.

H. J. DUPONT.

Cimla, Neath. [1051

MORE ABOUT HIGH TENSION

I CLAIM to be an authority on this question of cheap versus higher-priced high-tension batteries. I not only speak as a user of both for test purposes, but I have a technical knowledge of the laboratory side, having been chief assistant to one of the largest concerns in the industry.

Let me put all of your "cheap battery" correspondents wise. Support Thermion in his data and advice; he is unquestionably correct, and his articles are of the highest value to your readers.

For those who desire consistent quality over a reasonable period of useful life, the 5s. battery can serve no useful purpose, and one wonders what kind of reproduction these very mean people suffer. My sympathy is with the fellow who can (through circumstances) afford no better.

Certain of your correspondents should remember Thermion writes to help, not to hinder. Certainly the remarks of your correspondent H. A. Barber are rude and portray an entire ignorance of the subject.

J. H. CLARK.

Stockton-on-Tees. [1052

MELODY RANGER RESULTS

ABOUT this time last year I built the Melody Ranger, and was very pleased with it, and I have yet to hear an all-wave four-valver to come anywhere near it.

For its type, the selectivity is marvellous; also the sensitivity even now. I have put a class-B output stage on to it, and it now surpasses all the general run of four-valvers.

This afternoon (March 15) at 5 p.m. I had W8XK, 19.72 metres, on the loud-speaker, which is a permanent-magnet moving-coil.

I have nothing but praise for this fine set, which I think is the best four you have ever published.

D. E. MORGAN.

Stafford. [1053

INFORMATION BUREAU

Will every querist please observe the following revised rules?

Please write concisely, giving essential particulars.

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

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

The designing of apparatus or receivers cannot be undertaken.

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

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

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

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

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

Notes and Jottings

THE popularity of the new Exide indicator ("battery time") cells has prompted the manufacturers to extend this range to the DXG type which, fitted with the indicating device, will be known as the DXG-C type, priced at 10s. 6d.

The indicating device consists of a pointer pivoted at one end, the tip being free to move round an arc of a circle marked in sections "Full," "Half," and "Empty." Thus at a glance the condition of the cell can be seen.

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Although many sets are fitted with dials and scales marked in wavelengths the majority of dials are marked in degrees. To the users of the last-mentioned the new Pola tuning graph will be very useful. The graph is marked in wavelengths on the verticle axis and in degrees on the horizontal axis. Any reader requiring one of these graphs should apply to Wingrove and Rogers, Ltd., of 118-9 Strand, London, W.C.2, sending 3d. in stamps.

◆ ◆ ◆

A new model of mains suppressor, known as the No. 2 unit, has been introduced by T.C.C. In certain instances of interference it has been found necessary to use larger units than the standard, which consists of two 2-microfarad condensers and fuses, while the No. 2 unit consists of two 4-microfarad condensers and fuses.

Postcard Radio Literature

Here "Observer" reviews the latest booklets and folders issued by well-known manufacturers. If you want copies of any or all of them FREE OF CHARGE, just send a postcard giving the index numbers of the catalogues required (shown at the end of each paragraph) to "Postcard Radio Literature," AMATEUR WIRELESS, 58/61 Fetter Lane, E.C.4. "Observer" will see that you get all the literature you desire. Please write your name and address in block letters.

Crystal Loud-speakers

THE Rothermel piezo-electric loud-speaker is claimed to be the greatest development in sound reproducers since 1927, when the moving-coil type was introduced. These piezo-electric models are available as single units or in combination with moving-coil energised or permanent-magnet types. Readers desiring further information about these new loud-speakers should send for the catalogue which gives full details. **153**

Ferranti Tester

THE Ferranti list No. Wa529 deals with the A.C.-D.C. circuit tester. All the normal measurements of current, voltage and resistance of a radio receiver can be made with this compact little meter. Further information can be obtained from the catalogue. **154**

Wearite Components

THE new Universal coils are included in the latest Wearite catalogue, as well as iron-core intermediate-frequency transformers and tuning coils, frame aerials, filters, variable and fixed resistances, switches for all purposes, mains chokes and transformers, and high-frequency chokes. Numerous special components, such as class-B transformers, are also included. **155**

Amateur Wireless FEE 1/-

INFORMATION BUREAU COUPON
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Saturday, April 7, 1934

ONLY FOUR FRIDAYS in APRIL!

Only four issues of "Radio Pictorial" this month! Still, they'll be four you will thoroughly enjoy reading.

★ ***Next Friday's issue April 6, contains :***

A FULL-PAGE PORTRAIT of Sir WALFORD DAVIES

Should Cup-ties be Broadcast by HUGHIE GALLACHER
(the Chelsea & Scottish International Centre forward)

The Man behind the Cafe Colette by WALFORD HYDEN

Testing new B.B.C. Talent by JOHN TRENT

The Ideal Radio Home by R. ARBIB

The Syncopation Mystery—a thriller by BERNARD BLAND

Exclusive interview with the WESTON BROS.

Etc. Etc.

A great twopennyworth!

Take a copy home on Friday—not only will you enjoy it, but the rest of the family, too !

THEN GET YOUR NEWSAGENT TO DELIVER "RADIO PICTORIAL" EVERY FRIDAY

2D

RADIO PICTORIAL

COSSOR Super heterodyne RADIO

. . . brings you every worth-while station

—remarkable absence of background noises

WITH **SIX** **COSSOR VALVES** (Incl. Rect.)

ALL-ELECTRIC MODEL 635

Cossor All-Electric Super-heterodyne Receiver complete with Six Cossor Valves, viz.: MVS/PEN met. Detector, MVS/PEN met. I.F. Amplifier, 41 MP Oscillator. Second Detector, MP/PEN Pentode Output and 442 BU Rectifier. Mains-Energised Moving Coil Loud Speaker, illuminated single dial tuning calibrated in wave-lengths (200/570 and 1,000/2,000 metres), combined volume control and on-off switch. Visual wave-band Indicator. Tone control. Mains aerial. Handsome walnut-finished cabinet 13 in. high, 18 in. wide, 11½ in. deep, with pick-up plug and socket, and sockets for extension Loud Speaker. For A.C. Mains only, 200/250 volts (adjustable), 40-100 cycles. Price **£14.14.0**

Hire Purchase Terms: 32/6 deposit and 11 monthly payments of 26/6.

Illustration shows the handsome cabinet of the All-Electric Model 635, a receiver of truly magnificent performance.

A battery-operated model is also available, the abridged specification being as follows:—

5 Valve Battery Superhet. Model 634

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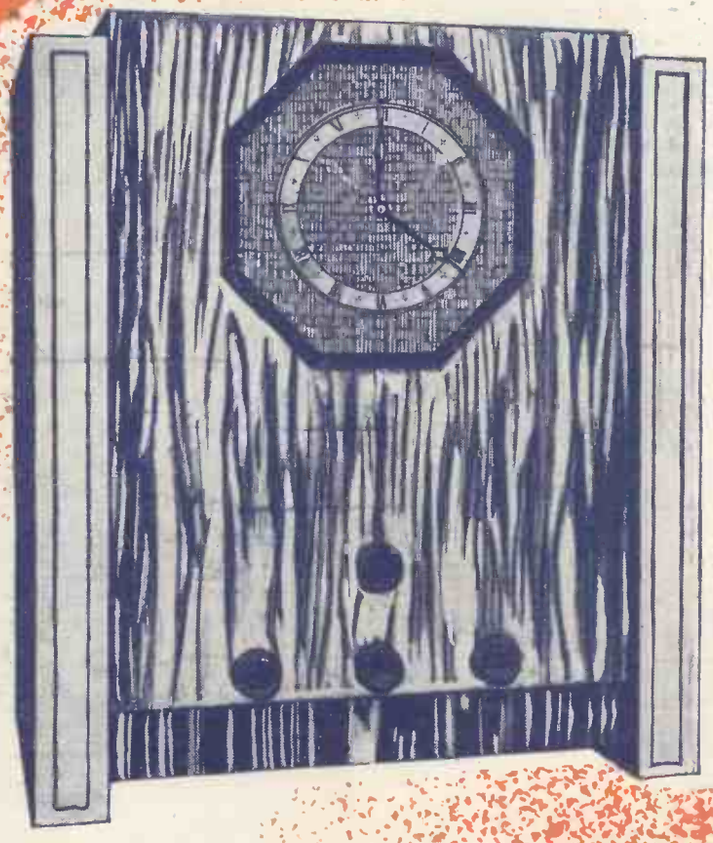

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Vol. XXIV. No. 618 APRIL 14, 1934

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News and Gossip of the Week

No Second Dance Band

LET us scotch once and for all time the persistent rumours about a second dance band at Broadcasting House.

It will not happen. The B.B.C. —rightly, we say—has decided that two permanent dance bands are quite unnecessary.

Besides, variety is the spice of life. With so many outside bands to draw upon, why should the B.B.C. tie itself down to two inside ones?

Variety Orchestra Coming

WHERE these false alarms probably started was in the idea of a new orchestra to accompany the variety turns.

That is another story. Very likely Eric Maschwitz will have his own miniature Theatre Orchestra relieving for more serious work the big Theatre Orchestra, now being rather overworked.

For Ten Years' Work

ONE of those pleasing little ceremonies for which "B.H." is noted took place the other day when S. Kneale Kelly, leader and sometimes conductor of the Theatre Orchestra, was presented with a gold watch.

This was a mark of esteem from fellow members of the orchestra on the completion of ten years with the B.B.C.

Ether Police To Meet

JUNE 12 to 20 is the period fixed for the meeting of the International Broadcasting Union in London.

These policemen of the European ether will get together for their routine assembly, discussing among other things the Lucerne and Geneva plans.

Just before the meeting Vice-Admiral Sir Charles Carpendale will make one of his rare microphone speeches by telling listeners what the I.B.U. stands for.

Great Tom Circuits

BY the end of April Big Ben will be silent and Great Tom from the south-west tower of St. Paul's will take over microphone duties for a couple of months.

Two-line circuits are being arranged for Great Tom, so that the amplifier for the bell microphone can be remotely switched from the control room at Broadcasting House.

You will like Great Tom's tone. It is quite different from Big Ben.

This Air Age

FROM the early experiments of the famous Wright brothers to the giant air liners of to-day is a relatively short span of years —yet full of incidents of daring and courage.

Lance Sieveking will dramatise this air epic on May 3, when he will present to listeners a thrilling story.

Imperial Airways will figure largely in the broadcast, as indeed they must to give a true picture of air developments in this country. A representative of the firm will give a talk either before or after the dramatisation.

Back to BB

NOW that the televisionaries are snugly at home in their special television studio at No. 16 Portland Place, the studio BB in the tower of Broadcasting House is again available for its original purpose—housing the dance band.

Henry Hall is back there with his boys. A lively little studio, its bright decorations having a cheering effect on the artists Henry is now so frequently bringing to the microphone.

Improved Children's Studio

STUDIO 3A is thus left by Henry Hall for the children's hours—it was originally built for them.

Before they move in again, though, the walls are being treated to resist sound conductivity—which was a little troublesome when Henry and the band were there.

To Feed Funny Men

MAX KESTER, whose amusing burlesques of B.B.C. activities have been such a success on gramophone records, has now joined the staff at Broadcasting House.

He will be invaluable in supplying humorous material for radio comedians, who quite naturally find it a little hard to change their acts as often as broadcasting demands.

[L.N.A. photo

Keen followers of the Quorn Hounds make good use of a portable in an interval of following the hunt

The Grisewoods

MOST of you know of Freddie Grisewood, London station announcer, and his cousin, Harman Grisewood, the announcer who appears in broadcast plays.

Now comes Peter Grisewood, young brother of Harman, acting in broadcast plays also.

Perhaps they will be known, after the manner of solicitors, as Grisewood, Grisewood *and* Grisewood.

Henry's New Pianist

NOW that Eddie Carroll has left the B.B.C. Dance Orchestra we expect most of you want to know who is Henry Hall's new pianist.

He is none other than Bert Read, who for a long time has been with Bert Ambrose—one of the most select bands in Town.

Morning Television

EUSTACE ROBB is metaphorically scratching his head. Cabaret turns that are most appropriate late at night are not very suitable for 11 a.m.

So Eustace is going to try illustrated lectures. The first will be by Shaw Desmond on Ju-Jitsu and Fencing.

First Twelve Years

THAT radio cavalcade on April 12 is going to be a hot show.

Here are some of the artists: Norman Long, Helena Millais, John Henry, Mabel Constanduros, Tommy Handley, Clapham and Dwyer, Mario de Pietro, Henry Hall, Elsie and Doris Waters, Anona Winn, Harry S. Pepper and Doris Arnold. Quite a gang!

New York Challenges the B.B.C.!

By Our Special Correspondent: LIONEL MERDLER

I HAVE just returned from a visit to the United States, where for two months I have been investigating the American broadcast system, and the conclusion I have come to is that unless British broadcasting is taken well in hand we are going to be in the same position as we were in the film industry five years ago.

In spite of the last few years of depression, American radio has been forging ahead and is now one of the most prosperous businesses in the States. The National Broadcasting Company, which has just moved into the Rockefeller Radio City, and the Columbia System between them made a profit of over £3,000,000 last year, and there is not a penny licence fee paid by a single one of the 60,000,000 listeners.

Note the tasteful decorations in this reception room at the N.B.C. headquarters in New York

Radio stars are earning £2,000 a week, and Hollywood magnates are having to keep a tight hold on their staffs to prevent their being overcome by the lure of the microphone. The radio star is made overnight: at one moment he may be unheard of—with a single broadcast he is on everyone's lips and has a fame far bigger than the greatest movie actor ever dreamed of.

The Radio Playboy

The publicity arc lights are turned full on, and from that moment the radio playboy knows little peace until, with the suddenness with which he appeared, he passes out of the public eye. Some of the older hands are playing their cards more carefully and it is these that form the backbone of the radio drive now furiously progressing in the States.

There are over six hundred transmitting stations in America, and in New York alone, with the simplest sets, there is the choice of a dozen or more programmes. The broadcasters fight to attract the attention of the listener, headed by the two giant network systems the N.B.C. and the C.B.S., which have eighty stations each, closely linked together and operating in every important town in the States.

The programmes are sponsored, chiefly by the manufacturers of national products, cigarettes, cigars, and foodstuffs. Each organisation vies with the others to produce the finest programmes, and the competition for stars is fierce. Advertising is subtly introduced and, contrary to general belief, does not detract from the entertainment value any more than advertisements do in magazines or other periodicals.

It is useless to criticise American broadcasting from this point of view, as advertisers realise that the first essential is to interest the listener and to keep his attention riveted on their station. Entertainment is the key word, and brief mention only is made of the programme sponsors. Through long experience programme directors have now learned to blend the two together and produce a harmonious creation for the listener.

No pains are spared to get the exact public requirements, as failure to do this reflects directly on the revenue obtained from the sponsors and American business men do not throw money away at times like this unless it pays them.

Broadcasting starts at 7.30 in the morning and proceeds without break until after midnight and sometimes later, Sundays included. During this time the whole amusement world is at the feet, or rather the ears, of the listener—Eddie Cantor, Rudy Vallee, Bing Crosby, the Boswell Sisters, Paul Whiteman, and other prominent American dance bands.

Anybody and everybody is dragged into the broadcast net—film stars, stage stars, politicians and national heroes: all fall under the pressure brought to bear on them in order to feed the microphone eighteen hours a day without fail. From coast to coast there is no cessation in activity.

Hundreds of thousands of letters pour into the broadcasting companies, and it is these that seal the fate of the star or bring the unknown to the public ear. The people are getting what they want and are responding by backing up what is fast becoming one of the leading industries in the States: over three million sets were sold last year, and manufacturers are looking to the future still more confidently.

With the installation of radio in their cars and in public buildings the wireless fans can follow their favourites at all hours of the day, and the radio taxi has now become firmly established on the streets. Gramophone records are scarcely tolerated as there is a demand for spontaneous programmes which cannot be withheld. One of the most ambitious ever attempted is the broadcast from the South Pole expedition of Admiral Byrd, which American listeners are following every week.

Compare this with the situation in this country. London, with a population of ten million people of wide and varied tastes, is given magnanimously a choice of two programmes, and this more often than not becomes the choice of one programme or switching off. Amongst this population, in the greatest centre of the world, are many whose occupations do not permit them to listen at the normal hours, and to these the best of radio is denied. Sunday, the best day for the listener, suffers from restricted programmes and lack of entertainment value.

The B.B.C. has been granted the extreme privilege of a monopoly of radio entertainment which, applied to any other art, could only result in stagnation. All other forms of entertainment must enter into direct competition to attract the public interest; failure to do this has only one end, financial ruin. A few years back a monopoly may have been an advantage; now it is almost a tragedy.

Stagnation Through Monopoly

Governmental control may perhaps be essential from the technical standpoint of radio, but for the entertainment side it is an almost inexcusable blunder. To monopolise art to defend it from open rivalry can have only one end—and that is stagnation.

There is no doubt as to the B.B.C. standard from the educational and classical points of view, but broadcasting is a national service, and we would not tolerate, say, a "tube" system that ran but two trains a day, even if they were the best in the world.

It is a question of having a service that entirely fills the country's needs. The professional men and those who only supplement their theatres and concerts with radio are probably satisfied, but those who rely almost entirely on their wireless sets for relaxation in their leisure hours are continually subject to programmes that are not to their taste.

The result is that the set is either left running with nobody paying any attention, or is switched off, so that even the bright spots of the evening are left unheard.

Too few of the broadcast authorities realise how big an item that ten shillings licence fee is to many listeners—and to this is coupled the expense of buying a set and keeping it in working order. There are many who can barely afford the luxury of a good wireless receiver and those who have made the sacrifice of other sources of entertainment expect to be rewarded in this home enjoyment.

Here is the "powder-puff room" at Radio City. Note the vanity tables for lady artists

The point is: are we failing to recognise the importance of radio to the British Empire, and leaving America to exploit this field just as she exploited the movie film? I fear that this is so unless some vital effort is made to lift the B.B.C. from the slough into which it is in danger of sinking.

We have not granted monopolies to the theatre, movie film, or other entertainments—theirs is a struggle for existence.

A Novel Tuning Arrangement

By J. K. PERRY, Grad.I.E.E., A.Rad.A.

In this article the author puts forward some interesting suggestions regarding tuning circuits. Many AMATEUR WIRELESS readers will be keen to try these ideas out for themselves experimentally and we shall be glad to hear how they get on with the suggested arrangements

IT is the object of this article to describe a type of tuning circuit which has been designed by the author primarily for combatting all types of interference, but which proves itself practically to be of great value in problems of selectivity. Another advantage which it possesses is that reaction may be applied to any such tuned circuit without involving the use of a reaction winding, the tuning inductance being thereby made less complicated as might be imagined.

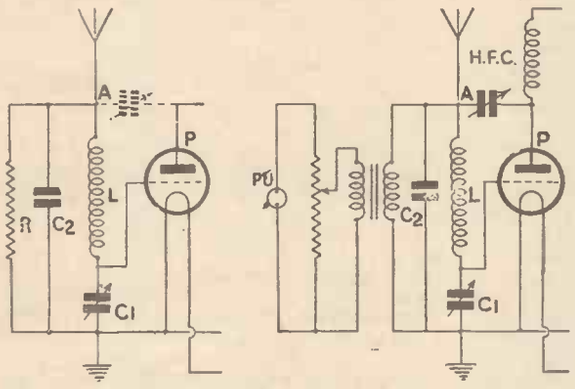


Fig. 3 (left).—High-frequency amplifying and detecting circuit. Fig. 4 (right).—Use of aerial-tuning circuit as scratch filter when pick-up is used

The majority of circuits to-day employ parallel tuning, that is the tuning condenser is in parallel with the tuning inductance. This also applies to the various band-pass tuning arrangements as well as "straight" circuits. Some of us will, however, remember the series-tuned circuit shown in Fig. 1.

When this circuit is tuned to a signal, the resonant voltages produced by that signal are similar both across the capacity of the circuit and the inductance; this is obviously so in the case of parallel tuning. Therefore, on the face of it, if we altered the circuit to that of Fig. 2, we should according to the previous statement be able to obtain results.

Resonant Voltage

They would be disappointing, however, for this reason: between the aerial and earth a certain capacity obtains, which, in effect, completes the high-frequency circuit. The majority of the resonant voltage would occur across this capacity and very little across the actual tuning condenser, therefore signals would be very weak indeed. This effect is, of course, of little importance in parallel tuning.

However, after some experimenting with circuits of this type the author found that the circuit shown in Fig. 3 would work quite well for high-frequency amplification or for detection. The introduction of the condenser C2 into the circuit causes a higher percentage of the resonant voltage to obtain across the tuning condenser C1.

A by-pass grid condenser and leak could be used if desired for detection, but the arrangement in Fig. 3 seems to work just as well. The grid of the valve would be insulated from earth but for the fact that the resistance R is inserted between aerial and earth. This fact makes for ease in applying bias to the grid for any particular purpose, as in the case of a variable-mu valve. In the case of a detector circuit the resistance R serves as a grid leak although of considerably lower value.

Now comes an important point concerning the circuit. It so happens that the impulses at P, the plate of the valve, are similar in phase to those at A. At first, this may not seem of any great importance, but it means that it is possible to apply reaction to the circuit merely by inserting a small variable condenser between A and P.

As was stated at the commencement of this article; there is therefore no need for a reaction winding, and although reaction may be applied magnetically if it is so desired, the former method is superior.

Now that we have the complete circuit, we may examine its working theoretically. Taking the case of a signal out of tune; this signal would find the inductance L acting as a kind of buffer to it, but would be able to dissipate itself to earth via the fixed condenser C_2. In consequence of this, very little signal voltage indeed would be built up across the tuning condenser C_1.

On the other hand, a signal in tune with the circuit would not only build up a comparatively high voltage across C_1, but the signal itself would be augmented by reaction impulses from P. The circuit would therefore appear to be very selective theoretically and it really behaves so in practice.

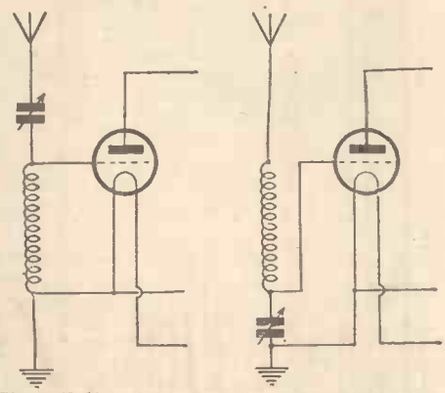


Fig. 1 (left).—Series-tuned aerial circuit. Fig. 2 (right).—Alternative tuning circuit

As regards values of components; for the fixed condenser C_2, .001-microfarad is a good average value, the tuning coils and condensers are normal, the reaction condenser about .0002—.0003 microfarad, the resistance R is, however, only 2,000 ohms (approximately). This latter resistance may be replaced by an iron-core choke if it is so desired, and if a pick-up were being used it could be connected as shown in Fig. 4; the inductance and condensers would then act as a scratch filter.

It would then merely be necessary to disconnect the aerial in order to play records, or alternatively, a record could be superimposed on a radio programme.

It will be noticed that reaction may be easily applied in any high-frequency circuit from the plate of the high-frequency valve itself; this is very useful in making a high-frequency valve do its utmost in a circuit employing a Westector.

Extra Tuning Capacity

One other point which might be mentioned is that it is often advisable to connect a small fixed condenser, of say .0001 microfarad, across the tuning condenser, as if the capacity between grid and earth is too low, as when the tuning condenser is at its minimum value, then reaction becomes difficult.

The foregoing is but a brief introduction to something different in tuning arrangements, and which may prove useful in spite of or even because of the now very popular super-het. The final diagram, Fig. 5, shows the complete circuit together with component values, of a four-valve set (screen-grid, detector, low-frequency and power) which the author is at present using as a domestic receiver, actually as a radiogram, employing this circuit.

The high-frequency stage is appropriately screened, the tuning condensers are not ganged and the tuning inductances are each made from three honeycomb plug-in coils suitably switched. The wavelength band covered by a .0005 microfarad condenser is somewhat narrower with this method than with parallel tuning, hence the use of three wave-change positions.

The set gives very good results and is very selective even on a large outdoor aerial.

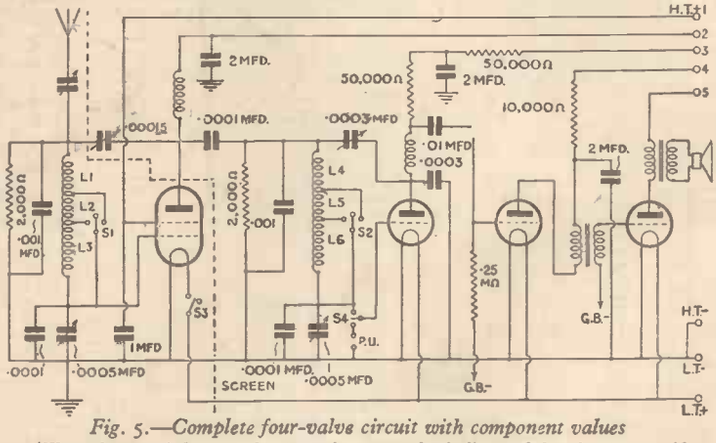


Fig. 5.—Complete four-valve circuit with component values

(Wave-change switches, S_1 and S_2; S_3 and S_4 are mechanically coupled so that screen-grid filament is off when pick-up is in use; L_1, L_2, L_4 and L_5 are 50-turn honeycomb coils; and L_3 and L_6 are each of 200 turns)

This interesting photograph shows the small size of a metal rectifier for high-frequency rectification

New Metal Rectifiers Simplify Design

Great interest is being taken in the possibility of a new type of metal rectifier for high-frequency rectification. Here J. H. REYNER, B.Sc., A.M.I.E.E., shows how the new device can be used in practical circuits.

A YEAR AGO radio designers were startled by the introduction of the metal detector for radio-frequency work. This unit, which was known as the Westector, has become very popular in certain types of set, but hitherto its application has been limited because it was not suitable for the higher radio frequencies above about 200 kilocycles.

The Westinghouse people have recently announced a new type of Westector, known as the WX series, in which some of the difficulties have been overcome. The principal trouble is due to the self-capacity of the rectifier, which absorbs energy from the tuned circuit across which the rectifier is connected during the periods when no rectification is taking place—that is, every alternate half wave.

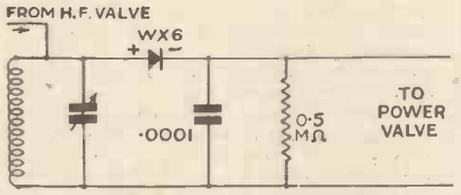


Fig. 1.—Simple rectifying circuit using the new metal rectifier

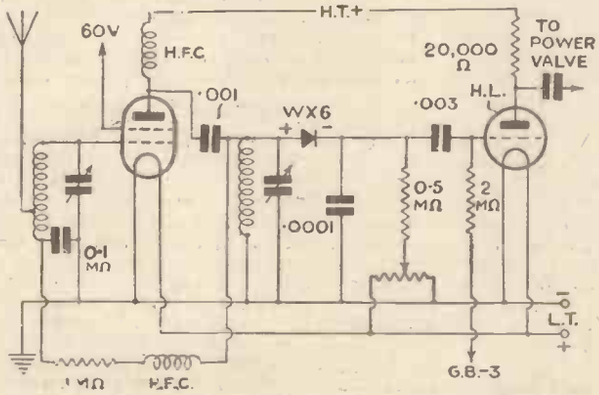


Fig. 2.—Biased rectifier with resistance-capacity coupling for low-frequency amplification

This energy loss is quite marked, and the result is that the signal strength is nothing like as good as it should be.

The new WX series has an appreciably smaller self-capacity than the earlier types, so that the absorption of energy does not become serious until a considerably higher frequency is reached. Actually it is claimed that the new type is satisfactory up to frequencies of 1,500 kilocycles (200 metres), and my tests indicate that it is certainly capable of use at such high frequencies, although it is still not ideal.

Whereas a rectifier of the ordinary W type will give practically no signals at 200 metres, due to the very heavy capacity loss, the WX type will operate quite well, particularly if the rectifier is tapped a little way down the tuning coil or some alternative connection is adopted to minimise the damping.

The results are still not up to those obtained with a diode, but there is no doubt that a considerable advance has been made.

Fig. 1 shows a simple rectifying circuit using the new WX6. This is a circuit which will appeal to quality listeners who are interested in really good reproduction from the local stations.

This circuit requires a fairly strong signal of the order of 3 to 5 volts to operate it successfully, so that it should be applied after one or more high-frequency stages. The circuit, of course, gives no amplification, and therefore must be fed into a sensitive output valve like a 220HPT or an AC2Pen, requiring only 3 volts to fill it.

Alternatively a stage of low-frequency amplification may be added. This can be a simple resistance-coupled stage giving quite a low step-up.

Where more sensitive results are required it is desirable to bias the rectifier because it does not operate efficiently with very small voltages. The optimum bias is just under 1.5 volts. Fig. 2 shows a circuit using this arrangement and also including a resistance-coupled low-frequency stage.

As an additional refinement the voltage developed across the detector resistance is used for developing self-adjusting volume control and is therefore fed back to the high-frequency valve. The somewhat unusual method of feeding the self-adjusting volume control line is adopted to avoid the steady polarising voltage on the detector from affecting the low-frequency valve. Otherwise this valve receives 1.5 volts bias which usually reduces the gain considerably.

The simple circuit shown has no delay thereon so that the self-adjusting volume control will come into operation at once. It is possible to avoid this by the use of two rectifiers, but the scheme shown will operate quite satisfactorily.

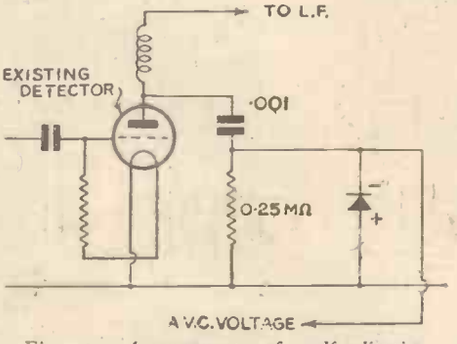


Fig. 3.—Arrangement of self-adjusting volume control

Another self-adjusting volume control arrangement which has been used with existing receivers to quite an extent is that shown in Fig. 3. Here the high-frequency current in the anode circuit of the detector valve, which is normally by-passed to earth, is routed through a rectifier and caused to develop a D.C. voltage.

The effectiveness of this depends upon the efficiency of the rectifier, so that with the older W type of rectifier the self-adjusting volume control produced was relatively insensitive. With the new WX type quite a considerable voltage can be developed, 1 volt applied to the detector giving approximately 10 to 15 volts automatic volume control.

An Essential Point

The actual value depends upon the effectiveness with which the circuit itself is arranged. The essential point is to make sure that the high-frequency component of the rectified current in the anode circuit of the detector is reasonably large and that as much of it as possible is routed through the rectifier.

Fig. 4 shows a method of doubling the self-adjusting volume control voltage obtained by using two WX type rectifiers in series. This is a variant of the well-known voltage-doubling arrangement used in high-tension units, and is often useful.

Less Voltage on Shorter Waves

It should be noted that even with the new type of rectifier the efficiency is not constant over the tuning range, so that the self-adjusting volume control will tend to be less effective on the shorter wavelengths. This, however, is a disadvantage which we must be prepared to tolerate for the time being.

No doubt further improvements will continue to be made in this form of rectifier, till we obtain an efficiency approaching that of the diode over the whole broadcast range of wavelengths.

The WX6 does not constitute any improvement over the older type as far as superhet receivers are concerned, except for those more modern types which are using intermediate frequencies of between 400 and 500 kilocycles, and here it will doubtless find distinct application.

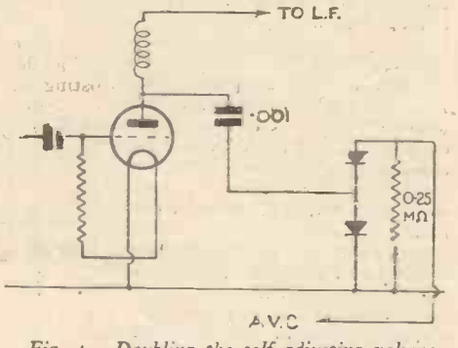


Fig. 4.—Doubling the self-adjusting volume control voltage by using two rectifiers in series

Detectors for Real Quality

By

NOEL BONAVIA-HUNT, M.A.

L.N.A. photo

"On the line." Commercial receivers undergoing final tests in a factory. Note the gravity roller track to save handling

AMATEUR: Last time we met we disposed of the subject of high-frequency amplification. . . .

PROFESSOR: Excuse me interrupting, but I am afraid I cannot admit that the subject was "disposed of"; there is a great deal more to be said about it, but I propose to leave it alone for the present, at any rate, as we can rest satisfied with the high-frequency circuit designed for our little set and proceed to the discussion of detector valves.

AMATEUR: All right. The detector comes next in the chain and I understand that the choice of a suitable valve is of the utmost importance.

PROFESSOR: It is. The high-frequency amplifier we have so far agreed upon will give us a reasonably faithful presentation of the studio wave-forms, so that up to this point in the chain we are tolerably free from anxiety.

Of course, the quality of the transmitted signals is in the hands of the engineers in charge of the transmitting station and of the land lines. Variations are inevitable in the existing state of things; but our home receiver must take what is sent over and make the best of it. We must see to it that we ourselves are not to blame for any deviation from the standard we have set up for that receiving apparatus.

If the Detector Distorts

Now, if the detector distorts in the process of rectifying the high-frequency wave-forms, all our efforts to design a good amplifier are wasted.

AMATEUR: That sounds obvious enough. I suppose most people use detectors that distort without knowing it.

PROFESSOR: They do, sure enough. There are three principal types of detector: (1) the leaky-grid, (2) the anode-bend, and (3) the diode.

AMATEUR: Shall we discuss each type in turn?

PROFESSOR: If you like.

AMATEUR: I suppose the leaky-grid detector is the commonest.

PROFESSOR: Naturally, since it is the most sensitive of all. People with indoor or frame aerials find this method of detection extremely useful. In some homes the conditions are such that no other form of detector will produce a sound in the loud-speaker.

The aerial system is so inefficient and the set owner's finances are so limited that he cannot afford to spend money on boosting up the high-frequency signals to the degree required to load any other type of detector. The leaky-grid method is the salvation of his set.

AMATEUR: If that is so, how can the poor fellow hope to secure real quality?

PROFESSOR: You think, then, that leaky-grid detection is radically bad?

AMATEUR: Isn't it?

PROFESSOR: Well, I am not at all inclined to damn it so ruthlessly. Granted that nine tenths of the sets employing it distort the signals pretty badly, it is quite possible to avoid distortion to a large extent by controlling the input load to the valve. As you know, the input *must* be quite small; given this small input, the valve rectifies with reasonable linearity.

AMATEUR: In that case we must incorporate some system of volume control before the signals reach the detector.

PROFESSOR: That is, of course, one way of doing it. But you will find pre-detector volume controls play the very dickens with the wave-forms. It was thought that the variable-mu high-frequency valve would completely solve the problem of pre-detector control, and, indeed, some people still make this claim.

They think that altering the biasing voltage preserves the characteristics of the wave-form in proportion to the amplitude, but it doesn't. The variable-mu valve is not without its usefulness in the design of a special receiver for logging distant signals while the local station is still working, but if your aim is the faithful reproduction of speech and music, the variable-mu valve, as such, is no better than the ordinary type of screen-grid valve.

In any case, to get back to the point we are discussing, pre-detector volume control does not solve our problem.

AMATEUR: Then if we happen to be able to use a decent aerial system or to amplify the signals efficiently before they reach the detector, we ought to scrap the leaky-grid type altogether.

PROFESSOR: I don't know that that would be an altogether wise step. You see, we might want to be able to tune-in to a weak signal (not necessarily a foreign one) and the input in this case might be too small to load the other type of detector we were using, with the result that the tone of the music or speech would be distorted.

What I mean is this. There are, roughly speaking, two distinct types of detector, as far as *loading* is concerned—leaky-grid and diode. The former—leaky-grid—is very easily loaded and therefore needs only a small input, while the latter—the diode—needs a bigger input altogether if it is to function properly.

Obviously, the leaky grid is the best where weak signals are received and the diode the best where strong signals are received. Get this simple fact into your head and you are more than half way on the road to the solution of our little problem of securing undistorted rectification. Also you know what to avoid.

You know that it is wrong—very wrong indeed—to attempt to tune-in a weak signal and hand it to your diode to detect, and that it is equally wrong to tune in a strong signal and expect your leaky-grid detector to handle it without distorting it.

AMATEUR: In that case it would seem that both the leaky-grid and the diode should be employed in the same receiver, with switching arrangements to bring either the one or the other into operation, as required.

PROFESSOR: That is certainly possible. However, let us be quite clear in our minds what are the good and bad points in the working of each type of detector. First, the leaky-grid type. We have already seen that this is good on weak signals and bad on strong ones.

Series or Parallel?

AMATEUR: I take it that by the leaky-grid detector you are referring to the older circuit, as shown in this diagram (*see Fig.* 1). I have given both forms of circuit, one in which the grid leak is in series with the condenser, and the other showing it in parallel. Which do you prefer?

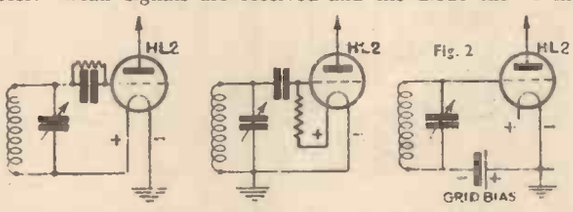
PROFESSOR: It does not matter two pins. If you wish to incorporate this type of detector in your set and also wish to be able to switch over to diode detection, it is more convenient to adopt the parallel grid-leak circuit. The value of the condenser is best .0002 microfarad, and that of the grid leak need not be more than 1 megohm.

AMATEUR: But isn't this rather out of date? I mean, nobody thinks of using the parallel leak nowadays; and, besides, what about power-grid detection? Hasn't that superseded the older methods?

PROFESSOR: My dear fellow, if you are out for real quality, you must not bow too obsequiously to the fashions of the moment. We are not primarily concerned with present-day practice, which may be good or may be bad—we want *quality*.

Now, you have just mentioned the

Continued on next page



Figs. 1a and 1b.—Parallel and series leaky-grid detectors. Fig. 2.—Anode-bend detector

MR. FLEX LIKES A "LISTEN-IN"

—BUT NOT A "LISTEN-INUENDO"

Detectors for Real Quality

Continued from preceding page

power-grid method. This is doomed, as I definitely prophesied it would be in an article which I contributed to the wireless Press more than a year ago. It came in with a great flourish of trumpets and was almost universally adopted. We were told that large inputs could be handled without distortion, but insufficient notice appeared to have been taken of the equally important matter of coupling the detector valve to the first low-frequency valve.

Defect of Power Grid

It was found that practically only one kind of coupling would work, and that one coupling possesses very serious defects from the quality point of view. You have to pass at least 5 or 6 milliamperes of current on the plate of the detector valve, and that means using a special choke in the plate circuit which is capable of standing up to this high current without saturation.

In any case, whether an anode resistance or an anode choke is used, it is impossible to make it large enough to respond to the lower frequencies of the musical scale because too much current will be dropped through it and the valve will cease to function as a power-grid detector.

In short a linear detector is no good if it does not allow a properly designed low-frequency coupling to be incorporated between it and the first low-frequency valve. In any case, the power-grid detector is ruled out from our small set. We simply haven't got the high-tension voltage required.

AMATEUR : Of course, I realise that the diode is superseding the power-grid method. But what about anode-bend?

PROFESSOR : You mean this one? (*See Fig.* 2.) Well, it has a history, in that it replaced the early form of leaky grid in the days when the quality of the transmissions and that of the receiving apparatus was less good than it is now. The anode-bend system had two distinct advantages over the leaky grid.

First, it could handle larger signal inputs without distortion, though its capacity to do so is, you must understand, strictly limited, and far short of what the diode is capable of; secondly, it did not pass the higher musical frequencies so well as the leaky-grid detector did, and this was very noticeable.

The result was a purer reproduction in days when high notes were terribly distorted by horn-type loud-speakers. There were additional advantages, too, which users of anode-bend noticed. Greater selectivity was one, and another was that reaction worked extremely well and largely compensated for the lack of sensitivity which marks the anode-bend detector when compared with its leaky-grid rival.

I may remark in passing that the falling treble characteristic which is so noticeable with the anode-bend detector makes it specially suitable in cases where the output valve is a pentode, which latter has, as you know, a rising treble characteristic.

AMATEUR : So much for anode-bend. Now for the diode. This, I understand, is the perfect detector.

PROFESSOR : Hardly. The perfect detector would be one that is capable of handling *any* voltage input without distortion. That is, it should be able to handle a microvolt as perfectly as 50 volts. A diode with such characteristics has yet to be discovered.

The crystal will deal quite well with very small inputs, but its output is non-linear. The copper-oxide detector in its present stage of development, likes a big input, and its output is linear only when the input *is* big. The Westinghouse people have just introduced a more sensitive detector [on the lines of their present types W4 and W6.

What we want is the sensitivity of the old crystal and the linearity of the Westector. Till this ideal detector arrives we must be content with the alternative switching arrangement you hinted at earlier in our discussion. In Fig. 3 you will see this arrangement, by which it is possible to use either the leaky-grid or the Westector, as desired.

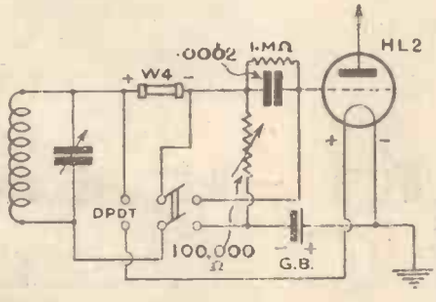


Fig. 3.—*Arrangement of switch for changing over from diode to leaky-grid detection*

Choose a Good Switch

When you switch over to the left you get leaky grid; when you switch over to the right, you get the diode. Providing you have no objection to the switch, the arrangement works quite well. It is essential to choose for the switch one that makes efficient contacts, such as the throw-over type. The rubbing-contact type is useless.

We are dealing with high frequencies here and faulty contacts set up high resistances. The contact must be a *locking* one, in which there is no possibility of varying pressure after the contact is made. If there is the least suspicion that the switch is likely to become faulty with use, don't have it. A small throw-over switch fixed to the panel is best, and it is readily accessible for cleaning.

AMATEUR : What about the thermionic diode valve?

PROFESSOR : I do not see the point in using heated valves when the cold valve is available and costs no more. To be able to dispense with filament heating and to have a valve that lasts practically for ever is a great recommendation. In sets that are run from A.C. mains, the indirectly heated diode valve is productive of mains hum, while the substitution of the cold valve removes all trace of hum from this source.

So you see that the best and most convenient form of diode is the cold-metal one, and it takes no more room in the set than our old friend the grid leak.

MULLARD PENTODE POSSIBILITIES

"We've seen to that!"

Because *you* are the man with the accumulator, the man who listens-in to battery reception, you mustn't think you're at a disadvantage. You're not! Don't think that the fellow with the all-electric, up-to-the-minute receiver has "got one over on you." He hasn't—*we've* seen to that; for while electric radio has claimed the world's attention for a time, Mullard technicians have been working solidly for you—planning, improving, testing—and have produced these wonderful new Battery H.F. Pentodes. They are Mullard production at its best—the high-water mark of high-frequency amplification for battery receivers. Wait until you hear them. "Mullard's again" you'll say.

BATTERY H.F. PENTODES

V.P.2 MULTI-MU SCREENED PENTODE 15/6

S.P.2 SCREENED PENTODE 15/6

Mullard

THE · MASTER · VALVE

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

On Your Wavelength

By Thermion

Big Ben Strikes

ON Easter Monday, Big Ben went on strike and didn't strike, if you see what I mean. The great clock of Westminster is due to stop for a couple of months for repairs on April 30, but the B.B.C. were flabbergasted to find that a whole month earlier the 10.15 a.m. chimes were not available.

Pips had to be sent out instead: so we were able to set our watches right enough. But what happened to this most reliable of clocks?

It turned out that it wasn't Big Ben's fault at all. The tower at Westminster is under repairs and a piece of tarpaulin attached to the scaffolding had been blown across the face of the clock by the wind and had fouled the minute hand.

Understudy Chimes

DURING Big Ben's rest the broadcast chimes will come from St. Paul's. It's a pity that we cannot hear Great Paul, the big bell at the cathedral, for he is the largest bell in London and weighs two and a half tons more than Big Ben.

Great Paul, though, does not undertake hour-striking duty. This is done by Big Tom, who weighs only five tons against Big Ben's thirteen and a half.

You may find St. Paul's chimes rather disappointing during May and June, for they haven't the Westminster richness. There are only two notes instead of Westminster's four.

If Big Tom doesn't weigh as much as Big Ben, he is a good deal older. Ben was cast less than eighty years ago, in 1858, but Tom is well over a couple of centuries old, having been made in 1709.

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German Stations Made Easy

UNLESS your set was accurately calibrated —and how many sets are?—it has always been rather a difficult business to pick out the German stations. The language doesn't help much, since it is spoken by the Austrian stations, by Beromünster, by Luxembourg, by Strasbourg, and not infrequently by stations in other countries.

A new regulation makes matters a whole lot easier for the searcher after foreign stations. Since Easter the German stations have used the word Reichsender (pronounced Ryshe-zender) in front of their own names.

Thus Berlin now calls itself Reichsender Berlin and so on. As German stations give their call-signs pretty frequently, this will be of the greatest assistance. It is a pity that other countries cannot do likewise.

Nightmare Calibration

IF you are calibrating a new set it is sometimes astonishingly difficult to identify stations. The stars in their courses occasionally seem to fight against you. On the first night you try you notice that Budapest is giving a concert, including a number of well-known pieces, at nine o'clock. Sharp to the minute you switch on and instantly identify one of the tunes on a setting rather below the middle of your dial.

Thinking the set must have gone mad, you wait a bit and presently hear Budapest's call-sign. Puzzled, you twiddle the knobs and discover Budapest all over the place. Then the solution dawns. It is one of these international broadcast nights.

Or, again, you may find that half the European stations are indulging in language lessons or news bulletins in foreign languages.

But perhaps the most trying moment of all is when you have sat up late for America and tune in a spot of music which bears every sign of coming from the other side of the Atlantic.

You have to wait a long while for the call-sign—and when it does come you find that it is some wretched little Spanish station sitting up late, like yourself. I suppose that long-distance listening wouldn't be half so much fun if these things didn't happen.

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S O S By Pocket Wireless

THE tiny sets used in some towns by policemen on their beats have already proved their worth, though the general public —which means you and me—doesn't hear much about them.

The other day there was a very striking instance of what they can do in time of need.

A window-cleaner at work in Brighton fell from his ladder on to a flat roof below. A policeman found him, but could not move him without assistance. A wireless S O S call was sent out and picked up by four other bobbies, who arrived post haste. Good work, wasn't it?

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Valvelets

SOME of the miniature valves designed for use in these pocket sets, as well as in portable deaf-aid appliances, have just come my way. Except for the now extinct Weco valves, these are the smallest tubes that I have yet come across. They measure only a couple of inches over all and an inch in diameter.

The caps are actually the biggest part about them, for the bulbs are of the size and shape of an ordinary thimble.

They are not intended for use in broadcast receiving sets, for they are not as efficient as their full-sized counterparts and you cannot work a loud-speaker from them. But for their own job they should be admirable.

The filament current is .1 ampere at 1 volt, which means that you can run two of them in series from a midget 2-volt accumulator. Only 45 volts high tension is required. With this the detector passes about 1 milliampere and the low-frequency valve just a trifle more.

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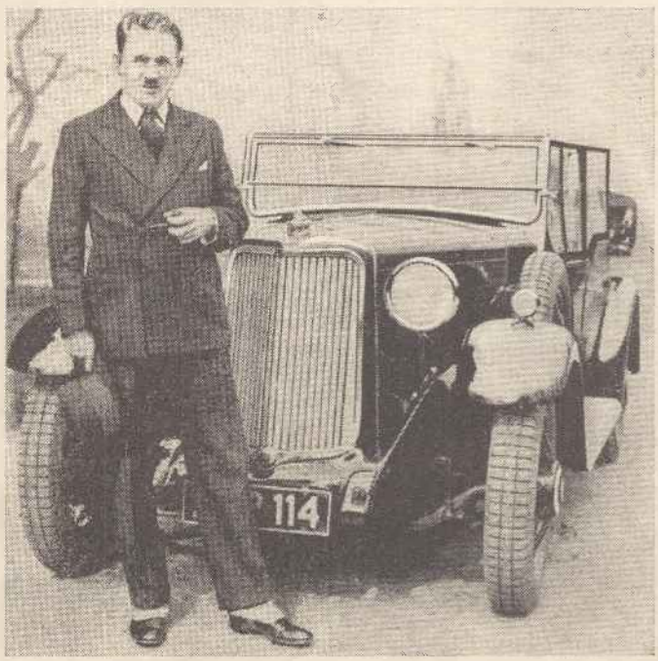
Battery News

NOW that Easter is over and we have settled down again to regular publication dates, and so on, I will be able to give you week by week an account of the five-bob 120-volt batteries which are being run at six hours a day for eleven weeks to see whether a reader's claim that they will give this service under a nominal load of 7 milliamperes will hold water.

Perhaps I had better show you now how the batteries have fared during the first four weeks of their test that have just been completed. The figures given below show the readings for each battery (they are labelled A and B respectively) at the beginning and the end of its test run on the last day of each week. Remember that the readings are taken under load.

Here they are :—

	First Week	*Second Week*	*Third Week*	*Fourth Week*
Battery A ...	116.9	99.2	87.6	84.8
	107.2	88.8	76.0	72.8
Battery B ...	116.0	106.4	91.2	87.2
	107.6	92.8	79.6	75.2



Golden-voiced A. S. Hibberd, the Chief Announcer at Broadcasting House, photographed during a spare moment with his new car outside his house at Bickley, Kent

Volts and Milliamps and Things

MOST tests are considered at an end when the voltage drops to nine-tenths of a volt per cell, for the internal resistance is then usually so high that the battery is of no great use for operating a wireless set.

This for a 120-volt battery means 72 volts, and you will see that battery A is already within .8 volt of the normal cut-off, whilst battery B is only 3.2 volts above the limit. In these tests, however, we are going to run right on for eleven weeks, irrespective of the voltage, just to see what *is* the state of these batteries when people get such long service from them.

The voltage will naturally fall much more slowly now. The current was originally 7 milliamperes, but it is now down to a little over 4 milliamps, which makes a whole heap of difference.

The triple-capacity battery, by the way, which is going through a 10-milliampere test at four hours a day, has now done ten weeks. Its starting voltage under load is 107.2 and it finishes four hours later at 100.8. Some difference, isn't there? Remember, too, that

it is still called upon to supply nearly 9 milliamperes.

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Saving Constructors' Time!

USUALLY I make my own chassis when I am building sets, but the other day, when I was having rather a busy time (or, at any rate, liked to think that I was!), I ordered a ready-made one of a certain design with a view to speeding up the building of a new set that I was making. And did I save time? Well, just read on.

To begin with the firm from which it was ordered took over a week to deliver it. When it did come I unpacked it and found (1) that one of the holes was cut for a five-pin instead of a seven-pin chassis-mounting valve holder (2) that those for the fixing screws of the variable condenser did not register (3) that the whole thing was rickety, and (4) that some of the brads holding down the aluminium covering of the base had been so badly driven that they had split the wood and were left with protruding points.

In the time required to set that ready-made (help!) chassis to rights I could have made the whole thing myself and had I done so it would have cost me just about a fifth its price. Emphatically not good enough.

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Are Sets Too Cheap?

SOME time ago I suggested that there was a tendency for receiving sets to become too cheap to be really good, and I still have a feeling that there is a good deal of truth in this. It is proverbial that what the eye doesn't see the heart doesn't grieve over and an elaborate cabinet can cover up a horrible mess inside. When you do examine the insides of some of the very cheap sets the spectacle presented is enough to make angels weep.

I am not saying that you shouldn't be able to buy a battery set complete for a fiver or less, or a mains set for £8 or £9. What I do maintain is that we expect nowadays too much for our money. The battery set must be a multi-valver—a superhet if possible; the mains set must certainly be a superhet, and we like to boast that, whatever it costs, it is capable of several watts output.

Personally, I would far rather have a first-rate three-valver than a cheap-jack superhet, and I much prefer a set that makes a little noise nicely to one which makes a lot of noise unpleasantly.

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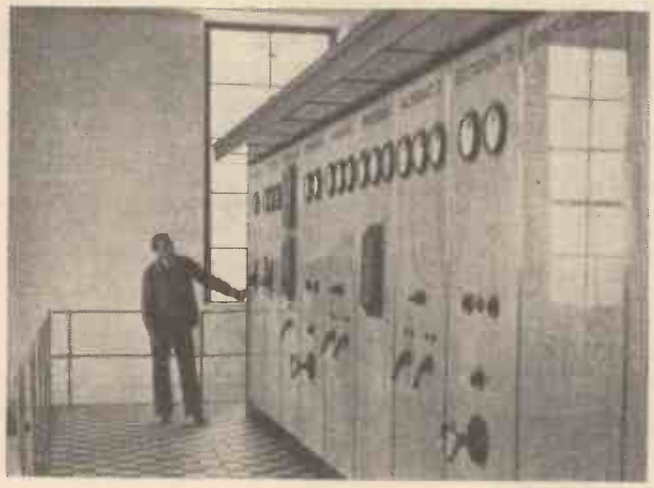
WLW Going Strong

FROM WLW, the 500-kilowatt station at Cincinnati in the States, I hear that the testing period is now nearly finished and that application is to be made to the Federal Radio Board for permission to use the big plant during normal broadcasting hours.

The station is at present operating only between 6 a.m. and 11 a.m. G.M.T., which corresponds to a period between midnight and 5 a.m. by its local time. Many people over here heard it some weeks ago, when conditions were particularly good for before-breakfast trans-atlantic reception. Reports of good reception have also been obtained from all over North and South America, as well as the West Indies and Australia.

If the permission in question is granted, WLW should be as easy to pick up just after midnight next autumn as the average Continental station.



Wide World photo

French material has gone exclusively into Radio Luxembourg, the 200-kilowatt sponsor station. Here is a view of one of the meter panels of Europe's radio giant

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Television Wonders

A FEW days ago I attended an astonishing demonstration of the latest Baird 180-line television. The transmission was made between the Crystal Palace and a private film theatre in Wardour Street. I had been to other demonstrations, but this one was run specially for me, because I particularly wanted to make a test or two of my own.

There was a telephone line between the theatre and the Crystal Palace, eight miles away. I called up the announcer at the far end, heard the telephone bell ring by means of the "sound" link, and saw him pick up his receiver. Then I asked him to come closer and then to move farther away. Next, I got him to move sideways, first in one direction and then in the other. This is a pretty exacting test, but no part of him went out of focus or lost illumination.

After that I saw and heard a talkie, as well as performances by one or two artists. As you may know that in the past I have been more cautious than some other writers in acclaiming television, you would probably like to hear my impressions.

Thermion the Enthusiast

MAY I say at once that what I saw and heard convinces me that real television is an accomplished fact? In the 180-line system twenty-five complete pictures a second are transmitted, each of them being divided into 180-line strips by the scanning disc.

There is no flicker, no eye-strain. Images are so clear that the wealth of detail is astonishing.

One of the talkies that I saw and heard was an extract from *I Was a Spy*. You may remember that in one scene the heroine wears a shepherd's plaid coat with quite a small check pattern. I went right up to the viewing lens and looked into the picture. The pattern was "sharp" and, further than that, you could see almost every hair on the lady's head.

Captain West tells me that with the newest tube eight lines of lettering, each containing twenty letters, can be televised. From what I have seen, I can well believe this.

The whole thing is an amazing achievement, and once the country is covered by a network of ultra-short-wave relay stations—remember that these transmissions are made on wavelengths in the neighbourhood of 6 metres—the televisor will definitely take its place beside the loud-speaker in our homes.

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That Subdued Hum

APROPOS a recent remark of mine on the subdued hum which is usually heard on a mains-driven set—when it is "off tune"—I have been taken to task by a reader who says that his speaker is "absolutely silent at all times." I hardly think he really means what he says, though that is beside the point.

However, I gather from his letter that he is only using a high-tension eliminator from the mains and a battery for the filaments. In these circumstances I thoroughly agree with him. A well-designed high-tension eliminator ought to be dead silent so far as speaker hum is concerned. In many ways the high-tension unit plus battery combination is an ideal one—in spite of the fact that it is a bit out-of-date nowadays.

Mains-energised Moving-coils

OF course, in the case of a moving-coil speaker which is energised directly from the mains—as distinct from the permanent-magnet variety—there is an extra risk of getting "hum" from the mains, unless the field supply is well smoothed.

Sometimes it is difficult to know whether the trouble really arises here or in the receiver circuits, though one can always make sure by disconnecting the primary winding of the output transformer on the set. If hum still persists in the speaker, then it can only come from the field current and one must take steps accordingly.

To revert to my preceding paragraph, can anyone really claim to have produced an all-mains set that is utterly free from hum—as free, that is to say, as a battery set? I think not, but I am always open to conviction. Usually there is a slight residual hum, no matter how good the design.

Don't forget to use the Coupon on page 404 and get a full-size blueprint of the PENTA-QUESTER!

This drop curtain is used in the opening scene of "En Ville Ce Soir" at the Prince of Wales Theatre, London. When the lights go up behind the curtain the scene revealed is a broadcasting studio

The Hottest Three in History!

The PENTA-QUESTER

Designed by the "A.W." Technical Staff

MEET the Penta-quester! Learn now why it is called *the hottest three in history*.

Learn how the quest for pep, selectivity, economy of operation, range, quality, ease of control and good looks *ended* when we finally evolved this set.

The three-valver is still the backbone of the wireless industry; still the average set; still the set the ordinary listener can afford to build and maintain without too costly renewals.

Of threes there has been an endless line. Each has had some special claim to your attention. Yet with many such sets advantages gained in one direction have been lost in others.

Is the Penta-quester just such a set? No, emphatically not! The Penta-quester represents absolute sanity in set design. It "gets there" without any wild stunting or extravagant claims.

Yet it is a three with points not to be found in any other set of equivalent valve stages. Mainly because, of course, each stage in the Penta-quester is a *pentode* stage—and you all know what pentodes mean.

At the very lowest estimate they mean greater power. So that even on that score the Penta-quester with its three successive stages of pentodes is manifestly a *powerful* set.

Modern Pentodes

But pentodes—modern pentodes, anyway—mean a great deal more than just increased power. In a high-frequency stage, for example, a pentode means greater stability of working.

In a detector stage a pentode confers several advantages, not only over an ordinary triode valve but over the usual screen-grid type of valve. There is less damping of the detector tuning, and therefore greater selectivity with a pentode. Further, the tendency to microphony is reduced if you use a high-frequency pentode detector.

Add these advantages to the over-riding advantage of pentode power, and you begin to see why, taking three pentodes as a basis for a circuit, something pretty hot can be evolved.

Not that our men have been content to let the three pentodes do all the work. They have experimented at every point to make sure that each stage shall give its very best.

You will find the output employs the very latest type of push-pull output circuit utilising a pentode class-B valve for great volume with the very minimum of anode current consumption.

Take it from us, what with tone control, differential reaction and input volume control, the Penta-quester circuit is just about as "hot" as anything you have ever struck in threes.

Nor do Penta-quester attractions cease with the circuit, interesting though that undoubtedly is alike to technician and non-technical amateur.

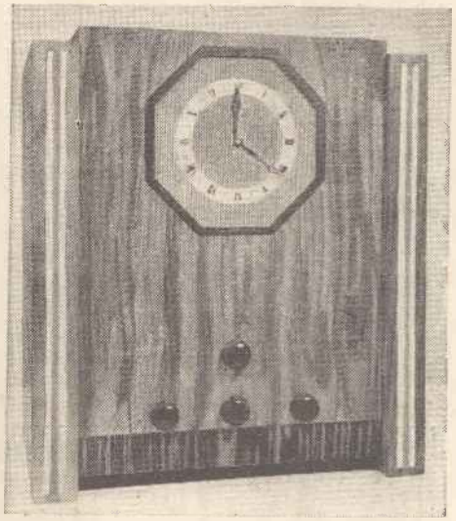
For this circuit has been built up into the latest form of amateur constructional design—a chassis arrangement evolved specially for the amateur to retain the advantages of the factory chassis without the complications inseparable from the use of metal for the baseplate and side pieces. The best of two worlds!

It is a *wood chassis*, with the top surface metallised. As easy to make as the old panel and baseboard type of set but infinitely more efficient, owing to the scientific alignment of the components above and below the main chassis board.

Take a look at any of the photographs of the Penta-quester and you will see how starkly simple is the top layout. Just the tuning condenser and the valve holders—all the rest of the parts are neatly and efficiently grouped below.

Why the PENTA-QUESTER Is the Hottest "Three" in Radio

- **—Because it uses three of the most up-to-date and powerful pentode valves.**
- **—Because it has screened iron-core coils for great selectivity.**
- **—Because it has continuously variable tone control to please all ears.**
- **—Because a metallised wood chassis gets the greatest efficiency from the components**
- **—Because it has a new and attractive style of tuning dial.**
- **—Because the cabinet is provided with a special local-station aerial.**
- **—Because, as a whole, it is the most advanced design available to the home constructor.**



This photograph shows the attractive appearance of the new clock-face tuning used on the Penta-quester

Don't Forget the Free Blueprint!

As we tell elsewhere in this issue, the assembly of the chassis is perfectly within the capabilities of the average amateur—especially *if full advatange is taken, as we hope it will, of our quite exceptionally generous offer of a full-size blueprint free of charge.*

When the circuit and chassis of the Penta-quester have passed your critical examination, look for a moment at the cabinet arrangement. It represents a startling departure from the usual run of radio designs, yet it is also utterly devoid of catch-penny stunts.

There are two outstanding features about this cabinet, quite distinct, we mean, from the generally high standard of workmanship and finish.

First, the clock-face tuning dial. More of this on another page. Here all we need point out is that this form of dial does strike out along a new line—something useful as well as ornamental.

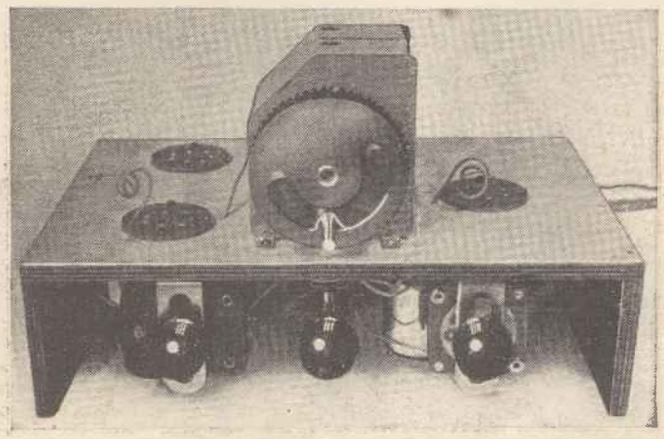
By arranging this dial inside the loud-speaker fret a real constructor novelty has been achieved.

"Local" Aerial

Secondly, there is the "local" aerial arrangement. You will find two strikingly attractive chromium vertical bars at each side of the front of the cabinet. These are most ornamental, but in addition they act as a miniature aerial and earth.

So powerful is the set that you can pick up locals at full strength.

Well, there it is. The Penta-quester claims your attention on three distinct scores. Its "hot" circuit; its rugged wood chassis; and its original cabinet. Examine it from all angles. Read all about the technical theory of it. Study the constructional details. And then agree with us that the Penta-quester is the hottest three in history.



Front view of the Penta-quester chassis, showing the arrangement of the four controls for tuning, volume, wave-change switching and reaction adjustments. All very simple, don't you think?

Putting the Penta-quester Through Its Paces

How the Stations Come In

Results of a Special Test by ERNEST H. ROBINSON

THE first thing which strikes one about this remarkable receiver is that it looks like a clock. Why a wireless set should be made to look like a clock any more than a clock should be made to look like a wireless set I do not know. I have been told that the clock-face tuning dial makes remembering the settings easier than an ordinary dial. Maybe it does.

Certainly a full-circle tuning dial is an improvement on the small arc or half-circle we are usually given.

When a man is going to build a set, particularly one that departs in many ways from usual design features, and is also cheap, he wants to know what it will do. My tests, carried out during one afternoon and evening, gave me thirty-three stations on the medium waves, all but four clear of interference. Eight of these were daylight stations, all but one at medium or full strength. Brussels No. 1 was the faint one.

The usual long-wave stations come in, most of them at full strength, day or night.

Very Severe Test

My test was a very severe one, for I connected up to a 100-ft. aerial, 40-ft. high. If a set is going to give any trouble at all from lack of selectivity such an aerial will "give it socks." In my opinion the Penta-quester came triumphantly through this test.

There are two controls on the front of the cabinet besides the tuning knob and wave switch. On the left is the reaction control and on the right a volume control, which is a small variable condenser in the aerial circuit. This will, no doubt, be explained in the constructional article; but I refer to the arrangements because they are of great importance in working the set properly. They are easy to use.

Reducing the volume control aids in obtaining selectivity and advancing the reaction control does the same thing. To cut out interference all you have to do is to reduce volume on the right-hand knob and then bring it up again on the left-hand knob.

On more than half the medium-wave stations I brought in I found that with the reaction condenser about half-way between minimum and the oscillating point I had to reduce volume considerably to prevent overloading and that reduction was quite enough to ensure good reception without interference.

A glance at the list of stations will show that they are well received over tuning range. On the medium waves good reception starts at 12.05 on the scale with Fécamp and from there stations come in fairly evenly right round the clockface until Budapest No. 1 is reached at 12.57.

Very likely in other districts some of the small fry below 240 metres can be had but the performance of the set was so excellent without them that I did not waste any time on them, though I heard (but did not identify) two medium loud stations which I believe to be Milan No. 2 at 12.07 and Montpellier at 12.07½. They were both interfered with, I believe by Dublin, which comes between them; but which I could not separate.

As is only to be expected, the local stations spread a bit. London National covers about 4 minutes on the dial even with volume reduced. Regional spreads about 6 minutes and interferes badly with Toulouse, though I was able to get the 100-kilowatt Hambourg transmission clear quite easily. Not bad on 100 ft. of wire!

Those who spend much time testing sets are only too well aware that the designers often sacrifice the long-wave portion of the reception. This, I believe, is sometimes because they find the long waves difficult to stabilise, particularly in straight sets. I was delighted to find that in this instance long-wave reception is equally as good as that on medium waves.

Of course, a full-length aerial flatters long-wave reception on the sensitivity side; but it also tends to flatten the selectivity. Those who build the Penta-quester need have no fears. I found that all the usual stations came in well by daylight and that, barring that Radio Paris cuts out Lahti and presumably also Moscow No. 1, and that Eiffel Tower, being where it should not be, I could not get Warsaw No. 1 and Motala was obliterated, selectivity was very good indeed.

Heston Weather Reports

The weather reports from Heston are being more and more listened to, particularly at week-ends and holiday times, and it is therefore all to the good that this station comes in well. I found it at 12.04 on the clock-face dial and had to cut it right down on the volume control to prevent overloading.

Working round the dial Croydon comes in at 12.06 and from there we jump to 12.17, where Oslo is to be found. I did manage to hear Moscow No. 2 very faintly at 12.11 on the dial; but it is not on my list because it really was so small a fish, in the way of programme value, that it was not worth counting.

The last station at the upper end of the scale which I found was Huizen, very faint on its morning and afternoon low power, but at fine volume after 3.40 p.m. when the high power is turned on.

How the Reaction Works

Reaction control is very important in a straight three-valver of this kind; but the amplification given by the use of two high-frequency pentodes is so good that over a dozen stations want no reaction at all.

The reaction is rather quick working in the set I had to run over. I mean the knob has to be turned a very little to start oscillation. This is, in a way, a good fault, for obviously as the high-tension battery runs down the oscillation point will be found only after more condenser is brought into play. An arrangement which only oscillates with almost full reaction when the battery is at its best is very disappointing and, indeed, exasperating to use.

There is practically no reaction "backlash" and what there is does not matter. I found a little at the lower end of the long-wave tuning—that was all. I should call the reaction control on this set distinctly good.

High-frequency pentodes are just a little expensive in current but the expense, judging from the results obtained, is well worth while. I found the standing current, using 140 volts on the H.T.+2 plug and 80 on the H.T.+1 (screening grid plug), with 7½ volts negative grid bias, to be 9 milliamperes. This indicates that a super-power battery will be an economy since loud reception will put the fluctuating current up considerably. The valves are very economical of low-tension current.

Continued on page 394

LIST OF STATIONS RECEIVED

"D," daylight reception. Clear of interference at night unless otherwise noted.

Long Waves			Station		Dial	
Huizen	...	12.47 D	Sottens	...	12.40½	
Lahti. (Interference from Paris)	...	12.1½	Paris PTT	...	12.39	
Radio Paris	...	12.38 D	Stockholm	...	12.38	
Königswusterhausen		12.35 D	Rome No. 1	...	12.37½	
Daventry	...	12.32 D	Munich	...	12.35	
Eiffel Tower	...	12.27 D	Midland Regional	...	12.32½ D	
Luxembourg	...	12.24 D	Leipzig. (When Midland Regional not working)	...	12.31	
Kalundborg. (When Luxembourg not working)	...	12.21	Scottish Regional	...	12.30	
Oslo	...	12.17	Berlin	...	12.27½	
Croydon	...	12.06	London Regional	...	12.25 D	
Heston	...	12.04	Toulouse. (Interference from London and Hambourg)	...	12.23½	
Medium Waves			Hambourg	...	12.23	
Budapest No. 1	...	12.57	Post Parisien	...	12.20½ D	
Beromunster	...	12.55½	West Regional	...	12.19½ D	
Athlone	...	12.54	Hilversum	...	12.18½	
Mühlacker	...	12.52	Scottish National	...	12.16	
Vienna	...	12.50½	Madona. (When Nationals not working)		12.14	
Florence	...	12.48	London National	...	12.13½ D	
Brussels No. 1	...	12.47 D	Frankfurt	...	12.12 D	
Prague No. 1	...	12.45	Trieste	...	12.10	
Lyons PTT	...	12.44	Fécamp	...	12.5 D	
North Regional	...	12.42½				

A rear view of the Penta-quester, showing the particularly neat appearance of the chassis. Don't forget you can get a real 1s. *blueprint free by using the coupon on page 404!*

Some of the Outstanding Features

Clock-face Dial and Local Aerial

Tune-in by Time with the Penta-quester !

ON this page we give you three fine artist's views of outstanding features of the Penta-quester.

Note, first, the clock-face dial for tuning, reproduced below. This is one of the most attractive aspects of the cabinet design, and which can be set anywhere from 1 minute past 12 o'clock to 1 minute to 12 o'clock the other side.

By this means non-technical listeners can gain a homely idea from the clock face of the correct tuning adjustments for their favourite stations.

Don't forget that the sprocket wheels and chain, shown in black by the drawing, are supplied with the cabinet.

Next week we will give you more explicit instructions on how to fit up this mechanism, but in the meantime you can see for yourself that it offers the advantage of an attractive and novel form of tuning dial. Backing it is, of course, the loud-speaker, the grille of which forms the inside of the face of the clock dial.

◆ ◆ ◆

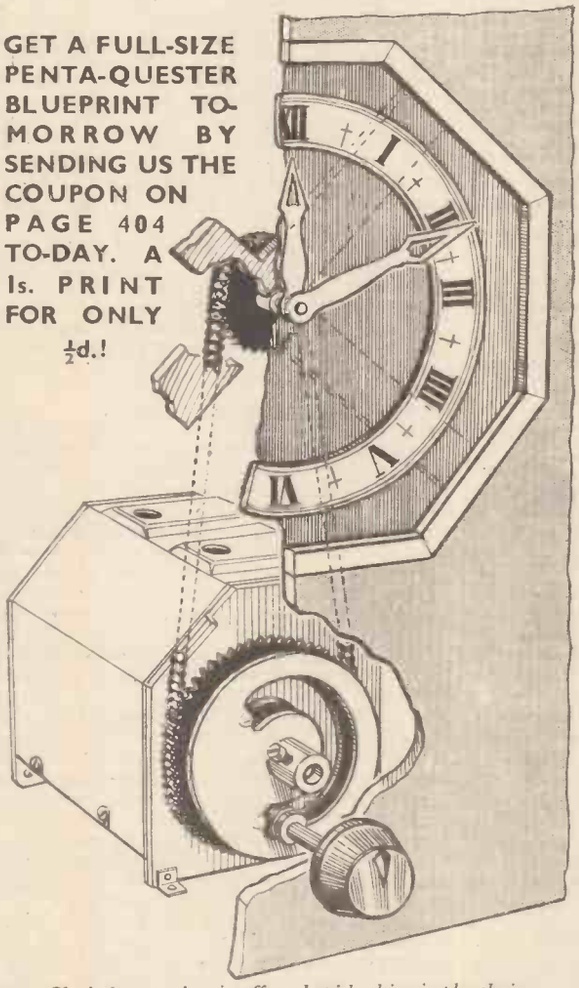
So much for clock-face tuning. Now a word on the second feature—the special "local" aerial system. This is well illustrated by the drawing on the right of this page, from which you will see that two vertical metal plates, actually chromium-plated brass, act as miniature aerial and earth rods.

We have found on test that this system acts perfectly well for the reception of the locals, and it does provide a very good excuse for ornamenting the cabinet in a very striking way, as you will agree when you see the cabinet.

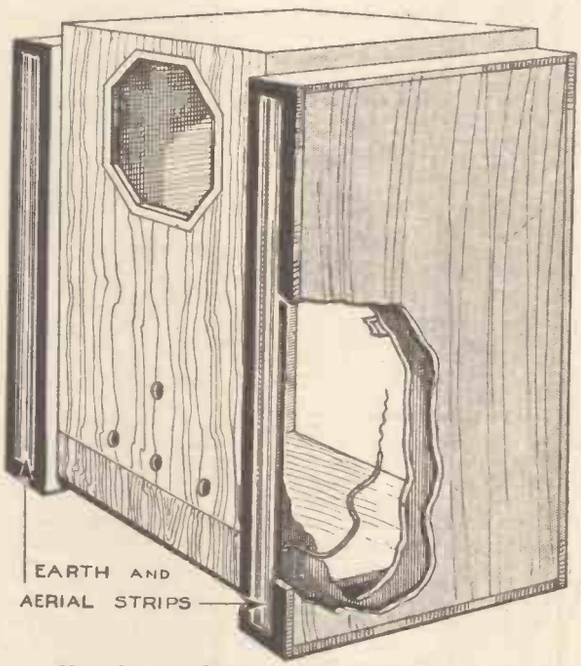
The connections for the local aerial and earth are made by means of short flexible leads already supplied soldered to the two vertical pillars of the cabinet. So there, again, you will have no difficulty in putting this new idea into practice.

At first sight it may seem ridiculous that such tiny high-frequency "pick-ups" can be effective, but then it must be remembered that the set itself is unusually sensitive, and for this reason can bring in stations with practically no aerial at all.

GET A FULL-SIZE PENTA-QUESTER BLUEPRINT TO-MORROW BY SENDING US THE COUPON ON PAGE 404 TO-DAY. A 1s. PRINT FOR ONLY ½d.!



Clock-face tuning is effected with this simple chain-and-sprocket mechanism, supplied with the cabinet



How the two chromium-plated pillars for the local aerial are set into the cabinet. Useful as well as ornamental !

Experimenting with the Pillars

You can experiment, if you like, with the use of both pillars as the aerial, but in general there is no improvement over one. By using the remaining one as an earth you balance up the aerial circuit, though we would stress the point that you can quite easily use just one pillar for the aerial and ignore the earth. If you put on your proper earth with one of the pillars as the aerial, you can log some foreigners as well as the locals.

◆ ◆ ◆

The illustration at the bottom of this page is a close-up of the coil-switching ganging mechanism. You should note that the two separate little switches are mounted on a piece of three-ply before being mounted on the baseboard of the chassis, in order to line up the spindle with the other variable controls. This will be clear from the lower photograph on page 391.

Well, there you have some further sidelights on this *hottest three in history*. The Penta-quester, as our diagrams and drawings prove, is a set with highly individualistic features. And they all have a purpose—*and* improve results !

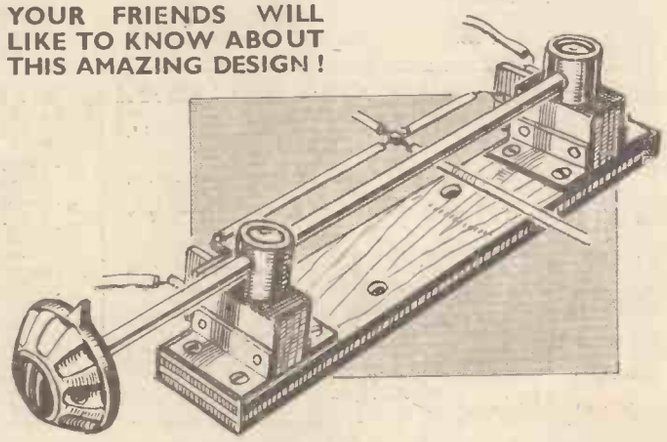
we should like to stress that the mechanism for obtaining this novel effect is actually an integral part of the cabinet, being supplied with the cabinet itself.

The variable condenser has the usual slow-motion knob fitted and on the spindle there is a large sprocket wheel, connected by a chain to a smaller wheel behind the face of the clock at the top of the cabinet.

This chain-and-sprocket mechanism, which is really very simple, gives a 2-to-1 reduction, so that a complete 360-degree rotation of the hand on the clock face turns the condenser plates through the usual 180 degrees, that is, it varies the capacity from maximum to minimum.

The hour hand is arbitrarily fixed at 12 o'clock, and then logging is done by turning the minute hand,

YOUR FRIENDS WILL LIKE TO KNOW ABOUT THIS AMAZING DESIGN !

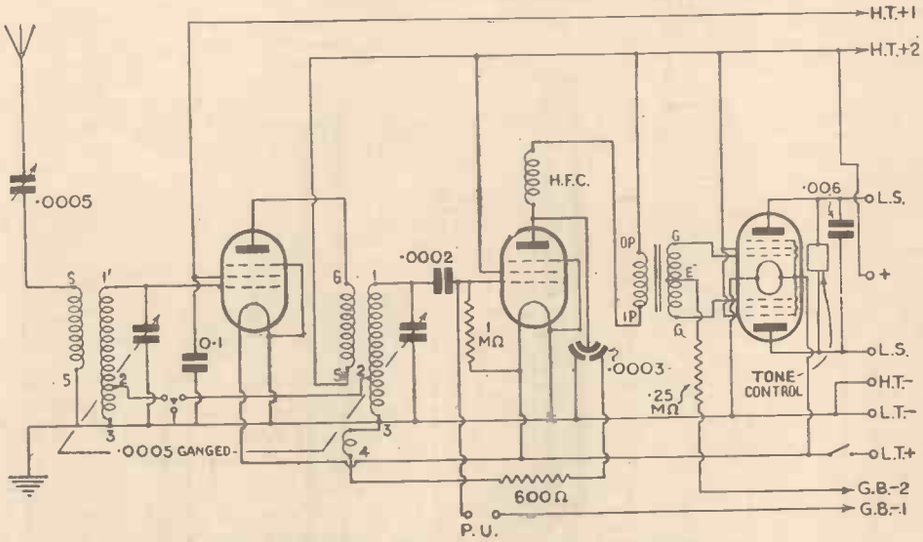


How the two little switches for the two screened coils are ganged together on a three-ply mounting

The Technical Story of the Penta-quester

Amazing All-pentode Circuit

How Pentodes For All Stages Produces The Hottest Three In History



Theoretical circuit diagram of the Penta-quester, a three-valver with three pentodes for high-frequency amplification, detection and power

WHEN we set out to design an all-pentode circuit arrangement we knew beforehand that the results theoretically possible were extraordinary. But, having got the circuit to work we were nevertheless amazed at the great power, the inherent stability and the ease with which tuning could be arranged for good selectivity.

We engineered this circuit to meet the present-day conditions. That goes almost without saying, of course. But in practice this meant that we had to strike a neat balance between power and selectivity.

Infinite Possibilities

Needless to say, had we not been able to strike this balance, the Penta-quester would not now be presented to you. Three pentodes *may* have been used before in a three-valver; we don't happen to have come across such a set, if it exists; all we know is that the circuit finally evolved did open our eyes to the infinite possibilities of triplicated pentodes.

So let us just run over this circuit, from aerial to loud-speaker. First, though, one or two general points in the circuit specification will clear the air.

The basic circuit is high-frequency amplifier, detector and quiescent push-pull output, three valves arranged in the most popular sequence. Two tuning circuits, worked by a two-gang condenser; input volume control; differential reaction; high-ratio transformer between the detector and the output; and tone control, fixed and variable, across the output.

Starting at the aerial lead you see a .0005-microfarad variable condenser. This is the input volume control, and provides, in addition to a good wide range of volume audibility, a ready means of sharpening up the tuning if desired. As the capacity of the condenser is decreased the selectivity is increased and the volume decreased.

The aerial tuning consists of a high-frequency transformer, actually a screened iron-core coil. The secondary is tuned with one of the .0005-microfarad sections of the two-gang condenser.

Follows the variable-mu VP2 high-frequency pentode. Actually in this circuit it is not used as a variable-mu, but as a straight high-frequency pentode, with the grid taken back to negative. Its working characteristics make it suitable for this circuit—that is why the particular type was chosen.

There is nothing special about the high-frequency stage, but you might note that a seven-pin valve holder is used for the valve, which has five pins and a terminal at the top. The suppressor grid of this valve is brought out to one pin but it is connected across to negative.

So we come to the high-frequency transformer coupling to the high-frequency pentode to the detector, which is also a high-frequency pentode, actually an SP2 valve. The detector stage is surprisingly simple, perhaps, to those who imagined that the use of this type of valve was a somewhat complicated business.

As you can see from the circuit, the usual .0002-microfarad fixed grid condenser and 1-megohm leak are employed. The connections for the pins are the same as for the high-frequency stage, with the suppressor grid brought out as before and taken to negative.

Coupled to the secondary of the high-frequency coupling transformer is the usual reaction coil, which is connected up in a rather special way for this circuit. You should note that there is a differential reaction condenser between the anode of the detector and the reaction circuit.

This is really two .0003-microfarad condensers with a common moving-plate section, so that as reaction is decreased by reducing one half of the capacity the bypass capacity on the other half is increased, thus maintaining a constant high-frequency bypass between the anode and earth.

Smoothing the Reaction

In series with the reaction side of the differential and the reaction coil is connected a 600-ohm fixed resistance, which has the effect of smoothing out the reaction very considerably. Another example of a small point that makes a big difference.

After the detector we have the high-ratio low-frequency transformer, actually a 1- to 15-ratio, with centre-tapped secondary for the QP21 pentode.

You should make a special note of the little ¼-megohm resistance in series between the centre tap of the secondary and grid bias. This is an anti-oscillation component, and on no account must it be omitted.

So we come to the final output. You will see that across the loud-speaker terminals there is a .006-microfarad fixed condenser. This provides a fixed amount of high-frequency tone correction for the pentodes, but in addition there is a variable tone control across this condenser, taking the form of a variable resistance in series with a fixed condenser.

The WB loud-speaker has an integral centre-tapped transformer suitable for the QP21, and the three terminals from the set are connected to the appropriate three terminals on the loud-speaker transformer.

For pick-up work two terminals are provided, one going to the grid of the detector and the other to a grid-bias tapping of the grid-bias battery in the usual way.

COMPONENTS NEEDED FOR THE PENTA-QUESTER

CHASSIS
1—Peto Scott Metaplex, 12 in. by 8 in. by 3¾ in.

CHOKE, HIGH-FREQUENCY
1—Graham Farish screened, type LMS (or Bulgin, Telsen).

COILS
2—Telsen dual-range screened, type W349

CONDENSERS, FIXED
2—T.M.C. Hydra, tubular type, values: .0002-, .006-microfarad (Dubilier, T.C.C.)
1—Dubilier .1-microfarad, tubular type (T.M.C., T.C.C.)

CONDENSERS, VARIABLE
1—British Radiophone two-gang .0005-microfarad with slow-motion drive, type PQ
1—Graham Farish .0005-microfarad, reaction type (or Lissen, Telsen).
1—Telsen .0003-microfarad, differential reaction type (or Graham-Farish).

HOLDERS, VALVE
3—Clix seven-pin, chassis-mounting type.

PLUGS, TERMINALS, ETC.
6—Belling-Lee wander plugs, marked: H.T.+1, H.T.+2, H.T.—, G.B.—1, G.B.—2, G.B.+ (or Clix, Eelex).
2—Belling-Lee spade terminals, marked: L.T.—, L.T.+ (Clix, Eelex).
5—Belling-Lee terminals, type R, marked: A, E, L.S. (two).
1—Telsen terminal block.

RESISTANCES, FIXED
3—Graham-Farish 1½-watt type, values: 600-ohm, ¼ and 1-megohm, (or Ferranti, Lissen).

SUNDRIES
4—yds. thin flex.
Connecting wire and sleeving.
2—British Radiogram 1½ in. metal mounting bracket.
1—Bulgin knob, type K14.
1—Strip of wood 4½ in. by ¾ in.

SWITCHES
2—Bulgin on-off toggle, type S80B, complete with 6 in. by 5/32 in. rod.
1—Bulgin on-off toggle, type S80T.

TRANSFORMER, LOW-FREQUENCY
1—Wearite, type PPA.

UNIT
1—Bulgin tone control, type CT2.

ACCESSORIES

BATTERIES
1—Drydex 120-volt high-tension, type H1012 (or Lissen, Ever Ready).
1—Exide 2-volt accumulator (or Lissen, Fuller).

CABINET
1—Peto Scott, type PQ, with clock-face dial and chain drive.

LOUD-SPEAKER
1—W.B., type PM4A (or Amplion, Blue Spot).

VALVES
High-frequency amplifier, Mullard VP2.
Detector, Mullard SP2.
Output, Marconi or Osram QP21.

SUITABLE MAINS UNIT
1—Atlas CA25 (or Ekco) for A.C. mains, or
1—Atlas DC 15/25B (or Ekco) for D.C. mains.

Putting the Set Through Its Paces

Test Results in Essex and Yorkshire

PROLONGED tests of the Penta-quester were made in the AMATEUR WIRELESS laboratories before the design was passed for publication. But that was not enough and we therefore arranged for exhaustive trials to be made out of London. A report from Surrey appears on page 388; here is a further test from Essex :—

"I was privileged this weekend to have the chance of testing out "A.W.'s" new three-valver—the Penta-quester—at my home at Westcliff-on-sea.

"I was inclined to look on this little job as rather a boring way of spending an Easter holiday, but a few minutes at the controls showed me that I was going to be well entertained.

"I wondered at first where the peculiar name for the set originated, but I soon understood how the 'quester' was arrived at. This little set brought stations in from far and near.

Forty-six Stations !

"My aerial and earth systems were not first class, rather below average in fact, the aerial being only about 15 to 20 ft. high and about 35 ft. long. However, this did not seem to have much effect on the distance-getting properties of the set and under these conditions I was able to bring in forty-six stations between 7.30 and 8.30 p.m. on Sunday.

"Nine of these were long-wave stations, which represents quite a good 'bag' for my aerial system. Radio Paris, Luxembourg, Eiffel Tower and, of course, 5XX were excellent signals and called for quite drastic use of the input control.

"By careful juggling with the controls, Konigswusterhausen was received at comfortable loud-speaker strength without noticeable interference and Eiffel Tower was received quite clear of 5XX.

"Croydon came in at good strength. At the top end of the scale Hilversum came in easily.

"It was on medium waves, however, that the distance-getting properties of the set were most evident. Below London Regional the set simply bristled with stations. On the more powerful foreigners, such as Poste Parisien and Hilversum; the input control was rarely more than one-third of the way in, with the result that the selectivity of the set was of a high order.

"Frankfurt was obtained clear of London National and Hamburg came in at full loud-speaker strength without interference from the Regional.

"I was surprised at the strength with which North Regional came in, as this is a pretty poor signal in my part of the world. Athlone also provided excellent entertainment.

"A surprising feature of the medium wave-band performance of the Penta-quester is the low minimum wave-length, which must be below 200 metres. Fécamp at 206 metres came in quite a few degrees from the bottom of the dial.

"There is not the slightest doubt that the new QP21 valve is a great improvement. The quality and output from this set on the local compared favourably with a mains set which was working in the next room.

"By means of the control on the back of the set the tone could be varied quite considerably. This control is also useful for eliminating heterodyne whistles which occur on a few stations.

"The current consumption of the set seemed very economical, being but 8 to 9 milliamperes with no signal. The test meter needle flicked up to about 15 milliamperes when a loud signal was being received and over a period of time I should think that the average consumption was from 11 to 12 milliamperes.

"The clock-face cabinet gives the set an original appearance and gets away from the decorated box with its inevitable loud-speaker fret."

So much for the East Coast report, which is clear evidence of the merits of the latest AMATEUR WIRELESS design. Now for a few bright and breezy comments specially intended for Yorkshire readers :

"To my North country brothers ! Now you Tykes and other inhabitants in the 'County of Broad Acres' —here's a set to suit both your purse strings and critical listening-in requirements.

"As I had arranged to spend Easter in Yorkshire, I decided to try out the new "A.W." Penta-quester to settle my curiosity as to its capabilities. After weathering some very rough handling in transit, I at last got the set to its destination—and commenced to connect to high-tension, low-tension and grid-bias—also loud-speaker, earth and aerial.

"Here let me say 'the receiving station'—(see back of Post Office licence, if you're not a pirate !) was located seven miles east of Wakefield, fourteen miles north of Doncaster and about thirteen miles south of Leeds. Roughly, the test aerial would be some thirty miles away from Moorside Edge—where the North Regional and National transmitters are built.

Trying out the Penta-quester—a member of the "A.W." Technical Staff experiences clock-face tuning for the first time

"After placing the valves in their respective holders I pressed the small toggle switch on the back of the chassis and—!!!—music. For a little while I played about with the various controls to get the 'feel' of the tuning, and also adjusted the tone control at the back to the required brilliance.

"My first impression was excellent, as the dial was literally 'full of stations.' The idea of my test was not so much to find *what* stations I could log as to find out how many, so I set the variable condenser at minimum, switched to medium waves, and commenced to move up the scale.

Ticking Off the Stations

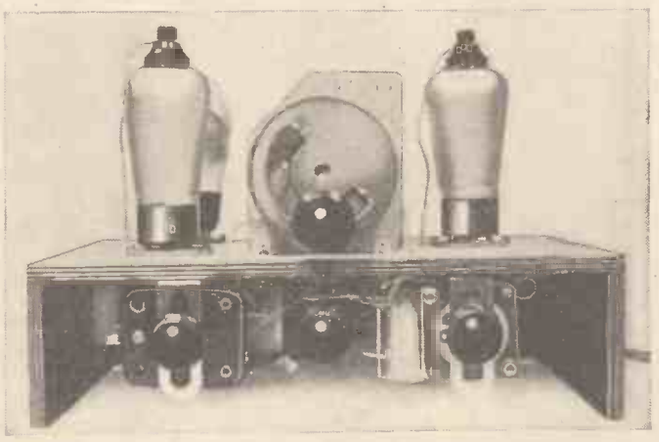
"For every station I got at anything like listening strength I made a tick on a piece of paper. Of course, such stations as my locals, Poste Parisien and a number of Germans, were too loud and I reduced them by means of the selectivity control or the reaction condenser.

"On I went to the top of the dial, logging each good station and found them all practically clear of each other. There was a spot of jamming on one or two stations, but I disregarded these transmissions. On counting up my 'bag,' I found thirty-seven stations on the medium waves.

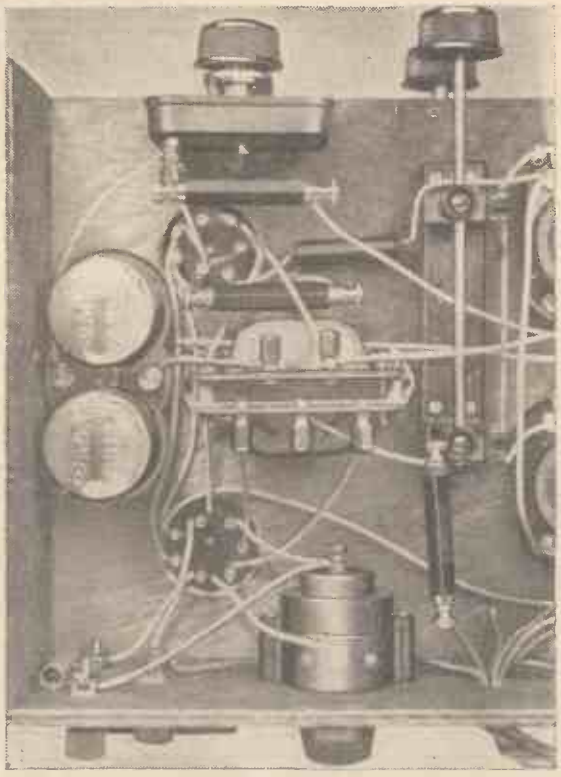
"I then went on to long waves and by the same procedure got seven good stations—forty-four in all.

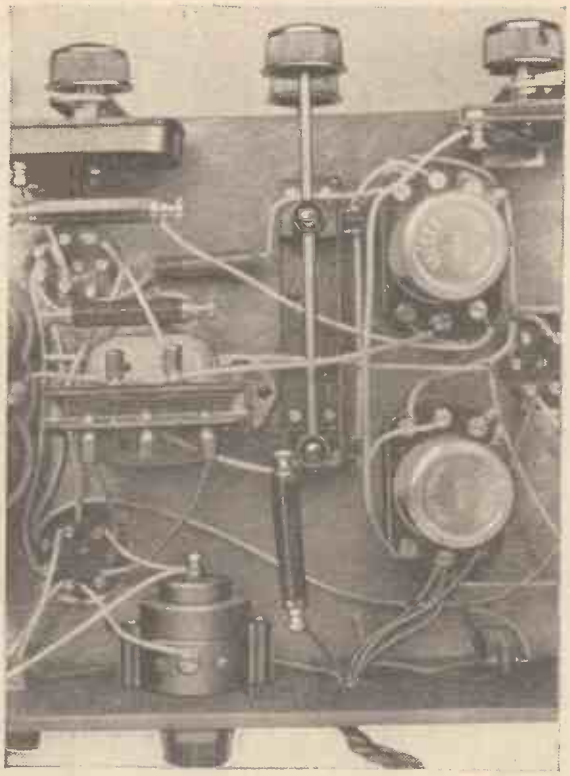
"In the words of the Tyke—'a reight champion artfit'."

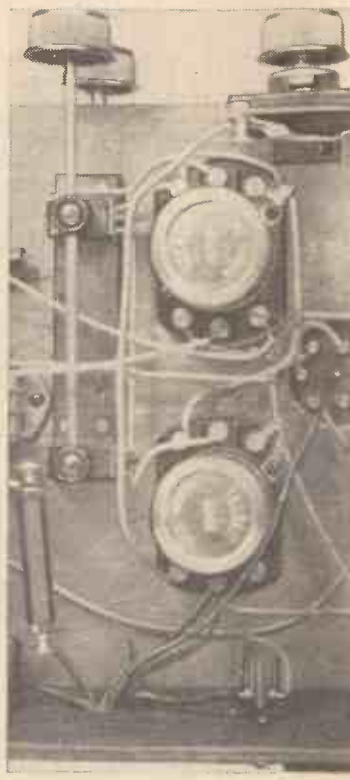
Well, there you have two reports from widely different parts of the country—from the East Coast and the heart of Yorkshire. These reports by independent amateurs prove that the Penta-quester is one of the best threes ever put out. Its "hot" circuit ensures a host of entertainment signals under the most adverse conditions.



Every claim we make for the Penta-quester in these pages will be substantiated when you build it !







These three photographs are close-up views of the under side of the Penta-quester chassis. They overlap to some extent, but all the details are very clear. up with the aid of a full-size blueprint there will be no difficulties as each lead is numbered in sequence

Using Your Free Blueprint to Build the PENTA-QUEST

We want to make the construction of the Penta-quester as simple as possible for every reader, and for this are presenting a genuine full-size blueprint of the set quite free to everybody who completes the application for 404. Send your coupon to-day and get your blueprint by return of post!

BEFORE you attempt to build your Penta-quester, you will not fail to send to us for *your* free full-size blueprint, will you? Because, with this full-size working layout of the components and wiring, your task is immensely simplified.

Not that the job of construction is difficult —even without a blueprint. Our various illustrations prove that it is, indeed, one of the cleanest three's of the chassis type yet turned out.

But, still, there is the gift horse—don't look it in the mouth!

We will plunge right into the sort of information you constructors really need—assuming that you have written for your blueprint and have received it. Assuming also—and this is quite important—that you have gathered together all the components as specified in our list on page 390.

Is Your Blueprint Ready?

Very good; all the parts on the table or bench and the blueprint spread out before you. No need to labour the description of the layout —that must surely be obvious to you from the layout and the pictures.

What we will do is to give you the gist of the notes we made when assembling the final set—the "posh" model you see illustrated, not the many and various "hook-ups" that were assembled before we finally reached the design that you will know as the Penta-quester.

A *wood-chassis* set. What does *that* mean? It means a set built on the modern-chassis principle, without the complication and difficulty of an all-metal construction. It means a very clean top layout, and a good grouping of components beneath the top side of the baseboard. It means short connections between vital parts—resulting in greater high-frequency efficiency, and therefore greater all-round performance.

What *is* a wood chassis, in practice? It consists of a flat piece of wood forming the baseboard or main section; two side pieces to hold the baseboard off the bottom of the cabinet; and sometimes, as in this Penta-quester, a back piece on which to mount subsidiary controls.

In the Penta-quester the main wood section is 12 in. by 8 in., and it is supported by two side pieces 3⅜ in. deep, with a similar depth of course for the back piece.

The top surface of the large piece of wood is metallised—has a coating of a special metal substance sprayed on to give it good conductivity. To all intents and purposes this piece of wood acts as a metal baseplate—but with the great advantage that it is easy to work upon.

The rest of the chassis structure is plain wood—*no metallising at any point*. And don't forget that the underside of the wood baseboard is not metallised, either. Some of our experimental models have metal all over the place, but gradually we have pruned it down so that in the final job only this one metal surface is necessary.

As you can see, the top layout is childishly simple. Just three seven-pin valve holders, a two-gang condenser and a terminal strip. For the valve holders you must have drilled out three circular holes of 1¼ in. diameter. These holes are already drilled if you buy your metal chassis from the people specified, but if you want to do the job yourself it is quite easy with a brace and centre bit.

Easy to Fix the Gang Condenser

The two-gang condenser is very easy to fit. You need two screws and a bolt with a nut on the end of it. That bolt is important. It is used to contact the metal screening of the tuning condenser with the earth system underneath.

To the underside of the bolt, when slipped through the little foot on the bottom of the condenser, put on a soldering tag, to which you later take a lead from earth. In this way the condenser shielding and moving plates are earthed.

You will find no difficulty about fitting the twin terminal block for the pick-up connections

If the set is wired

'ER

reason we
n on page

at the back of the chassis, though later we shall have a word or two to say on its connections.

Now let us take a look at the back of the chassis. Starting from left to right we have a row of fitments; the aerial and earth terminals one above the other at the extreme end, a toggle switch for on-off work, a good-sized hole to take the three lots of leads from the battery flexes, the knob for the tone control, and on the extreme right three terminals for the connection of the Q.P.P. loud-speaker, one terminal being for the centre tap connection.

Just a point here. If by chance you decide to make the chassis all metallised, don't forget that you must cut away the metallising surface for all the terminals except the earth. Also you will have to cut away round the hole that takes the spindle of the tone control, which is, technically speaking, alive.

We can at this stage conveniently take a look at the front arrangement. There is no actual front to the chassis, as the control spindles are mounted on brackets on the baseboard.

Looking below the surface of the baseboard, the centre knob is for the wave-change switch. To the right of that we have fitted the series aerial condenser. And to the left a differential type reaction condenser.

About this wave-change switch. The two switches are of the independent type, that is to say that they are not part of any coil assembly, nor are they in a single gang arrangement. This makes for simplicity, and you can easily see from the blueprint the exact positions of each of the two switches in relation to the coils.

For the sake of symmetry the spindle of the switches must be levelled up a little. You can do this with some ¼-in. plywood packing. This will bring them up to the level of the other two controls, that is the series condenser and differential aerial condenser. These two components are mounted so that their spindles come as far as possible up to the baseboard when slid in the holes of the adjustable brackets.

There are two screened coils, as you will have gathered. These are very easy to mount, but when you come to this job make quite sure that you mount them in such a way that the numbers 1, 2 and 3 face the front of the baseboard, as indicated in the blueprint. Many constructors slip up over this kind of thing—to their intense chagrin when they come to the wiring-up process.

Looking into our note-book, we find that there is nothing special to tell you about the fixing of the low-frequency transformer, nor of the twin high-frequency choke. The rest of the parts after these two consist of such things as resistances and condensers, which are wired in mid-air, so to speak.

The wiring is sufficiently rigid and strong to support them, and so there is no point in elaborately screwing them down, especially as that would tend to lengthen connections.

Insulate Your Connections!

The job of wiring is best done with the stuff we used—No. 20 gauge round-tinned copper. Over each length of wire you will slip insulated sleeving, so as to avoid the disagreeable effects of any two wires touching. We use 1-mm. sleeving, which goes over the No. 20 gauge wire nicely, without being loose when put on.

A certain amount of soldering is involved in the wiring up of the original model now before us as we write. The little condenser and some of the coil switching, for example. The rest of the connections are well clamped without soldering.

There is no need to be scared by soldering. It is a very simple process—and much easier in practice than trying to make fiddling small terminal pressure contacts.

The great secret of soldering is *cleanliness*. You must clean the soldering bit and the wires to be soldered. You must heat the iron just below red hot—but not actually red. Use the flux sparingly, and tin the bit frequently. Obey these simple but important rules and you can tackle any job of soldering with the utmost confidence.

When you are wiring up you will want to study the blueprint. Don't forget that you can obtain this priceless aid to home construction from us for just the cost of a stamp.

May we take the liberty of impressing upon you that the blueprint we shall send you upon receipt of your request is a real blueprint, for which we should normally charge you one shilling.

It is a contact print or photographic representation of our draughtsman's original drawing, not a cheap printed affair. It is accurate, checked and re-checked by experts. It gives the full dimensions appertaining to the layout of the components, and what is ever so important to the average constructor it gives you every wire in a numbered sequence.

Wiring Sequence

That is to say each lead is numbered from No. 1 up to No. 60, the first wire and the last. You cross out on the blueprint each wire as you make the corresponding connection in your own set, and then at the end of the job you have the comforting knowledge that you have neither missed out any of the vital wires nor put in any that should not be there.

While we are on this subject of wiring, it is a good plan to give you a few detailed hints jotted down as we went along. The valve holders, for example. You will see that the shanks of the holders come through the holes underneath the chassis, and that you make connections by pushing the bare ends of the connecting leads through the little eye holes in each leg, tightening up with the screws.

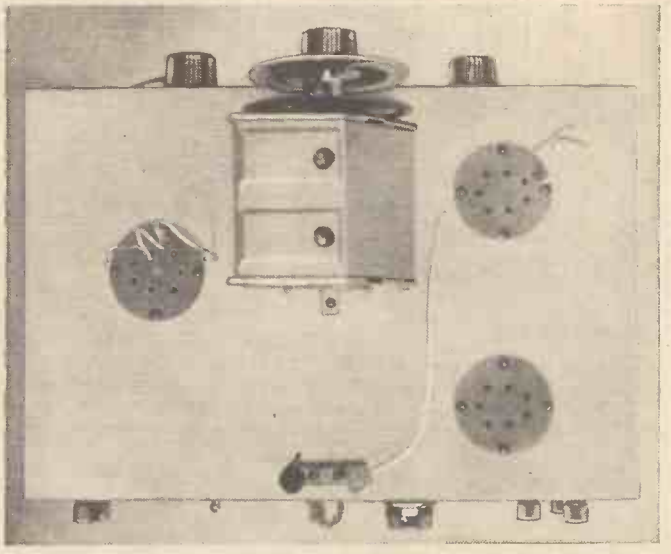
Note that the screen-grid connection of the high-frequency pentode used for the high-frequency stage has a flexible wire pushed in as well as the condenser wire from nearby. It is not a bad thing to solder the flex end to the end of the condenser connection, and push the solid wire thus formed into the little hole. That is not essential, so long as you make sure both wires do actually make connections.

Those Flexible Leads

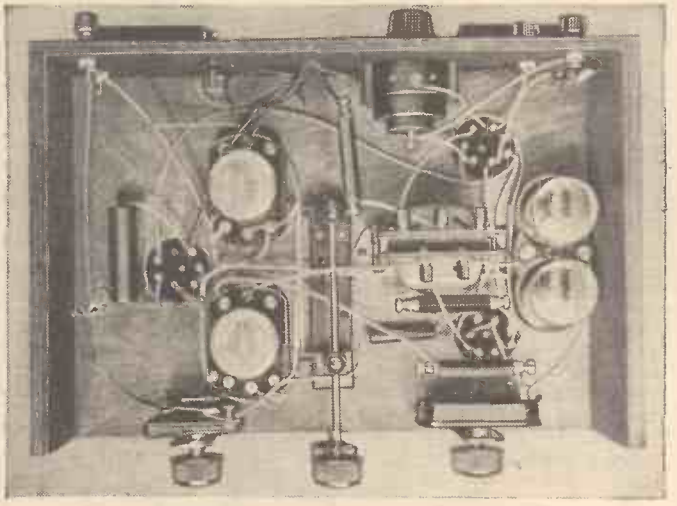
Another point. Two 6-in. long flexible leads must be taken up through the chassis baseboard to the anodes of the two high-frequency pentodes. One comes from the No. 6 point of the high-frequency coil and the other from the moving plates of the differential reaction condenser.

Furthermore, two wires have to be taken from the coils underneath the chassis to the two variable condensers in the two-gang assembly on the top. The two leads actually involved are from the No. 1's of the coils to the fixed plates of the condensers.

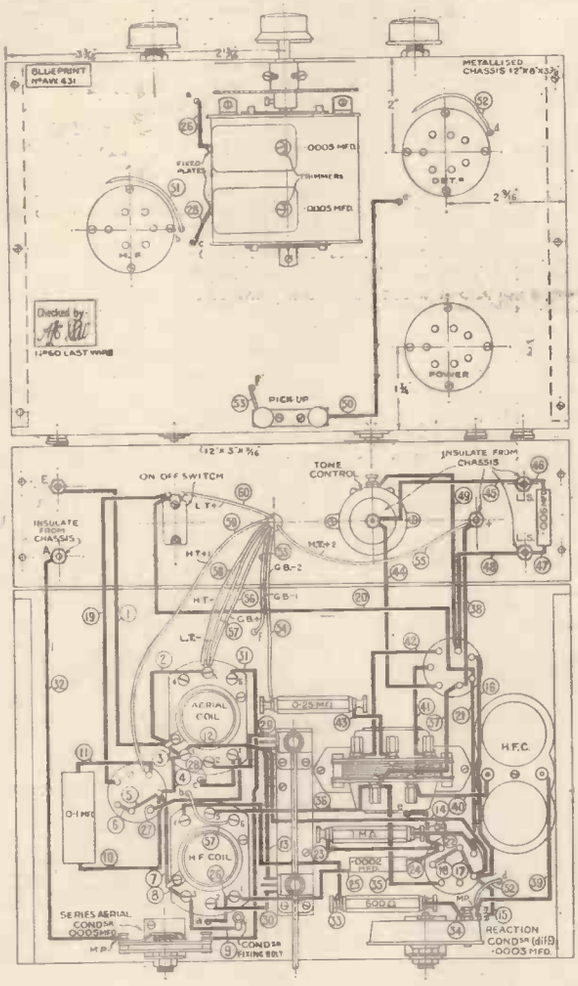
Apart from these you must not overlook



Note the clean appearance of the top of the Penta-quester chassis



Complete view of the underside of the chassis. Compare with the three views at the top of this page



This is a quarter-scale reproduction of the Penta-quester blueprint. A full-size blueprint will be supplied free to every reader who completes the application form on page 404

the wire for the connection of one of the pick-up terminals to the grid of the detector valve. This wire is taken over the top part of the baseboard for screening, and not underneath as you might imagine.

The other side of the pick-up terminal block is of course taken to the grid-bias battery by the usual flexible connection.

Talking of flexes, the rest of the wiring is done with flexible wires going from the various points under the chassis to the batteries, plugs and tags.

Well, that should bring you to the end of the most arduous part of the job of assembling the Penta-quester. Not at all difficult, is it? Just a plain straightforward construction that every amateur can tackle with gusto.

Using the Free Blueprint for the Penta-quester

Just a few final hints gathered as we went over the final checking of the blueprint may be of service to constructors.

See that toggle switch at the back? The inside is in no way connected to the outside metal portion, so that if you happen to use another type of switch and the back section of the chassis is metallised make sure that you don't connect your switch to earth.

When you fix the components to the underside of the chassis with wood screws do take care to see that the ends of the screws do not project through to the metallising surface on the top side of the baseboard, for the sake of safety—and of the appearance.

In the circuit diagram the coil switching is shown as a single three-point switch. This is done for simplicity, and that is actually what the switching comes to. But in practice of course there are two separate little two-point switches ganged together as already explained. These have one side of each common to earth, as you can see by following out the connection from the blueprint. We mention this point in case the apparent discrepancy may confuse you.

Those tuning coils are of the screened type, you will note. It is quite essential that the earthing tags fitted to the bases of the screens be earthed, as indicated again in the blueprint layout. If these are not earthed, or one is not earthed, there may be difficulty in ganging up the tuning condenser.

One last point: The valve holders used are of the seven-pin type. The high-frequency pentodes for the high-frequency stage and the detector have six connections, one pin of each being left blank. The connections used are: filament, control grid, screen-grid, suppressor grid and bulb metallising.

Next week we will go into the operation of the Penta-quester.

Actually the operation of this Penta-quester is delightfully easy. Tuning resolves itself into the adjustment of one knob—or you can work the minute hand of the clock-face dial.

Then your subsidiary controls are perfectly manageable. One knob for volume and another for the very smooth reaction. At the back the variable tone control.

To get the best results from the Penta-quester you need some form of external aerial and a good earth, but don't forget that local stations will come in on the cabinet device.

HOW THE STATIONS COME IN

Continued from page 388

Of course, when I had put the set through its paces I pulled the chassis out of the cabinet to "see the works." I was amazed at the simplicity of so excellent a performer. Those who build it will have the benefit of some very fine design work.

It must have taken hours and hours and hours of thought and experiment to turn out so simple a receiver with such a performance.

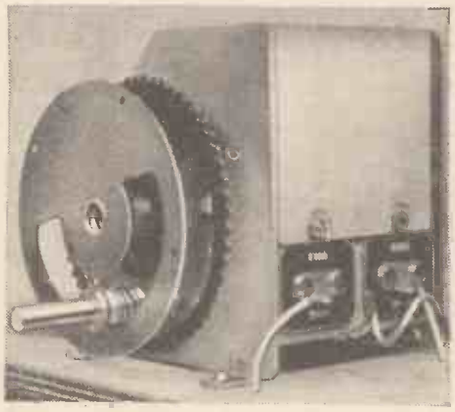
Having discovered that, so far as I could see, there was no decoupling in the ordinary sense of the word, I thought I would "make the begger howl." I fished out an old 150-volt battery that showed a bare 95 volts on load and connected it up. I got quite decent reception and no howls.

Hats Off to the Designers

I left the set running for an hour and then found that the pressure on load had gone down to 75 volts. Quality was pretty bad—but there were no howls. Good enough. I take off my hat to the designers.

The next "bad treatment" experiment was to see what would happen on a very poor aerial. I disconnected and earthed the main aerial and connected the set to 15 ft. of No. 22 cotton-covered wire, looped anyhow round the room, no portion being more than 4 ft. above the set. In fact a very bad aerial indeed.

With this ridiculous arrangement I expected nothing much. To my astonishment I had Fécamp, Frankfurt, West National, Poste Parisien and London Regional at good or full strength and North National, Hamburg, Scottish Regional, North Regional and Prague No. 1 faint but quite clear.



This view shows the sprocket wheel attached to the gang condenser for driving the special clock-face tuning dial

I had no time to test on a really good 30-ft. indoor aerial properly put up; but results should be, from this experiment, very good indeed.

I could not think of anything else that would really test the set except disconnecting the earth. Now my earth is a particularly good one and removing it has often a most disastrous effect on performance.

In this case it certainly did reduce volume on the long-wave stations, but seemed to have no effect at all on the lower half of the medium-wave stations and not much on the upper half until I got to over 500 metres, when volume was distinctly down.

Satisfied that "no earth" did not make for instability and had less than the expected effect on sensitivity, I twisted an earth connection round a main water pipe and tried that. Just twisted the wire, that was all. Reception seemed just as good as with my nearly perfect earth.

Finally—quality—my own particular pet subject. Well. It is not excellent. It is good. Since I do not know a battery-operated set that can be used in an ordinary house, by an owner not a millionaire, that gives "excellent" quality, I am content.

Most listeners will find little fault with the Penta-quester. The volume as well as the quality on local stations is very satisfying. At the price we cannot ask for more. No man who builds it need be ashamed of letting his critical friends hear it "do its stuff."

PENTA-QUESTER

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Criticisms by WHITAKER-WILSON

My Broadcasting Diary

Tuesday

SPENT a few minutes listening to Alfredo Campoli and his orchestra in the early part of the evening. Admit I didn't hear much, but enough to realise that the band is useful to radio. Something distinctive about it.

◆ ◆ ◆

Entertainment Hour didn't entertain me a bit. Switched off because everything was being crooned. Even the announcing. Sloppy, all of it.

Half an hour later remembered John Tilley was in the show; also Beryl Orde. Switched on again. More crooning. Found out afterwards I had missed Beryl.

John disappointed me. Surely he has given that Boy Scout stunt before? Want him to do something topical for next time.

This *Soft Lights and Sweet Music* stuff is no good. Mr. Austen Croom-Johnson will earn the pseudonym of *Croon*-Johnson if he's not careful.

Wednesday

LIKED *Playing the Game* very much. Some subtle lines. I admire Mr. Du Garde Peach's technique in writing these things. He has a delightful touch.

Bobbie Comber played with great restraint. Often I have had other thoughts about him, but he played so well to-night I feel I must say so.

Thursday

DIDN'T feel like hearing anything light. Looked about for something good. Found it in the Griller String Quartet. Only heard their last item but felt satisfied. Thank you, Grillers!

Good Friday

HAD to listen when I could to-day. My first was the City of Birmingham Orchestra and Hely-Hutchinson in Schumann's A minor piano concerto.

Hely-Hutchinson has greatly improved his playing lately. Hope he won't think that a patronising remark. Don't mean it that way, anyhow. Thought I detected a deeper interpretation than I have heard before from him.

On the whole, that concerto went extremely well. Have to put it that way because, after all, most of us music-cads know the thing backwards, and as it is played so often we, like the Western Brothers, get blasé over it.

◆ ◆ ◆

Glad the B.B.C. filled up the evening with the *St. John Passion* instead of doing *Parsifal*. So much more suitable.

How exquisitely Eric Greene sang! The Evangelist's part is not easy to sing, but he sang it *sensibly*. Gave me the idea he must have been reading the sentences over and over again to himself before he began singing them.

Of course, it may have been Bach's amazing setting of the words. Don't think it can be altogether that because he set a German version.

The whole performance was good but I simply can't get over Eric Greene's perfect artistry.

Saturday

LIKED that Gypsy-feller who told us about the various cures they use. Noted one omission. Nothing given to cure crooning. Salts of lemon might do it.

◆ ◆ ◆

The variety very good, on the whole. Arthur Prince rather overdid the schoolboy howler style with Jim's answers to questions obviously prepared for him. Overwise very funny.

Next time can Jim weep a few tears? He makes a delightful noise when they run down his nose.

The Western Brothers as good as ever. I liked their song "Aren't we all delightful people?" And, of course, "Play the Game." That might be a stock stunt for them, with new words each time. Hot topical, of course. What about it, you two Cads?

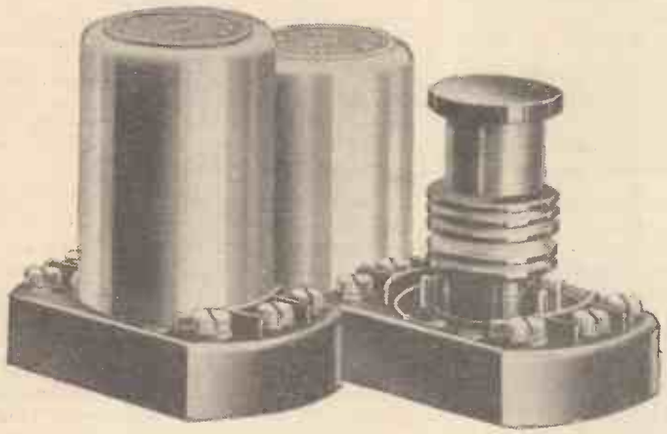
Elsie Waters made a good hit with her new song on the wives of broadcasters. She plagiarised Stanley Holloway admirably. Both were up to their usual standard in the Gert and Daisy episode.

Can Doris have "hiccups" again one day? She had an attack a long time ago. Quite good enough to revive after so long. Which, of course, is only another way of saying it is *very* good.

Easter Sunday

VERY suitable programmes all day. Only heard two violinists—Alberts Sammons and Sandler. No good comparing them. They set out to do different things. Thought Albert I might have avoided the Ireland sonata. Not good broadcasting stuff at all. Thought Albert II hit the mark very well with his light programme. Both fine violinists. Wonder how they would have got on playing each other's programme? Quite well, I expect.

TWO Telsen IRON-CORED SCREENED COILS are exclusively specified for the A.W. PENTA-QUESTER



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Twin Matched Coils - - - **17/-**

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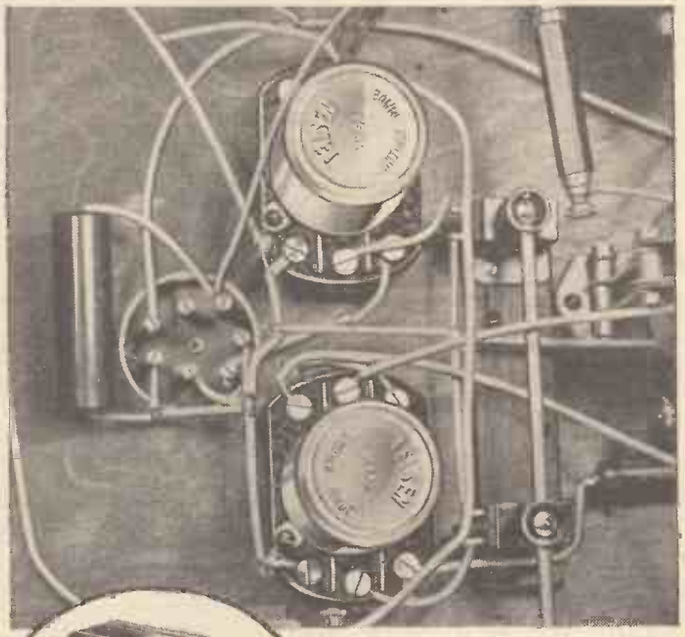


Above: View of the built-up PENTA-QUESTER showing the position occupied by the Telsen Iron-Cored Screened Coils.

On left: The Telsen .0003 Differential Reaction Condenser.

also TELSEN DIFFERENTIAL CONDENSER

Specified for the PENTA-QUESTER. Latest type, totally enclosed in dust-proof bakelite case, with flexible pigtail making positive contact to the spindle.

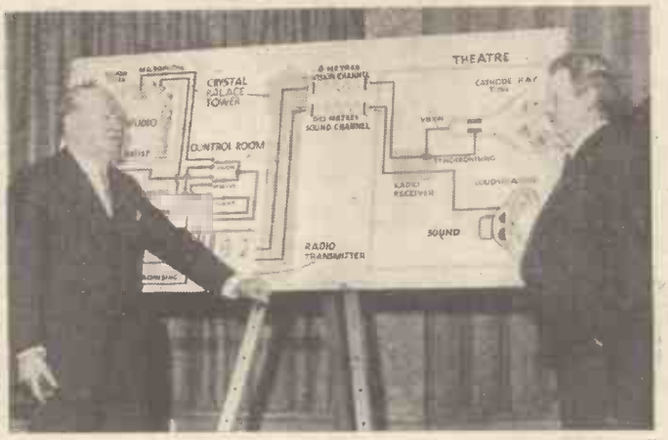
.0003 mfd. cap. 2/6.

TELSEN FOR EVERYTHING IN RADIO

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO. LTD., ASTON, BIRMINGHAM

All Ready to Look-in

By KENNETH JOWERS



Graphic Union photo

John Logie Baird (right) explaining with the aid of a large-scale diagram how television is transmitted from the Crystal Palace on short waves

CONNECTING the few components together is a very easy matter with a disc receiver. Join one side of the motor to one low-tension terminal, the other side to one side of the 2-ohm variable resistance, taking the remaining side of this resistance back to the second low-tension terminal.

Then connect the two points of the neon lamp to the two output terminals. Experiment with these two connections; one way will give a brighter light. There is nothing important about these simple connections but, of course, do not forget to fix them to the side of the chassis, otherwise they may foul the disc.

The receiver is now ready for operation, but before you can do very much you will have to

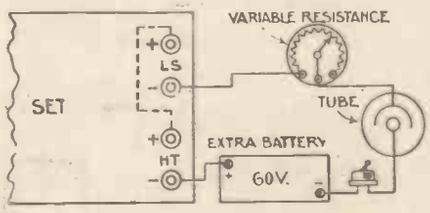


Fig. 1.—This is the most simple way of increasing the high-tension voltage should it be below 180 volts

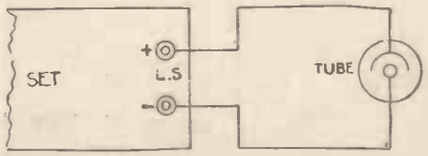


Fig. 2.—The simplest way of connecting the neon lamp to the radio receiver. Only to be used if the high tension is over 180 volts

decide whether your radio set is suitable to drive it.

Will the volume be sufficient? Is the output circuit correct? Will there be sufficient high tension?

These are all questions which must be considered. The minimum output really necessary to obtain results is between 1,300 milliwatts and 1,500 milliwatts. This means that practically any A.C. or D.C. pentode will do quite well and the majority of triode mains valves will give sufficient output.

It is the battery-set user who will have to check up receiver output. The largest battery output valve is the Mazda Pen220A and if you are reasonably close to a local station it is possible with about 160 volts high tension and adequate bias to obtain an output of 1,200 milliwatts, but this is barely enough to modulate the neon lamp.

If you can afford the high-tension current the remedy for this is quite simple. Use two Pen220A's in parallel and, if necessary, an intervalve transformer with a high ratio of 6 or 7 to 1.

If the maximum high tension available is only 160 volts, this will have to be increased by means of a booster (high-tension) battery of 60 volts and connected up in series with the neon lamp as in Fig. 1.

The striking voltage of a neon lamp is approximately 187, with a starting current of about 30 milliamperes, so you must remember to use a high-tension battery of the triple-capacity type.

If you are on D.C. mains and using a mains output valve, then the circuit of Fig. 2 will be more suitable, as the voltage applied to the output valve will be in the region of 200 volts. This voltage will be ample for the neon lamp, so that there will be no need to alter the existing output circuit in any way.

In practice the most suitable and universal circuit is as in Fig. 3, where a 1-to-1 output transformer is connected between the neon lamp and the loud-speaker terminals of the receiver. In this way you are able to connect in series with the neon lamp and the transformer secondary an additional high-tension supply of 180 to 200 volts. This voltage can be obtained from dry batteries, D.C. mains or from an A.C.-mains unit.

A circuit which is very popular and very adaptable is shown in Fig. 4 and is intended to be used when the radio receiver embodies choke-filter output.

Here again the additional high-tension supply can be obtained from dry batteries, D.C. mains or a high-tension mains unit from an A.C. supply.

A trouble which is difficult to overcome if you have not had an experience with television is a negative image. By this I mean a picture in which the light and shade are reversed. If you are using a radio receiver with two resistance-capacity stages, you must either use a third resistance-capacity stage or substitute for the second resistance-capacity stage a low-frequency transformer.

Reverse pictures are also obtained when the disc is put on the wrong way round. This is quite easy to remedy. Simply remove the disc from the spindle and replace it the other way round.

The speed of the motor is a vital point. It must be exactly synchronised with the transmitter and kept at that speed. If the motor is going too quickly the picture will tend to slide from left to right, or from right to left if going too slowly. The speed of the motor can be adjusted by means of the variable resistance before the transmission commences.

The most satisfactory way of doing it, however, is to make a 750-revolution stroboscope. This consists of eight spokes spaced equally over 360 degrees. Actually, I have painted these spokes on the disc itself, each spoke being about 2 in. long.

Start up the motor at about ten minutes to eleven, that is about ten minutes before the programme starts. If the house-lighting bulb is focused upon the stroboscope, as you vary the speed of the motor these spokes will appear to alter in speed until you come to a point when they appear to remain stationary. You then know the speed of the disc is exactly 750 revolutions per minute.

Holding the Pictures Steady

Without synchronising gear this speed may vary from time to time, but with a good-class motor you should be able to hold the pictures comparatively steady for the whole of the transmission.

If you are one of those fortunate people who have a large mains set with an output of 3 or 4 watts, then the pictures will be very, very good indeed, considering the cost of the apparatus, but for the man who uses a battery set with less than 1,500 milliwatts output, pictures—although being amusing—will not be good.

There are many points with this receiver that can be altered and there is plenty of scope for experiment. For example, if you intend to make a compact outfit, you may feel inclined to combine the radio receiver with the vision receiver, or to reduce space you could use a 16-in. disc, while the majority will in due course change over to the flat-plate type neon lamp, which gives such excellent pictures.

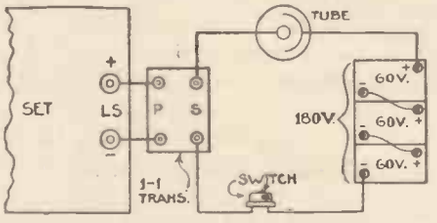


Fig. 3.—If you have a spare 1-to-1 output transformer this is a good way of connecting the lamp and the additional voltage to the radio receiver

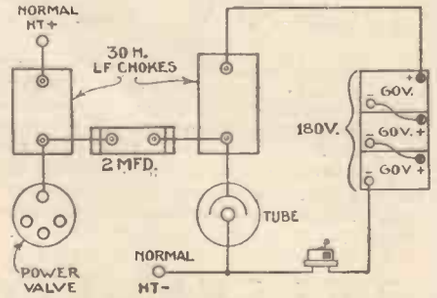


Fig. 4.—With choke-filter output a transformer is not required. This is the best way of connecting up the lamp and high tension

Broadcast Bells and Chimes

SCARCELY an hour of the day goes by without a broadcast of bells, chimes or carillons from somewhere in Europe!

This may seem to be a wild exaggeration; but if you verify it by actual reception or careful analysis of the published programmes, you will find that every hour or so, from early morning to midnight, one or more of the principal European stations can be found broadcasting bells or chimes.

Some of these bell broadcasts are daily time signals; some consist of recitals on noted carillons; others, again, are church peals preceding broadcast services, and so on.

Famous Peals and Chimes

From time to time on the wireless you can hear many of the most famous peals and chimes in the world. But of all these broadcast bells, undoubtedly the best known and best beloved is Big Ben. With the majority of Empire listeners, in fact, Big Ben seems to be *the* most popular performer in the programmes.

Indeed, one listener in India, evidently believing that one cannot possibly have too much of such a very good thing, wrote to the B.B.C. asking them if they would kindly broadcast Big Ben every quarter of an hour! Of course, one knows what he meant, but strictly speaking it is only at the full hour that the actual bell named Big Ben is struck; at the intermediate striking (quarter-past, half-past, etc.) the chimes alone are heard.

Big Ben weighs over 13 tons and is cracked. The crack developed some little time after the bell was cast, and had to be widened by filing to prevent the broken edges setting up unwanted vibrations. But the bell is not really quite as cracked as it sounded on the occasion of its first broadcast in 1923, when the sound of the striking was picked up somewhat imperfectly by a microphone rigged up on a near-by roof!

Nowadays, with the excellent permanent microphone arrangements in the tower, the sound is so perfectly realistic, when reproduced by a good set, that an Empire listener thousands of miles away can hear it almost as well as anyone standing in the street outside the Houses of Parliament.

Although Big Ben is the most famous of all broadcast time signals, other noted chimes in various parts of the Continent have become familiar sounds to many long-distance listeners.

Chimes from Copenhagen

The Copenhagen Town Hall chimes, for instance, form a regular feature of the programmes relayed by the Kalundborg high-power station. The chimes of the Potsdam Garrison Church, or those of Berlin Cathedral, find a place periodically in the Deutschlandsender programmes. Barcelona and Madrid each broadcast chimes several times daily. Silesian chimes can be heard from Breslau and Gleiwitz, Swiss chimes from Sottens, and so on.

On the occasions when the Ceremony of the Keys is relayed from the Tower of London, a clock chime features prominently in the broadcast. The ceremony and the descriptive commentary are so timed that the Tower clock is heard chiming and striking the hour of ten just before the sounding of the Last Post.

Some world-renowned carillons have been broadcast at various times; they include that of the carillon school at Malines, in Belgium, where carilloneurs are trained; and the Wellington War Memorial carillon that was in Hyde Park for some time before being shipped to New Zealand. Carillon recitals can be

Continued on page 407

Mystery of the Portuguese Stations

By JAY COOTE

AT present, Portugal is somewhat of a mystery. The official 20-kilowatt transmitter under construction at Barcarena, which was to be opened on October 5, 1933, and of which the building has been so delayed owing to conflict between the Portuguese Office of Works and the Ministry of Public Monuments—whatever that may be!—should be testing shortly on 476.9 metres. (Curiously enough, the Portuguese Press gives the wavelength as 431 metres.)

On the Heilsberg Channel

In the meantime, however, Radio Parede, which so far has been working on 396.7 metres, has taken up its correct position on 291 metres; whether it will stay there is another matter, as this is the Heilsberg channel. CT1AA, Lisbon, is no longer reported in the medium waveband, so it is to be presumed that it has closed down.

Although seldom mentioned, Portugal possesses three other privately owned transmitters which broadcast entertainments and news bulletins at regular hours.

They are CT1DR, on 216.6 (G.M.T. 11.00-12.30) and CT1DH, on 212.6 metres (G.M.T. 12.30-14.30, and from 22.00-24.30), also located at Lisbon. In addition, CT1RP, at Oporto works on 245.9 metres between G.M.T. 21.30 and 23.30 nightly. They are all of low power, but this does not mean necessarily that their transmissions cannot be picked up in the British Isles when conditions are favourable.

◆ ◆ ◆

Although at the lower end of the medium band the channels accommodate a welter of European and North American stations working on powers varying from 100-250 watts, it is a curious fact that on some nights it is possible to secure quite a number of even the smaller ones.

Spain, France and Belgium operate a shoal of stations on channels between 200 and 206 metres and from time to time you may log some very easily. Spain, by the way, has a crop of private broadcasters numbering over fifty; in fact, so many have been recently installed that the authorities are refusing licences to stations unless they are at least twenty miles distant from an existing transmitter. Twenty miles, mark you, and working at 100 watts!

An occasional search on these low channels frequently results in pleasant surprises; in fact, in the early hours between 2 and 3 a.m. it is possible to hear some North American broadcasts fairly clearly.

◆ ◆ ◆

The reception of transmissions from the United States and the Argentine Republic on the medium waves still continues to be good; on fair nights it is also on the cards that you may again capture WKAQ, San Juan (Porto Rico), and one or two of the more powerful Mexicans.

Jumping Wavelength Channels

You will notice that Radio Vitus and Radio LL, both in the French capital, still retain their old habit of jumping channels in order to find more favourable positions than their colleagues, and these transgressions at times cause widespread trouble.

Such an example is unfortunately catching as during the past few days Agen (France), equally dissatisfied with its allotted position on 200 metres, has worked respectively on 205.5 and 207.3 metres, and has suddenly slid into a region of the band where it has interfered on several occasions with Radio Toulouse, Strasbourg and even London.

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In the long waveband Vienna Experimental has reappeared on 1,250 metres, close to the channel on which it operated before the change-over in January.

New Station at Sofia

The new Sofia (Bulgaria) station was recently inaugurated and is now in daily operation on 352.9 metres, a channel common to Valencia and to some Norwegian relays. It is not a powerful broadcaster and I doubt whether its signals will be heard in Western Europe, inasmuch, as working to Eastern European time, it closes down before the others are off the air.

On the other hand, Radio Beograd (437.3 metres), which has been transferred to a more favourable site at Makis, near the Jugo-Slavian capital, and to which a more effective aerial system has been donated, may now come within our reach—although the power has not been increased materially. The authorities are contemplating a super station of some 50 kilowatts in the near future. Careful tuning to log Beograd will be necessary as it is sandwiched between Paris PTT and Sottens, with Frederiksstad working on a channel with only 2.5 kilocycles separation.

Short-wave Notes

By KENNETH JOWERS

THERE are certain parts of the country where short-wave reception is unusually good and results obtainable which cannot be achieved elsewhere. A particular spot that I have in mind is Luton, whence I have been receiving reports for quite a long while. Most of these reports are exceptionally good.

This week I had one from Mr. Jeeves, which is one of the best short-wave reports I have had this year. For example he logged W8XAL on 49.5 metres at midday. Although signal strength was poor and atmospherics very bad it was the first time that I have ever had a report of a 49-metre station being heard so early in the day. At 13.45 Sydney, on 31.28 metres, was picked up and held for almost an hour at good strength, to be followed by W3XAU, on the same wavelength at 14.45. From 20.00 to 21.30 W1XAZ, Springfield was heard giving a miscellaneous programme. At 23.00 W1XAL was logged giving a special programme to passengers on board the American liner *Washington* on its way to South America.

No Lack of Variety

In addition to all this the locals, such as Daventry, Moscow, Rome, Zeesen and sundry French stations, were all heard at varying strengths, so that no complaint could be made of lack of variety.

All of these stations were heard on a conventional screen-grid, detector and power receiver, and all during one day. I know these results are exceptional, but as I am continually getting reports that are *almost* as good it does show that the stations are there and can be picked up if you go the right way about it.

◆ ◆ ◆

I went to visit some friends last Sunday afternoon and, as usual, the conversation veered round to radio—more particularly the reception of American stations. I naturally made the suggestion that the only way to get American programmes decently was with a short-wave set.

Faults in an Adaptor

A friend of mine chimed in that he used to be of the same opinion after reading some of these notes and made for himself a two-valve battery-operated plug-in adaptor, consisting of a screen-grid high-frequency stage and leaky-grid detector.

This was plugged in to the detector stage of his broadcast receiver, which had two low-frequency stages so that he had the equivalent of a four-valve short-wave set. He had used all the very best components and had made the unit exceptionally well, but although he had had it two or three years all he had heard was two or three American stations, now and then, and a lot of morse.

The unit was duly brought out for me to examine. It certainly was made very well—Stratton condensers, low-loss valve holders and so on. At first sight it seemed excellent in every way, but there was a different tale to be told after it was put on test. The tuning condenser seemingly made a nasty noise every time you touched it.

But this was tracked down to the tuning dial and not to the condenser. The metal plate behind the dial intermittently touched the metal panel of the receiver. A new dial cleared this trouble and the receiver was then quite easy to tune.

Then came the coils. Neither of them was anywhere near the same inductance so that when you tuned in to, say, the 25-metre band one condenser was reading 70 degrees and the other

Continued on page 407

Sets of the Season Tested

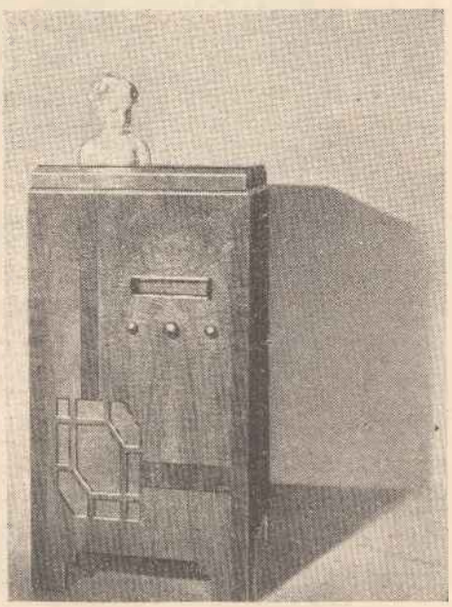
Telsen Radiogram

A FEW weeks ago we were bold enough to forecast a still greater increase in popularity for the combined gramophone and radio instrument. The only proviso that we made was that the price must be reduced to a more reasonable level to bring such receivers within reach of the average listener.

We have been of the opinion for a long while that there has been far too big a difference in price between a standard radio receiver and the combined radio and gramophone. This has caused far too many listeners to put up with the inconvenience of a gramophone pick-up as a separate unit.

High-class—But Inexpensive

So far this year has seen the introduction of quite a number of radio gramophones at quite reasonable figures; and now the introduction of the new Telsen model 1240, a really high-class and at the same time inexpensive radiogramophone, sets a new standard for its price. This new Telsen model will do a lot to popularise the gramophone pick-up and the pedestal type of radio cabinet.



The attractive appearance of the new Telsen radio gramophone is well shown by this special "A.W." photograph

The finish of a pedestal-type cabinet should, if anything, be better than that of the normal table type of set because it is more imposing and in addition to being merely a radio set is regarded in many homes as a standard piece of furniture.

Size a Happy Mean

It is not possible adversely to criticise the design of cabinet or the workmanship of the 1240 receiver. A happy mean has been struck in the size, as it is not bulky but at the same time space has not been cramped so as to make the cabinet look small and, perhaps, cheap.

Highly-polished grained walnut inlaid with a similar wood of a darker tone gives a very pleasing finish. A weak point with this type of receiver is often the design of the lid, but with the Telsen set this part of the cabinet has been finished off very tastefully.

The frontal design is pleasing, consisting of a simply designed fret in the left-hand bottom corner, a horizontal wide-vision escutcheon and three control knobs. On the right-hand side are two more switches, one a wave-change, with long and short waves calibrated on the switch plate and the other a radiogramophone switch which puts the pick-up in or out of circuit as desired.

Simplicity of control, a feature that cannot be too highly stressed has, in this case, been given special consideration. There are only three active controls—the master tuner, which is in the centre under the escutcheon, a dual volume and a simple reaction control.

Dual-purpose Volume Control

When the gramophone pick-up is used the one volume control will be found to operate on both radio and gramophone. This is quite a useful arrangement because you can adjust the volume with the pick-up in action and the cabinet lid down. On some receivers of this kind every time the volume has to be adjusted you have to lift up the lid to make any adjustments and quite often, in doing so, upset the pick-up.

The tuning control actuates a knife-edge pointer which covers a tuning scale calibrated in wavelengths between 200 and 535 metres on the medium waves and 835 and 2,040 metres on the long waves. This tuning dial is illuminated by twin dial lamps, which can be replaced, if necessary, in a matter of seconds. The reaction control is quite normal. It is simply used as a signal booster or as an aid to selectivity.

At the rear of the chassis will be found the mains connections; sockets for additional loud-speakers, external mains aerial and an earth socket. The receiver is sent out with valves packed separately, but they can all be plugged in the correct holders without any trouble, as the four valve holders are in line at the rear of the chassis.

The first valve is a straight grid-base high-frequency pentode and is on the extreme left at the back. It is followed by a second high-frequency pentode—used as a detector—then a Mazda AC/S/Pen and finally a Mullard D.W.3. full-wave rectifier.

Behind the rectifying valve is a black strip marked "input", containing three sockets marked with varying voltages. This voltage adjuster is provided for matching up the primary of the receiver with the mains voltage.

Between valves 2 and 3 there is a hum adjuster. Should there be any noticeable hum when the receiver is working, vary this resistance by means of a small screw-driver, until you find a position where the hum is reduced to a negligible quantity.

The Circuit

For the technical listener the most important part of a receiver is the circuit and the system employed to obtain the maximum amplification coupled with good selectivity and quality.

The aerial is bandpass coupled to a fixed grid-base high-frequency pentode, which is in turn coupled to a similar valve as a detector. To obtain the maximum amplification from the high-frequency detector it is necessary to use a very closely matched resistance-capacity circuit, when the output is sufficient fully to load a power pentode.

The output valve in this receiver is a Mazda AC/2/Pen, which, with only a small input of 2.6 volts, gives an undistorted output of 3,400 milliwatts. In practice this means

IN A NUTSHELL

Makers : Telsen Electric Co., Ltd.

Model : 1240 Radio Gramophone.

Price : £18 18s.

Valve Specification : High-frequency pentode stage (Mullard SP4), high-frequency pentode detector (Mullard SP4), super-power pentode output (Mazda AC/2/Pen), and full-wave indirectly-heated valve rectifier (Mullard 1W3).

Power Supply : A.C. mains, 200 250 volts, 50-60 cycles.

Type : Upright pedestal model radio gramophone.

that even the weak Continental stations which might not be heard with a standard output valve can, with this set, be listened to comfortably on the loud-speaker.

The combination of resistance-capacity coupling, pentode output and a carefully matched moving-coil loud-speaker give quality well above the average standard.

Those who live in flats or are unable to erect an external aerial need not be deterred from buying this type of receiver because after a very brief test with the mains-aerial attachment and no earth connection we were able to log over twenty-eight stations, without having to fiddle with the tuning controls.

Aerial Length Needed

Under normal conditions this log could have been increased considerably, while with an external aerial the maximum number of stations received depends solely on local conditions. A receiver of this kind needs an aerial having a total length of about 45 to 50 ft.

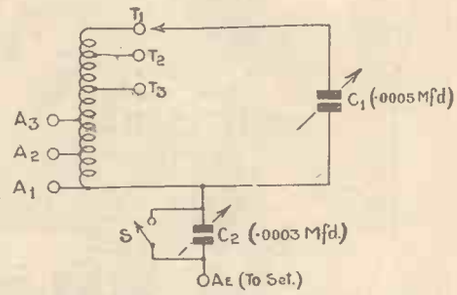
A separate loud-speaker can be fitted in the kitchen or any other rooms and connected up to the two terminals marked "L.S." on the back of the chassis. The point to remember here is that unless you are going to use an additional output matching transformer the loud-speaker should be of the high-resistance type.

The gramophone pick-up will give excellent reproduction with absence of chatter, providing the correct type of needle is used.

Another view of the new Telsen radio gramophone, which has a very well-finished cabinet

A Simple Unit for Increasing Selectivity

Try It if You Are Troubled by Interference



Arrangement of simple unit for increasing selectivity

THE following small unit, which can be used in conjunction with any straight set, will be found very useful for suppression of interference on the medium waveband, due to lack of selectivity of the set itself.

The components required are :—

.0005-microfarad variable condenser (preferably with slow-motion control).

.0003-microfarad variable aerial series condenser with cut-out switch which comes into operation when the condenser is at maximum capacity.

Coil of 100 turns of No. 28 gauge enamelled wire on 2-in. diameter former with tappings at every twenty turns.

These components are arranged in the circuit given on this page, and can be mounted in any suitable manner.

When no interference is experienced, aerial plug can be left in A_1 and condenser C_2 at maximum. In this position switch S is closed and therefore neither the wavetrap nor the series aerial condenser is in operation.

Minimising Interference

Mild forms of interference can usually be suppressed by reducing input to set by varying C_2 and then bringing volume up to normal again by use of reaction control on set. Should the interference be too strong for this to be sufficient then the wavetrap is brought into operation by plugging aerial into A_2 or A_3 and turning condenser C_1 until interference is minimised.

Slight readjustment of C_2 and set controls may also be necessary in order to secure the best results. Alternative tappings, T_1, T_2, and T_3, for condenser connection can be provided with advantage. Experience will determine which one will be most satisfactory at any particular part of the waveband. A. H. T.

Listeners' Letters

THE LUCERNE RANGER

To the Editor, AMATEUR WIRELESS.

I HAVE just finished making up the Lucerne Ranger, and feel I must write and congratulate you on a three-valver which will no doubt meet the needs of thousands of enthusiasts both as to performance and price.

H. COLLIS.

Dalston, E.8. [1054

SCHOOLBOYS' TELEVISION

CONGRATULATIONS on the schoolboy features. I think it a bright idea. Too long have the boys been neglected. You have given them a break by presenting those entertaining, simple, yet instructive articles. They needed such a start.

One day the lads will be men, and thank you for your guidance from the bottom of the wireless educational ladder.

Woolworth's should now stock their shops with those cheap lenses, not forgetting to indicate that they are very useful for building boys' television sets.

If wireless traders are "alive," they will not miss the opportunity of retailing the components mentioned in the articles. They also could help to let the boys know that someone has at last taken them under the wireless wing.

"A VERY OLD BOY."

Leyton, E.10. [1055

"THE EXPERIMENTERS" APPRECIATED

THERE is no doubt that the Experimenters have got IT. I look forward to their articles just as much as I do to my breakfast, and I am one of those mortals who can't start the day without a good meal.

They have certainly put me right on many points. I wish that we had had them in 1922; I certainly needed tips then, when I was labouring—that's the word—with miles of wire making coils, etc.

I won't waste any more of your time. Thanks for a good paper.

ERIC WEBSTER.

Guernsey, C.I. [1056

CHEAP HIGH-TENSION BATTERIES

IT is with admiration that I read Thermion's determined campaign against so-called "cheap" high-tension batteries.

A correspondent in reply to my remarks of a few weeks ago *re* quality and cheap batteries states that the question of quality is irrelevant to the discussion. On the contrary, it is in the highest degree relevant.

Surely the extent to which one is satisfied to listen to reproduction limited by high resistance and very low voltage in the high-

tension supply is governed by the listener's ability to understand and tolerate distortion.

It is not sufficiently stressed in these days that really good reproduction *is* possible with a battery receiver.

In conclusion, I would say to listeners that the finest method is to compare the receiver starved of high-tension current with one working with a really generous supply and a good large undistorted output, and you will dump the cheap (?) battery, which is responsible for a great deal of bad reproduction.

In A.D. 1934 we should listen to something better than the horrible noises oft-times masquerading as speech and music.

F. SMITH.

*London, S.E.*13. [1057

MELODY RANGER RESULTS

LAST March I built the Melody Ranger. Since then I have received programmes from Canada, America, South America, Africa, Russia, and the whole of Europe.

Some of the most notable programmes received from America were an account of the crash of the Akron by a survivor; General Balbo's landing; Commander Settle's attempt on the Stratosphere; the Harmsworth Trophy race of last year; Betty Nuthall; and The Street Singer.

The amateur transmitters are also well received.

W3XAL (16.87 metres) has been received on quite a number of occasions in the afternoon. On the medium and long waves America has been logged about a dozen times in one night, besides the whole of Europe and Croydon weather reports to aeroplanes. These have all been received on a moving-coil loud-speaker.

Thanking you for a really fine set.

A. CHAPPLE.

Cardiff. [1058

Medium-wave Broadcasters

This week we give details of all the important European medium-wave stations.
Next week we shall publish a list of short- and long-wave transmitters.

Metres	Kilo-cycles	Station and Call Sign	Country	Power (Kw.)
201.1	1,492	Bordeaux-Sud-Ouest	France	.3
203.5	1,474	Plymouth	Great Britain	.3
203.5	1,474	Bournemouth	Great Britain	1
204.2	1,469	Pecs	Hungary	1.25
206	1,456	Fecamp	France	20.0
207.1	1,448.5	Agen	France	.5
208.8	1,438	Miskolcz	Hungary	1.25
209.5	1,432	Beziers	France	1.5
209.9	1,429	Newcastle	Great Britain	1
211.3	1,420	Tampere	Finland	1.2
215	1,395.4	Radio Lyon	France	.7
218.2	1,375	Basle, Berne	Switzerland	.5
221.1	1,357	Turin (2)	Italy	.2
222	1,351	Dublin (2)	Irish Free State	1.2
222.6	1,348	Koenigsberg	Germany	.5
222.6	1,348	Milan Vigentino (2)	Italy	7
224	1,339	Montpellier	France	.8
224.1	1,338.8	Lodz	Poland	1.7
225.6	1,330	Hanover and other Hamburg relays	Germany	1.5
230.2	1,303	Danzig	Germany	.5
231.8	1,294	Linz and other Vienna relays	Austria	.5
233.5	1,285	Aberdeen	Great Britain	1
235.1	1,276	Stavanger	Norway	0.5
236.8	1,267	Nurnberg	Germany	2
238.5	1,258	San Sebastian (EAJ8)	Spain	.6
238.5	1,258	Rome (III)	Italy	1.0
240.2	1,249	Juan-les-Pins	France	2.0
241.9	1,240	Cork	Irish Free State	1
243.7	1,231	Gleiwitz	Germany	5
245.5	1,222	Trieste	Italy	10
247.3	1,213	Lille PTT	France	1.4
249.2	1,204	Prague Strasnice (2)	Czechoslovakia	3
251	1,195	Frankfurt-am-Main and relays	Germany	17
253.2	1,185	Kharkov (2)	U.S.S.R.	35
255.1	1,176	Copenhagen	Denmark	10.0
257.1	1,167	Monte Ceneri	Switzerland	15
259.1	1,158	Moravska-Ostrava	Czechoslovakia	11
261.1	1,149	London National	Great Britain	50
261.1	1,149	West National	Great Britain	50
263.2	1,140	Turin (1)	Italy	7
265.3	1,131	Hoerby	Sweden	10
267.4	1,122	Belfast	N. Ireland	1
267.4	1,122	Nyiregyhaza	Hungary	6.25
269.5	1,113	Kosice	Czechoslovakia	2.5
269.5	1,113	Vitus (Paris)	France	1.0
271.7	1,104	Naples	Italy	1.5
271.7	1,104	Madona	Latvia	15.0
274	1,095	Madrid EAJ7	Spain	3.0
276.2	1,086	Falun	Sweden	.5
276.2	1,086	Magyarovar	Hungary	1.25
276.2	1,086	Zagreb	Yugoslavia	.75
278.6	1,077	Bordeaux PTT	France	13
280.9	1,068	Tiraspol	U.S.S.R.	10
283.3	1,059	Bari	Italy	20
285.7	1,050	Scottish National	Great Britain	50
288.5	1,040	Leningrad (2)	U.S.S.R.	100
288.5	1,040	Rennes PTT	France	1.3
291	1,031	Heilsberg	Germany	60
291	1,031	Parede	Portugal	5.0
293.5	1,022	Barcelona (EAJ15)	Spain	2.0
296.2	1,013	North National	Great Britain	50
298.8	1,004	Bratislava	Czechoslovakia	14
301.5	995	Huizen	Holland	20
304.3	986	Genoa	Italy	10
304.3	986	Cracow	Poland	1.7
307.1	977	West Regional	Great Britain	50
309.9	968	Grenoble PTT	France	3.0
312.8	959	Poste Parisien, Paris	France	60
315.8	950	Breslau	Germany	60
318.8	941	Algiers	North Africa	13
318.8	941	Goeteborg	Sweden	10
321.9	932	Brussels (2)	Belgium	15
325.4	922	Brno	Czechoslovakia	35
328.6	913	Limoges PTT	France	.7
331.9	904	Hamburg	Germany	100
335.2	895	Radio Toulouse	France	8
335.2	895	Helsinki	Finland	10
338.6	886	Graz	Austria	7
342.1	877	London Regional	Great Britain	50
345.6	868	Poznan	Poland	17.0
349.2	859	Strasbourg	France	15
350.7	855.3	Porsgrund	Norway	.25
352.9	850	Valencia	Spain	3.0
352.9	850	Bergen	Norway	1.0
356.7	841	Berlin	Germany	100
360.6	832	Moscow (4)	U.S.S.R.	100
362.7	827.1	Radio LL, Paris	France	1.2
364.5	823	Bucharest	Roumania	12
368.6	814	Milan	Italy	50
373.1	804	Scottish Regional	Great Britain	50
377.4	795	Lwow	Poland	21.5
377.4	795	Barcelona (EAJ1)	Spain	8
382.2	785	Leipzig	Germany	120
386.6	776	Toulous PTT	France	.7
391.1	767	Midland Regional	Great Britain	25
395.8	758	Katowice	Poland	16
400.5	749	Marseilles PTT	France	2.5
405.4	740	Munich	Germany	100
410.4	731	Seville	Spain	1.5
410.4	731	Tallinn	Estonia	11
410.4	731	Madrid (Espana)	Spain	1.0
415.5	722	Kiev	U.S.S.R.	36
420.8	713	Rome	Italy	50
426.1	704	Stockholm	Sweden	55
431.7	695	Paris PTT	France	7
437.3	686	Fredriksstad	Norway	0.7
437.3	686	Belgrade	Yugoslavia	2.8
443.1	677	Sottens	Switzerland	25
449.1	668	North Regional	Great Britain	50
455.9	658	Langenberg	Germany	60
463	648	Lyons PTT	France	15
470.2	638	Prague (I)	Czechoslovakia	120
476.9	629	Trondheim	Norway	1.2
483.9	620	Brussels (I)	Belgium	15
491.8	610	Florence	Italy	20
499.2	601	Sundsvall	Sweden	10
499.2	601	Rabat	Morocco	6
506.8	592	Vienna	Austria	100
514.6	583.2	Riga	Latvia	15
522.6	574	Muhlacker	Germany	100
531	565	Athlone	Irish Free State	60
539.6	556	Beromunster	Switzerland	60
549.5	546	Budapest	Hungary	120
559.7	536	Wilno	Poland	16
569.3	527	Viipuri	Finland	13.0
569.3	527	Ljubljana	Yugoslavia	7
578	519	Hamar	Norway	.7
696	431	Oulu	Finland	1.2
726	413.5	Boden	Sweden	.6
748	401	Geneva	Switzerland	1.5
748	401	Moscow	U.S.S.R.	20.0
765	392	Ostersund	Sweden	.6
824	364	Smolensk	U.S.S.R.	10.0
840	357	Budapest (II)	Hungary	3.0
845	355	Rostov (Don)	U.S.S.R.	20.0

NOTE:—The following wavelengths are common to several transmitters: 206 m. (1,456 kcs.); 207.3 m. (1,447 kcs.); 208.6 m. (1,438 kcs.); 211.3 m. (1,420 kcs.); 218.2 m. (1,375 kcs.); 221.1 m. (1,357 kcs.); 225.6m.214 m. (1,330 kcs.); 228.7 m. (1,312 kcs.); 235.1 m. (1,276 kcs.); 236.8 m. (1,267 kcs.); 251 m. (1,195 kcs.).

Broadcast Bells and Chimes

Continued from page 399

heard periodically from several of the Continental stations, Beromünster being notable.

Church bells of every magnitude are heard on the wireless from time to time. On one occasion they may be the homely peal of some small village church, and on another the bells of some great cathedral or abbey in the midst of a huge and bustling city.

Round about the end of 1933 and the beginning of 1934 there were some striking contrasts in this way. Shortly before Christmas, for instance, you may have heard the rural peal from the little church of St. Hilary, ringing out in the silence of the Cornish countryside on the occasion of the annual Nativity play. Then, of course, on Christmas afternoon there was another village church peal—the Bredon bells, echoing at the foot of the famous Bredon Hill in Worcestershire.

Above the Rumble of London's Traffic

On New Year's Eve, by way of contrast, there was the majestic peal from Westminster Abbey crashing out above the rumble of London's traffic, then the Parliament chimes and Big Ben striking midnight, and finally the bells of Canterbury Cathedral.

Between these two extremes, on Christmas Eve listeners in five continents heard a triumph of bell broadcasting—the world-wide relay of the bells of the Church of the Nativity at Bethlehem.

A previous New Year's Eve—back in 1927, if I remember rightly—was the occasion of another interesting bell broadcast. On that night Big Peter made its microphone *début* from York Minster. Big Peter is one of the largest existing bells in England, weighing over 10 tons.

The New Year's Eve in question was the thirteen-hundredth anniversary of York Minster, and the thanksgiving service held in this connection was followed by Big Peter striking midnight. The ordinary peal of bells also featured in the broadcast.

On another occasion some years ago, the Curfew Bell from York was included in a miscellaneous programme under the title of "Round About the North."

One can hardly think of bell broadcasts without calling to mind the playing of hymn tunes on the bells of St. Martin-in-the-fields immediately before the Sunday evening broadcast service.

Some little time ago one of the German stations broadcast a talk (or possibly it was a series of talks—I forget, now) on "Bells Through the Centuries," illustrated by actual examples of church chimes in Germany.

The B.B.C. might well adopt a similar idea. Many listeners in this country, as well as those in distant parts of the Empire, would undoubtedly be interested in a talk or two on British bells, with relays of chimes and peals from various famous belfries and clock towers by way of illustration. W. OLIVER.

Short-wave Notes

Continued from page 401

30. I put two turns on one of the coils and that brought the 25-metre band round to about 30 degrees on both dials and the 19-metre band at about 8 or 9 degrees.

When I tuned in the only strong signal going, I found that the reaction suffered from chasing. I mean by that that you could vary the wavelength to which the unit was tuned by altering the reaction. This made careful tuning impossible.

I then had another look at the reaction coil and decided to space the reaction winding in the same way as the grid winding. This did the trick. When the reaction condenser was varied it did not alter the grid tuning more than a fraction of a degree.

By this time the receiver was getting a bit more shipshape and I knew whereabouts the various stations should be so I made a pencil note of the tuning positions of the five commercial short-wave bands and started to search through very carefully. Within a very few minutes I had logged W8XK, W2XAD, Rome, Copenhagen, and a phone station from Beunos Aires, but the strength was not good. The only station that was really suitable for the loud-speaker was Daventry.

Aerial Alterations

Then I had a look at his aerial. It seemed quite all right, but the lead-in trailed along the picture rail for quite a long way. I removed the whole set to within a foot or so of the lead-in tube. Immediately it put up the signal strength 25 to 30 per cent., and during the course of the next hour or so some fifteen or twenty long-distance stations were picked up at good strength.

It should interest all those sceptics that write to me so frequently that a little attention to detail will most probably show a different state of affairs.

◆ ◆ ◆

I have just been looking at an American Philco catalogue of this year's sets, and I was surprised to see how many of them tune from 13 to 575 metres, instead of just on the medium waveband. Large family radiograms are all the same in this respect.

Americans Ahead of Us

The Americans are certainly ahead of us in the design of short-wave sets, and the use of these sets by the man in the street is bound to increase interest in short-wave reception. Unfortunately in this country one is supposed to find out these things by listening to the set manufacturers' words of wisdom or by reading their catalogues.

This year there does seem to be a tendency to produce short-wave sets, even if they are intended for our Colonies.

◆ ◆ ◆

Judging from readers' reports and coupled with my own experiences, it looks as if this season must be given the palm for consistent reception conditions. Most of the old favourite stations have been on tap at the usual times, although one or two of them have been missing. One thing about the missing is that they do not turn up at odd intervals.

Reception of Sydney has not been so simple for many years. Before breakfast on Sunday morning with a good set reception has been 100 per cent. reliable, and, what is more interesting, is that the afternoon session has also been worth listening to and plenty of readers report reception up until 19.00.

Notes and Jottings

OWING to pressure on our space this week, "The Experimenters" are unable to continue their series on high tension from the mains. We hope to see them back again next week.

◆ ◆ ◆

The Croydon Wireless Society is taking a keen interest in television. A lecture on the cathode-ray tube and its application to television was recently given.

◆ ◆ ◆

Glasgow readers will be interested in the Glasgow and District Radio Club. Applications for membership should be addressed to the secretary, Henry Duff, of 90 Budhill Avenue, Shettleston, Glasgow, E.2.

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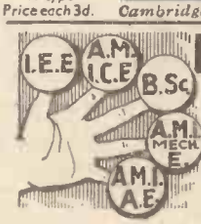

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1934 A.C. Century Super (Superhet)	AW425
James Super-straight Six (2SG, D, LF, Push-pull)	WM339

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

Super Senior (Super-het)	WM256
Seventy-seven Super (A.C. Super-het)	WM305
Q.P.P. Super 60 (Super-het)	WM319

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

Amateur Wireless Blueprint Dept., 58-61 Fetter Lane London, E.C.4

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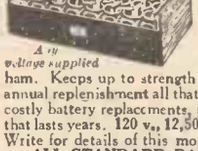

Listener after listener tells how the wonderful Standard Wet Battery puts a stop to H.T. troubles for good. **"I have had battery in use on various sets for 2½ years and think it best solution to H.T. problem,"** writes A.R.P., of Dazenham. Keeps up to strength amazingly, recharges itself overnight, annual replenishment all that is necessary. Decide to-day, no more costly battery replacements, purer tone, better reception and H.T. that lasts years. **120 v., 12,500 m.a. £2 complete, carriage paid.** Write for details of this money-saving Battery.

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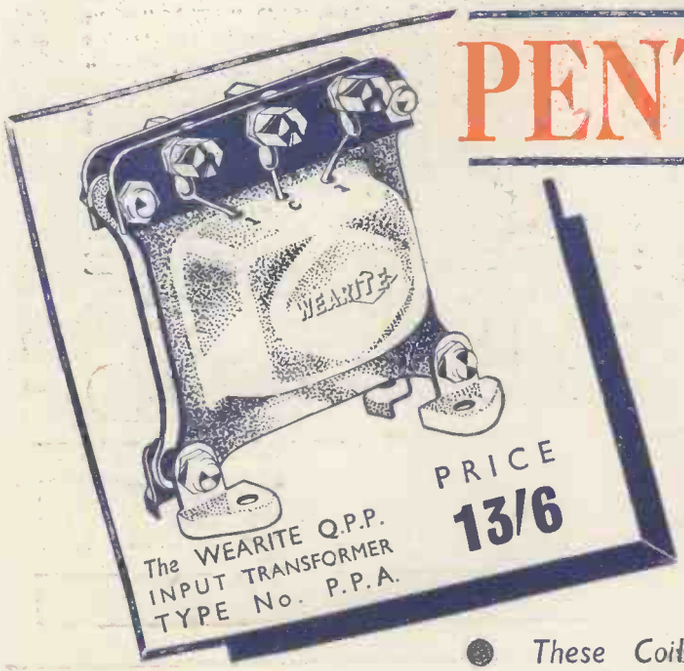
INFORMATION BUREAU COUPON

Available until Saturday, APRIL 21, 1934

Printed for the Proprietors and Publishers, BERNARD JONES PUBLICATIONS, LTD., 58-61 Fetter Lane, London, E.C.4, by The Sun Engraving Co., Ltd., London and Watford. Sole Agents for South Africa: CENTRAL NEWS AGENCY, LIMITED. Sole Agents for Australia and New Zealand: GORDON & GOTCH (A'SIA), LIMITED.

Saturday, April 14, 1934

An ESSENTIAL SPECIFICATION for the PENTA-QUESTER



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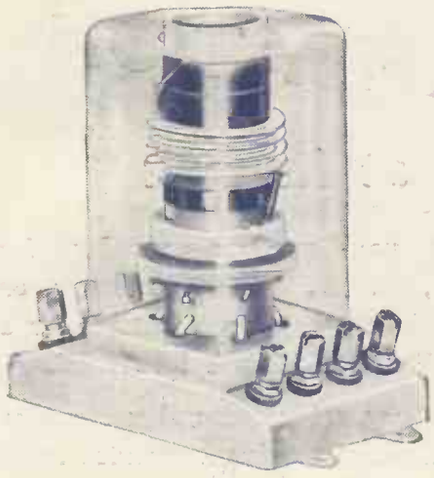

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A.W. 14/4/34

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Amateur Wireless

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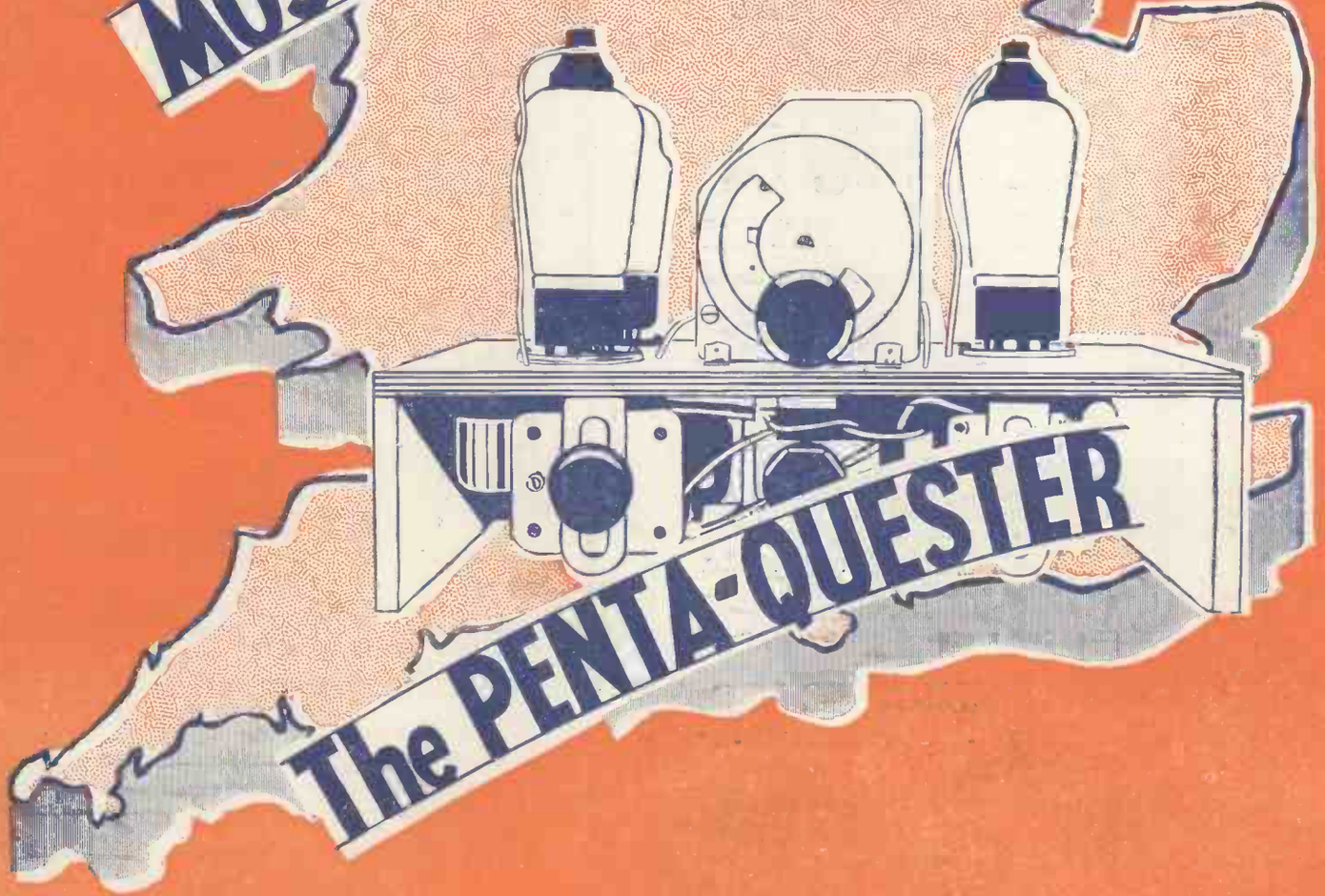
MAKING A POWER TRANSFORMER
See page 413

HOW REACTION AFFECTS QUALITY

EXPENSIVE ECONOMIES

FITTING TELEVISION INTO THE ETHER

BRITAIN'S MOST UP-TO-DATE SET



The PENTA-QUESTER

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News and Gossip of the Week

T' Coop !

GET ready, lads, for the broadcast commentary on the Cup Final at Wembley on April 28. The technical arrangements will be the same as in preceding years.

G. F. Allison and Derek ("Square Four") McCulloch will do the show—and do it with gusto, of course.

For Cardiff, Indeed

POPULAR J. N. Lampson, one of the Empire announcers at Broadcasting House, is going to join the announcing staff at Cardiff very shortly.

He is engaged, you may recall, to Joy Riddock, who was until lately in the B.B.C.'s Music Department.

This Television !

STRIKING proof that the B.B.C. television broadcasts are widely picked up is furnished by a Bradford looker, who recently sent Eustace Robb photographs of images he had picked up on his television set.

From these photographs it was possible to recognise Betty Bolton quite easily.

Considering that for the three seconds' exposure needed to take the images no less than thirty-seven pictures were formed, it is a remarkable feat.

Droitwich National

NOT long to wait now! The transmitter for Droitwich National is all fitted up.

The high-capacity aerial is now being slung between those 700-ft. masts, ready for the first tests of our new giant.

Is Your Aerial Short ?

SOME heartburning is bound to follow the scrapping of the medium-wave Nationals when Droitwich passes out of its tests.

Mainly because there are so many lop-sided aerials slung up anyhow—they get the medium-wave stations, but will prove rather disappointing when the National programme comes only from long-wave Droitwich.

To Your Rescue

BUT those charming engineers are busy preparing you a nice little pamphlet, explaining how to counter the sad effects of the coming National upheaval.

We *love* these effusions. Such beautifully trite technicalities—neatly bound up with little bows of red tape.

Seriously, though, the pamphlet will give you a very good idea of the proposed changes—and it will show you how to make the best of Droitwich. So shall we—don't worry !

New-style Pirates

WHEN the Lisbon transmitter comes on the air shortly the Portuguese authorities will take steps to tackle the problem of the wireless pirate.

Only they don't call them that. No, *clandestine listeners* is the beautiful phrase. Precious, what?

Dramatising Religion

AS a sequel to its efforts to dramatise the talks, the B.B.C. has decided to try the effect of a more dynamic treatment of its religious broadcasts.

It is searching for religious plays specially written for the microphone.

Caught Napping!

YOU don't often catch out the B.B.C. over S O S messages—they are much too careful to check up the facts before committing themselves.

But the other night a hospital story was framed to hide the real reason for the S O S—a young girl had eloped.

And the B.B.C. fell for it.

Those Guest Nights

CERTAIN critics have been frothing at the mouth because they thought the Guest Nights so successfully developed on Saturdays by Henry Hall were coming to an end.

Not a bit of it. They are quite definitely going on. Believe you us.

Ridgeway Back

ADMIRERS of Philip Ridgeway will be glad to hear that he will be back at the microphone with his famous Parade.

The dates fixed are June 1 and 2, Nationally and Regionally—as usual. Philip will come fresh from a very closely packed tour of the country's halls.

Dance-music Variety

NEW-STYLE variety shows featuring dance bands are promised us by ever-energetic Eric Maschwitz.

He plans to bring dance bands to the microphone and to let them rip with short interludes of funny men.

Billy Cotton will come first, with a programme mainly of dance music and the rest gag-stuff by an English and an American sailor.

The Command Show

FOR the Royal Command performance the B.B.C. will *not* indulge in any description of the turns—previous efforts having proved a washout.

While turns unsuitable for the microphone are going on the Theatre Orchestra will play. Workers from the theatre, such as electricians, scene shifters and so on, will also give intimate side-lights on back-stage secrets of variety production.

YOUR LAST CHANCE

To get a FREE full-size blueprint of the Penta-quester — a genuine contact print normally sold at 1s.—is to send us by April 28 the COUPON ON PAGE 432

Disillusioned!

THUS ends a letter received by the B.B.C. from a listener:—

"I know the old reply to this—that these stations are only built to serve just a few miles short of the district the complaint comes from."

He must have written before, then !

Our Penta-quester

WHAT think you of the Penta-quester? It's a grand little set—with a pentode per stage for power with economy.

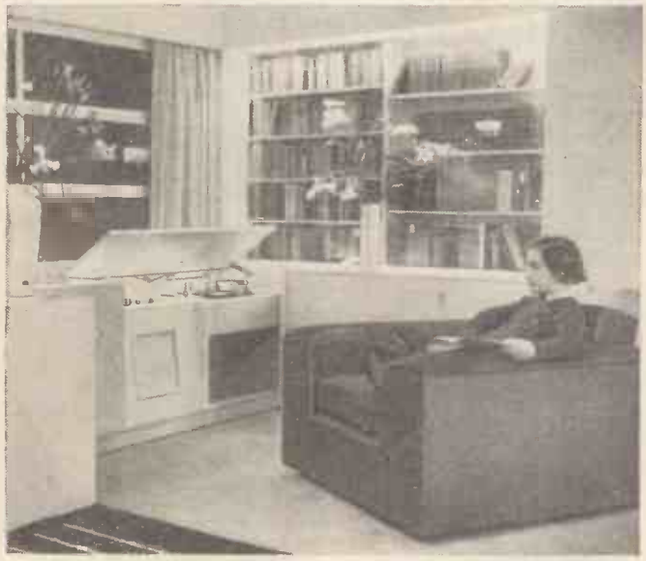
Clock-face tuning, too—*and* a chromium-plated aerial system. Luxury upon luxury—really a jolly nice set !

Paying Up!

FEARS that the Empire service is going to be a permanent drag on the British Isles listener are not readily dispelled.

Well, here is a good portent. *One* colony, we must not say which, has just sent in a contribution to the B.B.C. for the service it derives from the Daventry short-wave stations.

Money will be needed when the Empire service develops. New masts and possibly a third transmitter will have to be considered.



Barratts photo

This ambitious radio-gramophone installation is on show at the "Daily Mail" Ideal Home Exhibition at Olympia. Anybody would be proud to own it !

This Summer-time Business

How it Affects Broadcasting :: By J. GODCHAUX ABRAHAMS

IT is a curious fact that it seems an impossibility to secure an international agreement, at least so far as it concerns European states, on even such a minor point as a change-over to Summer Time. This year the alterations are again complicating matters in view of the great difference in the dates chosen by countries which have adopted this policy as an annual occurrence.

Chandler photo

Summer time will soon be with us and scenes such as this will be of everyday occurrence

France, Belgium, and Portugal, working in the ordinary way to Greenwich Mean Time, advanced their respective clocks by one hour on the night of April 7-8; Great Britain does not effect this change until April 22. Holland, on the other hand, only goes over to Amsterdam Summer Time on May 15.

As regards radio entertainment it is true that these alterations do not inconvenience listeners to any great extent if they are satisfied to consult a programme which for each country's transmissions has been reduced to our standard time, but such is not the case with railway or shipping time-tables, which have to be changed *three* times to adjust themselves for international connections.

As it is, between April 7 and 22, France, Belgium, and Portugal are ahead of us by one hour or on a par with Central European time as used by Germany, Austria, Scandinavian States, and so on; Holland is ahead of us by twenty minutes.

On April 22, when we change over to B.S.T., we overtake France, Belgium and Portugal, and are level with Central European time. If Spain does not alter, we are one hour ahead of her, as well as of Algeria and Morocco, and two hours in front of Iceland.

Between April 22 and May 15 we are *forty* minutes in front of Holland and when, on the latter date, the Dutch move on they overtake us and get *twenty* minutes ahead. When B.S.T. rules in Great Britain there is only a difference of two hours between us and Moscow, and we are one hour behind Leningrad and countries working on Eastern European time.

As a rule, the United States effect their change on approximately the same date as we do, and the difference between B.S.T. and Eastern summer time remains the same, namely, 5 hours.

This year, on April 22 the B.B.C. will adopt in its programmes the 24-hour clock system. Although it is one familiar to all those listeners who were connected with the Army, Navy, or Air Force services during the Great War, and has since been largely used in connection with times of radio transmissions, in particular on short waves, it may still prove a puzzle to the man-in-the-street.

As a matter of fact, it is a perfectly easy matter if you consider midday as one shilling or twelve pence and midnight as "two bob" or twenty-four pence—in this case, the limit of your wealth!

All times from midday are reckoned in pence and when translated the bob is knocked off. Fifteen pence or, as you will see in the printed programmes 15.00, is 1s. 3d. hence, less the shilling, 3 p.m., and so on to 23.00 or 1s. 11d. representing 11.0 p.m.

Only Logical Method

The minutes, such as 16.40 or 4.40 p.m., are self-explanatory. Perfectly simple, isn't it? And yet some people with whom I have discussed the 24-hour system view its adoption with awe as a revolutionary measure which is likely to drive them crazy. When you consider the question you will see that it is the only logical method of dealing with the day and night hours without running any possible chance of confusion.

For radio listeners on the short waves, where original times of transmission have to be consulted, it simplifies matters greatly. If Eastern standard time (New York) is five hours behind G.M.T., you can arrive at the sum quicker than if you had to consider a.m. or p.m. figures. Listening in at 23.00 (11 p.m.), you simply deduct 5, leaving 18.00, and we all know that eighteenpence is 1s. 6d. or 6 p.m. If you have to carry the time forward no difficulty is offered. Sixteen (16.00) o'clock in England would be with the addition of eight hours for, say, Bandoeng (Java) 24.00 or midnight, or ten hours added for Sydney would give 26.00, namely, 2 a.m. *next morning*.

I doubt whether it will take the average reader ten minutes to familiarise himself with the whole system.

New Automatic-changing Radiogram

A NEW automatic radio gramophone of the super-het type has just been introduced by the Marconiphone Company. Owing to the success of the Lucerne Specials it was decided that the twenty-guinea radio gramophone would have a wider appeal if it could be supplied with an eight-record automatic record-changing mechanism. A receiver of this kind is now available at the low price of 27 gns. and is called the Marconiphone 288.

The cabinet is constructed of walnut inlaid with sycamore and is of the usual Marconiphone high standard. All of the controls, with the exception of the volume control, are grouped beside the gramophone motor.

Adequate Selectivity

Actually, the receiver consists of a five-valve super-het circuit but uses four receiving valves and a full-wave valve rectifier. The aerial is bandpassed to a screen-grid and oscillator detector, which gives adequate selectivity and minimises second-channel interference.

This is followed by a transformer-coupled variable-mu intermediate-frequency amplifier and a power-grid second detector. The output of the second detector is coupled to an intermediate-frequency power pentode by means of a triple-compensated auto-transformer coupling unit. This gives exceptional reproduction with a level output. Selectivity is almost constant over both wavebands and is of the order of 9 kilocycles.

A variable tone control operates on both radio and gramophone and in addition to minimising heterodyne whistles it eliminates needle scratch. With the pick-up in circuit it is possible to obtain thirty to forty minutes' continuous entertainment by means of gramophone records without having to bother about new needles or record changing. An undistorted output of over 2,000 milli-watts is obtained from the power pentode, which is ample for most rooms. Provision has been made for external loud-speakers of either the low- or high-resistance types.

The new Marconiphone model 288 automatic recording changing radio gramophone

Although an external aerial is an advantage, a large number of stations can be received with only a mains-aerial attachment. In exceptional cases, where it is not convenient to obtain an aerial or an earth, sufficient volume can be obtained from the more powerful stations without difficulty.

The current consumption on the radio side is 60 watts, increasing to 75 watts when the gramophone motor is in operation. It is designed for 50 to 60 cycles, 200 to 250 volts, and is supplied complete with all connecting plugs and mains leads for 27 gns.

Expensive Economies—and Other Extravagances!

Many readers of "A.W." are considered to be experts by their friends and have a great responsibility when advising beginners—as PERCY W. HARRIS, M.INST.RAD.E., points out in this pertinent article.

G.P.A. photo

It is never an extravagance to buy a really first-class receiver. This example has ten valves and four loud-speakers to cover the whole musical range perfectly

THE instinct to save money and do things economically is a natural one and by no means confined to those who *must* look on both sides of a penny before they spend it. At the same time in wireless it is quite possible to waste money on schemes which seem to save it just as some seeming extravagances are real economies.

I do not know what the present broadcast licence figures are—they grow very rapidly and by the time I have memorised one set of figures an entirely different set takes its place. In any case there are thousands of new devotees each month and thousands more are now asking themselves: "Is it expensive to run a wireless set?"

Idea of Running Costs

You, dear reader, because you read AMATEUR WIRELESS each week, are almost certainly the owner of a set and should have a general idea of running costs by now. Because you have such a set you are just the person who will be asked the question I have quoted. What kind of answer do you give and are you *quite sure* that all of your answers are correct?

It will help you and your friends if you keep in correct relationship to one another the *first costs* of a set and the *running costs*. To the man or woman who does not yet possess a receiver and who has alternating current mains in the house, the decision as to whether the set shall be a battery or a mains-driven one will call for thought.

By looking around you will see it is cheaper to buy a battery set—that is so far as first costs are concerned—but do not make the mistake of overlooking the considerable difference in the running costs of the two. An all-mains set is complete nowadays in practically all cases, for in comparatively few is the loud-speaker sold as a separate item, and as all you have to do is to plug it into the mains your running costs are only those of the current used.

Generally speaking, it can be said that the modern all-mains set of the most popular type consumes about as much current as a single room lamp.

Now in the case of a battery set it is becoming more usual to sell it complete with one accumulator and a high-tension battery, but in some cases the price of the set does not include either of these items. In any case, even when you pay the inclusive price, remember only one accumulator is supplied, and you must have two to give continuous service, for when one is being charged another must take its place.

Furthermore, accumulators must be charged regularly—say once a fortnight—and your high-tension battery gradually becomes exhausted. The more powerful the set—the more you use it—the quicker you will have to replace your battery and you can take it from me that in order to keep costs down battery set manufacturers do not supply any bigger battery than will just do for the purpose!

Your annual running costs, then, will have to include battery replacement for high tension and the cost of a fortnightly charge for your accumulator.

The additional cost of running a battery set may actually make up the difference between the cost of that set and a mains one in the first year and personally I would never dream of recommending a battery set for use in a house where alternating current mains are available.

The extravagance of buying small and cheap high-tension batteries of unknown makes has too often been pointed out in these pages to need repetition here, as has the extravagance of buying too small a high-tension battery, even of the best makes, when the set you are using is rather extravagant in its current consumption.

"A.W." photo

Every AMATEUR WIRELESS *set undergoes thorough tests before it is described in these pages and is always good value for money. The Penta-quester, for example!*

There are several other lesser known extravagances, however, masquerading as economies to which I would like to refer here.

Say, for example, that you are consulted by a friend who has no wireless and who is "going in" for a set. He wants to do everything as economically as possible and is mainly interested in the reception of a few stations of good quality and clarity. He may say he does not want to go to the expense of erecting an outdoor aerial, thinking he will save money this way, but actually the aerial is the collector of the signals and the bigger the collector the greater the strength of signal for a given set.

Good Aerial Saves Money

Thus, if he spends a few shillings on putting a pole in the garden and running a wire from it to the house he can easily get as good results on a three-valve set this way as with a four- or even a five-valve set using a small aerial consisting of a wire round the picture rail.

Again, by attempting to save a few shillings on proper insulators and lead-in tube for his aerial and by not troubling to make a good earth connection, he may waste a good deal of what is picked up, and have to use more high-tension current than otherwise would be necessary in order to get the stations he wants.

It should not be overlooked that with a variable-mu screen-grid valve the greater the magnification (the more the volume control is turned up) the greater the high-tension consumption.

About Cheap Valves

Cheap valves are not always bad valves, but generally they are less efficient than the regular-priced variety, and as you buy valves mainly for magnification purposes this point is not to be ignored. Have you ever thought how much you can lose by a relatively small drop in the efficiency of a valve?

Say, for example, you have three stages of

Continued at foot of next page

Car Radio in Germany

AT the great International Motor Car Show which took place in Berlin during the month of March, the well-known firm Telefunken were showing an entirely novel receiver for use in cars.

As can be seen from the accompanying photographs, the entire four-valve super-het set with built-in moving-coil loud-speaker can be fixed under the dashboard.

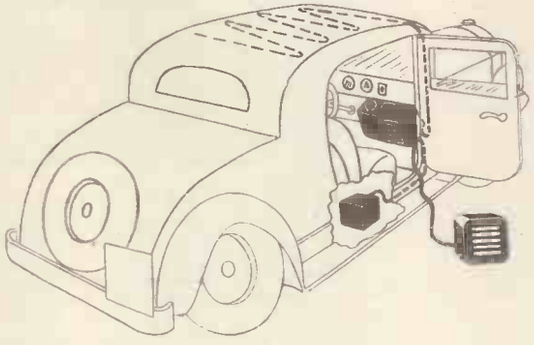
Remote control is provided so that the driver can tune the set even when he is not accompanied.

The most outstanding technical feature of the set is the fact that it obtains all its current from the 6- or 12-volt starter battery. The 6- or 12-volt D.C. is "vibrated" into A.C., transformed up to 250 volts, and then rectified again to D.C. in the same unit.

It is interesting to note that an extension loud-speaker is provided—presumably for use when one is picnicking!

This outfit tends to emphasise the world-wide interest in radio equipment for the car. Having started in America the idea spread to England and is now being extensively adopted by car enthusiasts in various parts of Europe, particularly in Germany.

Gulliland photo



Gulliland photo

(Above) Telefunken four-valve superhet built in under the dashboard: It is fed from the 6- or 12-volt starter battery

(Right-hand sketch) Arrangement of Telefunken car radio set: Note the aerial in the roof and the extension loud-speaker

(Right-hand photograph) Another view of the Telefunken automobile receiver, recently shown in Berlin, remote control is provided

Expensive Economies—and Other Extravagances

Continued from preceding page

magnification (it does not matter for the moment whether it is high- or low-frequency or a combination of both) and you are comparing two sets of valves, one of which is 25 per cent. better than the other. We will say, for example, that the better of two sets magnifies ten times whereas the other set only magnifies eight.

Starting with a unity signal we have a magnification of 10 × 10 × 10, or 1,000 in all. In the second case we have 8 × 8 × 8, making 512 in all! If you take the comparison through four stages the difference is even more startling, for it then becomes 10,000 and 4,096 respectively.

Tolerant Ears!

A little while ago I made comparative tests between a number of loud-speakers on the market—they were all of the moving-coil variety—and I was astounded at the variation of efficiency. The human ear is very tolerant and does not notice slight changes of volume, so when you hear two loud-speakers side by side, one of which is obviously very much louder than the other you can be sure the difference of efficiency is considerable.

A good set fitted with poor valves and a cheap inefficient loud-speaker may give worse results both in signal strength and quality than a smaller set costing half the price but with good valves and a loud-speaker of the right kind.

A petty "economy" which has cost a great deal of money in the past is "topping up" an accumulator, when charged at home, with ordinary tap water to save the cost of distilled water, which has to be purchased.

In a few districts tap water is comparatively free from lime and other salts, but in most districts salts, which are good for health but extremely harmful to accumulator plates, are present in a considerable quantity, so that a rapid deterioration of the plates inevitably sets in and before long the accumulator has lost a good deal of its capacity or is ruined.

Running the accumulator after the voltage per cell has dropped below 2 volts in order to get everything out of it, is another frequent cause of battery deterioration and joining a small new high-tension battery in series with an old and run-down one in order to boost the voltage is also an extravagance, because a lot of the power in the new battery is lost in overcoming the resistance of the old one.

Neglecting to "top up" the cells of an accumulator and thus allowing the level liquid to fall well below the tops of the plates is another extravagance for only those portions of the plates beneath the liquid can actually give you service.

Thus if a third of the plates are uncovered not only is all of the work of the battery being done by the remaining two-thirds but the third which is dry, is actually deteriorating and will never be quite as good again even when it is ultimately topped up and fully charged.

A final note. It may be an extravagance to rush out and buy a complete set of valves when the performance of your set is falling off. Before you spend any money make sure that your aerial and earth are in good condition, that your insulators are clean, all your terminal connections tight and that the wire has not come off the aerial terminal.

Gulliland photo

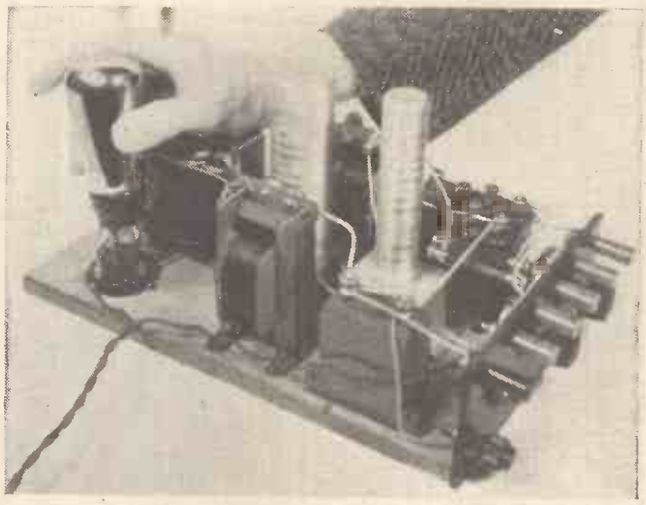
You do not have so much choice of sets in Germany. This is the new Volksempfänger, which is made by the whole of the German radio trade

So Sensitive!

Modern sets are so sensitive that many of them will work quite satisfactorily so far as the local station is concerned (provided the volume control is turned up to full) with the aerial wire an inch or two away from the aerial terminal!

The ABC of High Tension from the Mains

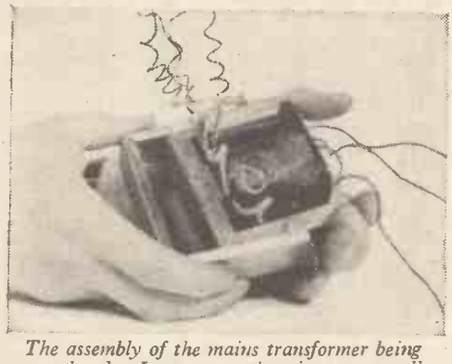
Two weeks ago "The Experimenters" described a D.C.-mains unit. Now they tackle an A.C. version—with a home-made power transformer



You will like making the A.C.-mains unit described this week by "The Experimenters"

UNACCUSTOMED as we are to being cold-shouldered, we were frightfully pained when the Editor—bless him—gently hinted that our mains-unit *saga* was to be interrupted for a week to make way for the Penta-quester.

"It must be a *jolly* good set to oust ours," we bridled. "Yes, it is," replied the Editor,



The assembly of the mains transformer being completed. Its construction is not at all difficult for the amateur

"otherwise I would not *dream* of crowding you chaps out."

So those of you who read with any sort of interest the first article on the alpha and omega of mains units, as published in the April 7 issue of AMATEUR WIRELESS, must cast your minds back a couple of weeks, and then we can go ahead with the description of how to get your juice from the mains when the supply, by the grace of the all-mighty grid, is A.C.

By the way, before we go any further, about that letter from Eric Webster in last week's issue. Thanks to him we are now known in the "Amateur Wireless" offices as "the lt boys." Isn't "poisonality" ghastly?

Now let's be serious for once. You will recall that we gave a sketchy outline of how to make a unit to get your high tension from D.C. mains. In the course of this—at the end, as a matter of fact—we told you roughly how to make your own low-frequency chokes.

Filling the Space

We ended the article with a complete unit for high tension from D.C. mains, leaving a gaping white space on the baseboard for the problematical addition of apparatus that would enable the unit to work from A.C. mains.

Well, now for the problem. It is quite easy to solve, really. All you want now is a *mains transformer* and some sort of *rectifier*. This week we are going to tell you not only how to add these parts to the existing unit but also how to make your own power transformer.

A word or so on the "why" of the transformer. You might ask, with some sense, why we cannot run the mains straight on to the rectifier. You can see that with A.C. some sort of rectifier is needed, but why insert a transformer between it and the mains?

Let us assume that the mains voltage is 230 volts—the standard grid supply. At our final output we want to be able to draw upon up to 250 volts. Well, there's the reason for the transformer—or one good reason, anyway.

Another reason for a transformer—which doesn't really transform the voltage, but merely changes its pressure either up or down—is that we need 4 volts to heat the filament of the rectifier valve, and a quite separate 4-volt supply for the heaters of A.C. valves in the set.

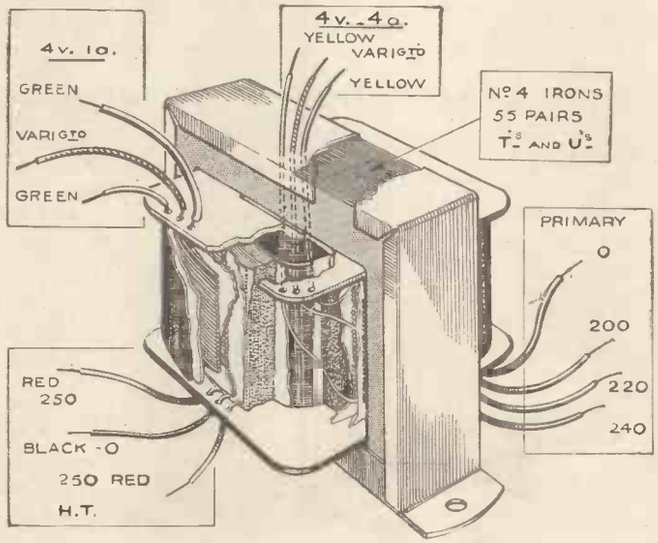
At this point some "wise guy" may want to know why we cannot make the one 4-volt winding do for both rectifier filament and the filaments of the receiving valves.

That's an easy one! You see, the centre point of the rectifier filament is actually high-tension positive—as you grasp in a moment while the centre point of the heaters of the receiving valves is high-tension negative. Obviously, we needn't labour the reason for the two windings any more.

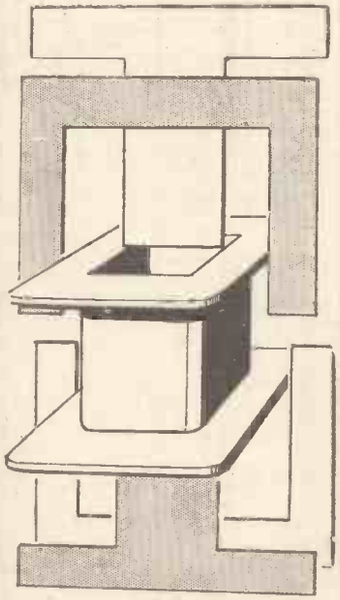
Would you like to look at the rectifier circuit a moment? It is a good way of seeing what we are doing. The transformer is symbolically represented as having a primary winding and three separate centre-tapped secondaries.

One secondary is wound with a large number of turns of fine wire, giving a high voltage of the rectifier. You may wonder why there is a centre tap on this secondary winding. Actually the reason for this is found in the use of a double-wave rectifying valve.

This double-wave rectifier is really two complete half-wave rectifiers in one bulb, with a filament common to the two anodes. One half-wave rectifier deals with the first half cycle of the alternation from the mains, and then the other half-wave rectifier deals with the second half of the complete cycle.



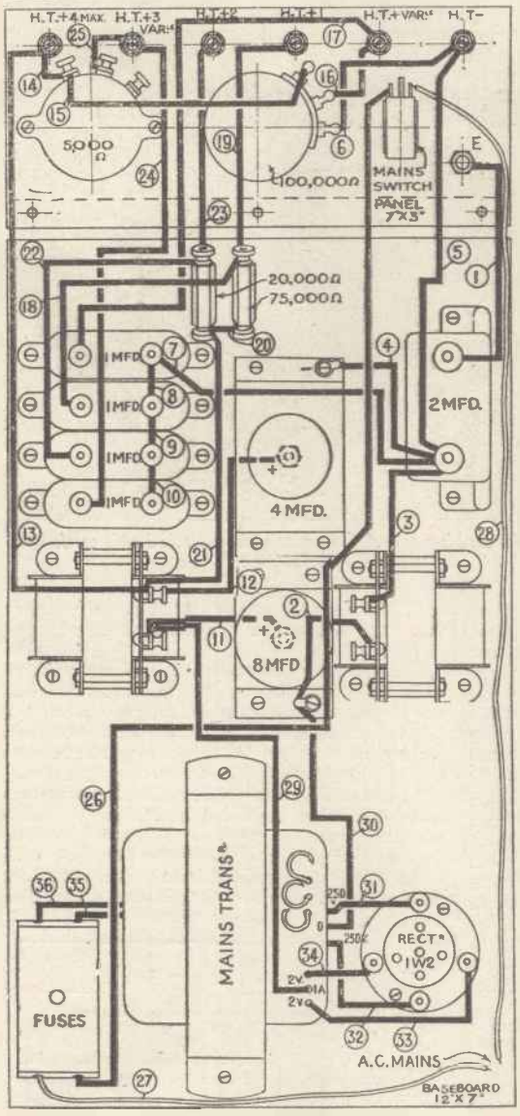
This drawing shows how the leads for the various windings are arranged on the mains transformer. Bobbins can be obtained already wound if you prefer it



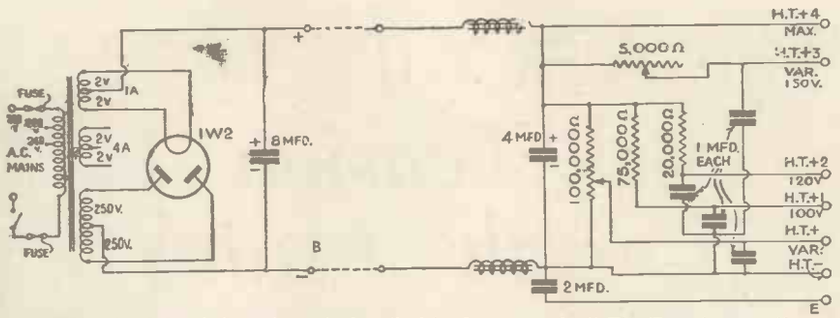
How the laminations (No. 11 iron) are fitted into the bobbins

In this way we get the maximum possible rectification, and, what is more, the resultant output is relatively smooth, although of course it still needs the rest of the apparatus to make it fit for the anodes of the receiving valves.

Now the point is that each half-wave rectifier needs the *full* A.C. voltage and that is why the "outers" of the high-tension secondary winding are both at something above 250 volts with respect to the centre tap,



A full-size blueprint of the A.C. mains unit can be obtained for 1s., post paid. Ask for No. A.W.432



Circuit of the A.C. mains unit described in these pages by "The Experimenters"

which forms the negative point of the supply.

For the rectification effect the filament common to both the anodes must of course be heated. This is easily done by raw A.C., a small winding with thick-gauge wire giving the required 4 volts.

Now for the centre tap of the filament transformer winding. Why is it needed? If you look at the circuit diagram, it is obvious that if it were only a half-wave rectifier the complete circuit would be around the anode and filament, and as the anode is negative the filament would be positive.

But as we have two anodes with one filament between them we must use the centre point to get our common positive. We cannot actually tap the valve filament, but we can do something that amounts to the same arrangement—*we can take our centre tap from the winding feeding the transformer.*

So that now we have our positive and negative high-tension points—the negative from the centre point of the high-tension secondary, the positive from the centre of the filament secondary.

Across those two points we have a high voltage capable of giving us some sort of direct current if connected by a resistance—say the resistance of the anode to filament paths of the receiving valves.

If you look at our diagram you will see two points marked A and B. These represent the beginning of the unit already assembled for D.C.-mains working. But before we can connect our transformer and rectifier to them we must insert a very important component—the *reservoir* condenser.

This condenser is of the electrolytic type, has a capacity of 8 microfarads, and must be connected the right way round. The metal case is connected to negative and the insulated terminals to positive.

This reservoir condenser stores up the slightly pulsating current and delivers to the rest of the smoothing and voltage dropping apparatus a comparatively even D.C. output.

Before we leave the theory of the thing and get on to the practical work, let us have a word or two on some minor but important points. Take the extra 4-volt winding for the filament heaters first. It also has a centre tap, which is equivalent to the negative side of a battery-operated valve.

We will go into the filament supply in greater detail another time. The filament winding is included for the sake of those who may want to electrify their sets completely.

By the way, you might try .0005-microfarad condensers across each rectifier anode and the filament.

They are useful but not essential. By including them you will stop the sort of hum noticed when you tune in a station's carrier wave. It is known as *modulation hum*, and the two little condensers, in a way we frankly do not fully understand, clean this trouble up in a remarkable way.

One other little point. Those two fuses in the input leads of the D.C.-mains unit must be taken out if you are converting to A.C. Put them in each of the leads from the mains to the primary of the transformer.

The 250-volt output from the A.C. rectifier portion then feeds into the smoothing portion, and thereby replaces the original D.C.-mains supply, which for the sake of argument in our last article we assumed was also 250 volts.

Practical Pointers

We come now to the practical dope. From our diagrams you ought to be able to gain a very good idea as to how this mains transformer is assembled. As with the low-frequency mains chokes, the assembly has been simplified by cutting out the actual winding in the home of the primary and secondaries. Your job is simple, but don't forget—will you?—that we had to design these components ourselves, and that the specification is not just a haphazard jumble of wires.

We don't want to ram down your throats the fact that we are so jolly clever that we can design our own components—but we do want to emphasise to you that our specification ought to be followed implicitly, *not modified out of all recognition.*

Your kit of parts, as obtained from Peto-Scott, Ltd., or from Ohmic Accessories or McDaniel and Co., consists of a fully-wound bobbin, containing the three secondaries and the primary, 55 pairs of No. 4 T and U laminations, metal to clamp the laminations and two pieces of presspahn.

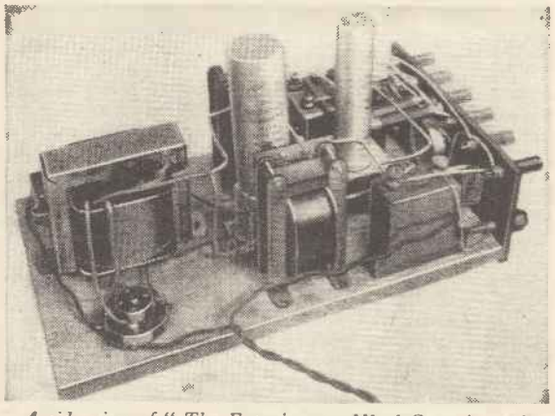
Now, supposing you say this is too easy for you, we can give you all the dope on how to make it.

When we made up our own original model we used a presspahn bobbin, which, although it had the advantage of cheapness, was far too fragile. So we then wound another transformer on a moulded bakelite bobbin and that was just fine.

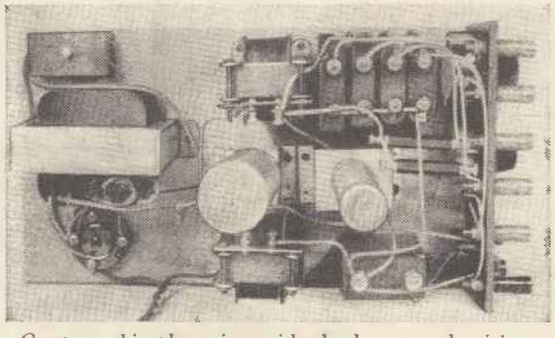
Start, therefore, with just such a bobbin, and then put on the primary winding. To start with, drill a small hole as close in to the centre as you can. Solder on to the end of the thin

Continued on page 430

"THE EXPERIMENTERS" DESCRIBED A D.C. MAINS UNIT IN "A.W." DATED APRIL 7



A side view of "The Experimenters'" A.C. mains unit with home-made power transformer



Compare this plan view with the layout and wiring guide reproduced above

Fitting Television into the Ether

ALAN HUNTER Reviews the Difficulties

WHEN the Bell Laboratories showed me their three-colour television four years ago in New York a shrewd engineer emphasised the fact that *commercial* television was a long way off—probably ten years.

He made it clear that what could be done in the laboratory through a land line across two rooms *could not be applied to a public service.* The reason was very simple. Quite apart from the enormous expense of the apparatus, there was *no room in the ether* for the wide range of signal frequencies needed to convey visual intelligence.

Communication Problem

To-day, with laboratory television coming ever nearer to commercial application, we have to ask ourselves how far this over-riding problem of communication has been solved.

For it is now clear that the latest cathode-ray systems can be made to give pictures of real entertainment value. Recent demonstrations by Baird and others have shown that we are getting nearer to home television.

Yet the ordinary public must be a little confused when it realises that at the very moment television seems to be coming into its own the B.B.C. has decided to cut down its official television broadcasts.

The 30-line transmissions that have been coming to us four nights a week for the past year are now limited to two periods a week, one in the morning and one at night.

Opinion seems divided as to the wisdom of this change. Some maintain that until ultra-short-wave television becomes really practical the medium-wave transmissions should be kept on as much as possible. Others are equally emphatic that medium waves will never yield any real progress, and that the sooner a change-over is made to the ultra-shorts the better.

Incidentally, even if the medium-wave television signals are of no ultimate use, they seem to me to have a great educative value, enabling amateurs all over the country to experiment with the reception end of the business.

Furthermore, there is no reason why the B.B.C. should give its twice-weekly television broadcasts at such inconvenient hours. The night session is rather late for most people, while the morning session can interest very few indeed.

Frequency Limitation

It seems to be generally agreed that the medium waves will never give us high-definition pictures. In the nature of things they cannot. Only 9 kilocycles frequency band is available—and into this can be crowded only a limited number of picture elements.

The 30-line pictures possible through an ordinary broadcasting channel of 9 kilocycles seem to represent almost the ultimate in television on the medium waves.

For the high-definition pictures giving good entertainment value the medium waves are definitely ruled out. The frequency band needed to take such pictures would be absolutely impracticable.

Small wonder, then, that responsible engineers at the B.B.C. have called a halt to these 30-line transmissions. Or that lately they have concentrated their time and energy to the various ultra-short-wave systems.

It may be helpful to line up the advantages and disadvantages of the ultra-short waves—by which are meant wavelengths below 10 metres.

Perhaps the greatest advantage is that they do not interfere in any way with existing broadcasting or commercial services. The ultra-shorts provide the channel of communication perhaps entirely unforeseen four or five years ago.

Secondly, the ultra-short wavelengths offer an almost unlimited scope for high-definition pictures—for pictures that have real entertainment value. Signals of very wide frequency band can be fitted into the ultra-short waves without causing any interference.

Thirdly, apparatus for transmitting and receiving signals on ultra-short waves is cheap compared with that needed for medium waves. This is an important consideration when you realise that a full-blown television service would involve duplicate plant for transmitting and receiving the sound with its vision accompaniment.

Fourthly, there is no night fading within the prescribed service area of an ultra-short-wave transmitter. Steady and reliable signals are essential for television—much more so than for the reception of sound signals.

Now for the disadvantages. The ultra-shorts have a very limited range, this depending to some extent on the height of the transmitting aerial and the receiving equipment. About 15 miles is the normal range, though this can be increased to 50 miles under very favourable conditions.

Secondly, reception is inclined to be patchy, one locality getting perfectly good signals while a near-by point can get nothing, owing to the ease with which such short waves can be deflected by metallic or earthed bodies.

Thirdly, the ultra-short waves are subject to a certain amount of interference from the electrical systems of motorcars.

Case For Short Waves

Weighing up the two sides, it is obvious that there is a very strong case for using the ultra-shorts for television. It is known that the Chief Engineer of the B.B.C. is strongly in favour of them—a significant fact in view of his high technical standing.

Although there may appear to be a state of stagnation over television at the B.B.C., in actual truth a great deal of research work is going on. It will not at all surprise me if the B.B.C. announces a public experimental service of ultra-short-wave television in the autumn.

Just now we cannot expect the B.B.C. to say a great deal about its ultra-short-wave experiments. After all, they *are* experiments—by no means intended for public participation. But if keen amateurs want a straight tip, I should say keep your eye on these experiments—they seem destined to lead to a definite advance towards television in the home.

The First Step

Meanwhile, it behoves every keen amateur to become acquainted with the rudiments of ultra-short practice. At this very moment Baird is sending out ultra-short-wave television from the Crystal Palace, while the B.B.C. is transmitting from the roof of Broadcasting House by the E.M.I. process. Even if you have not the apparatus to resolve these vision signals into images, you should take the necessary first step of getting to know the technique of ultra-short-wave reception.

Photopress photo

Back in September, 1929, the B.B.C. broadcast its first television programme from a restricted studio at Long Acre, the image signals passing over land-line to Savoy Hill

Fox photo

What a contrast this picture affords to the early days! Here you see Anton Dolin and Brigitta during their television performance from the new studio at No. 16 Portland Place

A New Baffle Idea

—and Four Other Loud-speaker Hints

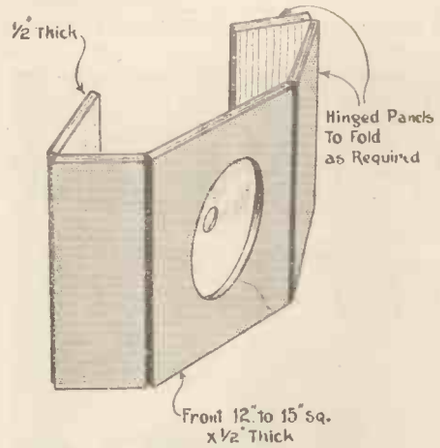


Fig. 1.—Folding baffle board adaptable to all conditions of reception. Use thick wood

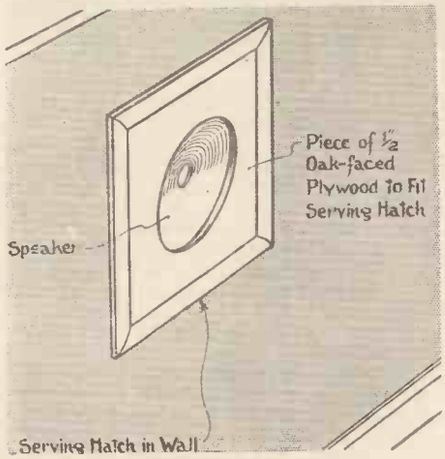


Fig. 2.—An unused serving hatch makes a good cubby hole to take the baffle of a moving-coil loud-speaker

IN these enlightened days most of us use some sort of a moving-coil type of loud-speaker. Thus we gain better bass-note reproduction—or should, if the baffle has been properly arranged.

Often enough, though, the good quality of a moving-coil loud-speaker is lost through inadequate or wrongly designed baffling.

The baffle is not, remember, a sounding board for the notes to reverberate upon. It is a board inserted between the waves radiating from the front of the moving-coil cone and those set up behind. If these two sets of waves intermingle—or "interfere"—the low notes are reduced.

Baffle-board Arrangements

Of first importance, therefore, is the arrangement of this baffle board. We give on this page several ideas that have the merit of being thoroughly practical, and at the same time cheap to put into use.

The first idea is quite novel, so far as we know. Nothing less than a folding baffle board. You can see the idea by the Fig. 1 diagram.

At the front is a piece of wood say 12 in. to 15 in. square, and this ought not to be less than ½ in. thick. Hinged to this main section are two flaps on each side, and to these flaps further ones are hinged, so that altogether you have five pieces of wood acting as a folding baffle. When there is room you can open out the panels or flaps to their full extent, but where space is limited you can fold them back in any desired positions—the baffle effect being just the same as for a flat piece of wood—or very nearly so.

There is the further advantage that no matter what shape you make the folding baffle there will be the very minimum of what we call box resonance or "boominess."

The thickness of the wood is important. All too often the mistake is made of using very thin wood. A good stout ply or solid wood is essential for efficient baffling, and with advantage the thickness can be increased to 1 in.

We come now to another novel idea for a baffle—this time the serving hatch, as often placed in the wall between a kitchen and dining room, acting as the receptacle for the baffle board, as shown by Fig. 2.

A piece of ½-in. oak-faced plywood is cut to fit the space in the serving hatch, the loud-speaker unit being screwed or fixed behind the board and extension leads run from the radio set. You can make a nice job by adding some sort of beading to the edges of the board, staining and polishing to fit in with the surroundings.

But perhaps these ideas do not appeal to you, and your object is to build a separate baffle? If so you might consider the layout at Fig. 3, where we show a suitable dimensioned open-box baffle capable of giving good results.

As before, make the main front portion from 12 to 15 in. square, of ½-in. oak-faced plywood. The sides, top and bottom need only be just deep enough to clear the loud-speaker unit system.

Leave the back off—thus preventing that horrible boxy sound we so much dislike. You can cover the opening with a piece of muslin or ornamental silk, just to keep the dust out of the unit.

Four little rubber feet on the bottom of the box will save ruining a highly polished table—a tip every housewife will bless us for remembering to mention.

If you have a nice corner in the living-room, why not consider the arrangement shown by Fig. 4? Here we have a large flat baffle, which can be made to look very ornamental with a little care.

A piece of plywood, preferably not less than 18 in. square, and if possible larger, is used as the basis of this baffle. As before, not less than ½-in. thick wood should be used.

You can fit a small platform at the bottom of the baffle board to stand the loud-speaker on, and ornamental supports can be arranged as suggested. Again stand the job on four rubber feet, which can be large to give character to the completed job. A neat moulding round the edge of the board will greatly enhance its appearance.

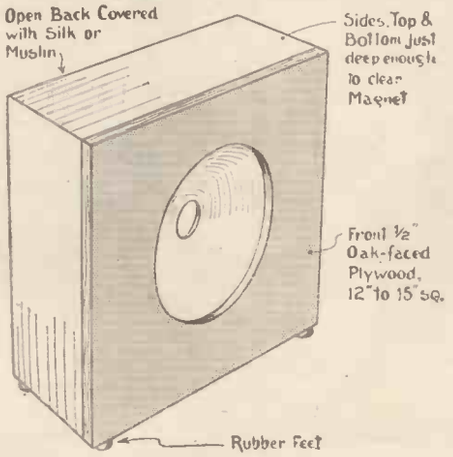


Fig. 3.—Specification for a full-size box baffle. Note that the back is left open to prevent boxiness

We have found that many amateurs fail to fit a proper baffle to their moving-coil loud-speakers simply because they have not the room in the house for it.

Well, there is a very simple way out of that difficulty. What about the walls in the living room? Are they full up? Of course not—plenty of room to hang a decent-sized baffle board after the manner indicated by our diagram Fig. 5.

Here the standard-sized board; with or without beading, can be supported on the picture rail by means of small mild steel hooks.

These hooks are screwed to a triangular piece of wood screwed at right angles to the top of the main baffle board, as shown by the smaller diagram at Fig. 5.

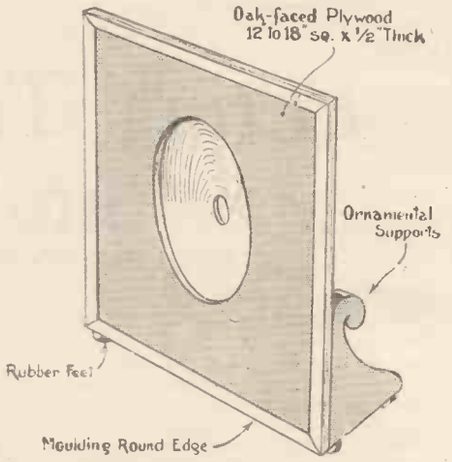


Fig. 4.—A baffle board standing on rubber feet is a good idea—so long as you can make the board of ample size

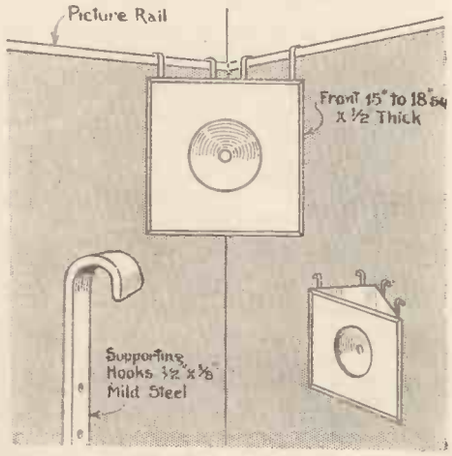


Fig. 5.—Simple method of hanging a baffle board from the picture rail in a corner of the room

Leads can be run up the wall in an unobtrusive way from the set to the unit.

From these five diagrams you can see that the problem of fitting up a suitable baffle board to make the most of a moving-coil loud-speaker is really quite simple—a large variety of methods being available if you remember that *thick* wood of *ample* area is essential for good results.

On Your Wavelength

By Thermion

Five-bob Batteries

HERE'S the latest news of the two five-shilling 120-volt batteries which are going through an eleven weeks' test, six hours a day, under a load that was initially 7 milli-amperes. The test, as readers may remember, is being made on account of the claims of a reader that he obtained this amount of service from such batteries, and its object is to show just what their condition is from week to week.

On the last day of the fifth week of the test, Battery A's starting voltage under load was 80.4, and its voltage at the end of six hours 68.8. The figures for Battery B are: 84 and 72.

Thus, at the end of but five weeks the better of the two batteries shows only 70 per cent. of its original voltage at the beginning of the day's run and 60 per cent. at the end of it. Each drops just about 12 volts during every run, and you have only to look at a family of valve curves to see what the effects upon reception are going to be. *Neither battery is now in fit condition to operate effectively any set containing a screen-grid valve.*

The Big Battery

MEANTIME, the triple-capacity battery, which is running at 10 milliamperes for four hours a day, carries on serenely. It has now completed eleven weeks and has not yet fallen below the 100-volt mark under load at the end of the day's run. The present figures for it are: starting voltage under load, 106; ending voltage under load, 100. *Thus, after seventy-seven days' use it is in much better condition than were either of the cheap standard-capacity batteries after only nine days' service.* Its voltage drop on the seventy-seventh day was but 6 volts; on the ninth day both of the cheap batteries were down to the 100-volt mark. One of them fell exactly 12 volts on that day during its run; the other 11.6.

In case the reader should object that the tests are not quite similar, since the cheaper batteries have a lighter load, but longer hours, I can give him the figures for the previous test of cheap batteries under precisely the same conditions as those used for the big fellow of good quality. Under the 10-milliampere load, at four hours a day, the cheap batteries were down to the 100-volt mark in thirteen days, and their average voltage drop on that day was rather over 14!

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Wireless on Lighting Mains

A PARTICULARLY interesting new system of broadcasting transmission and reception was demonstrated some days ago by the Liverpool Corporation Electricity Department in conjunction with British Insulated Cables, Limited.

The demonstration, which was conducted in a hush-hush atmosphere, was given to a number of experts, and the audience included members of the House of Commons Standing Committee on the Electricity Supply Bill.

Though all details were subsequently refused to inquirers, I understand that the system is for the transmission of broadcasting over the mains by means of what is known as *wired wireless*. A good deal has been heard of this before, but, so far as I know, the many snags in the way have not hitherto been overcome.

Quite apart from ordinary transmission problems, there is always that of interference, for recent investigations have shown that a very large percentage of the man-made static from which we suffer is mains-borne. Any wired wireless system using the mains must include means of cutting out the 50-cycle hum of standard A.C., as well as other kinds of interference.

There are great possibilities in the idea and there is no reason why apparatus should not be devised for sending two or more alternative programmes over the mains from a central station relaying B.B.C. transmissions.

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Westector

I AM an enthusiastic Westectorite, for this little device seems to me to solve, in the simplest possible manner, most of the big detector problems. The only thing it cannot and doesn't do is to magnify whilst detecting; hence it does not fully replace the triode detector valve.

You can, though, use your triode to do the amplifying, and nothing else, and your Westector for detection only. Now that a real high-frequency form of Westector has been developed, it is just as useful in straight sets as it has been in superhets.

The strong points about "Westection" (I am rather good at inventing words to-day—what?) are many. First of all, you can forget about distortion due to detector overload and about that caused by the various funny little ways of triode valves, however you employ them as detectors.

Next, the bugbear of the microphonic valve completely disappears. In my newest set, which has two Westectors—one for detection and the other for S.A.V.C.—you can flip any valve you like and the loud-speaker remains unmoved. This is a particularly strong point in modern sets, with built-in loud-speakers.

Last, but by no means least, the Westector requires no energising current and it appears to be practically everlasting.

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Wandering Waves

IN these columns I have referred more than once to the extraordinary "echoes" that are a feature of short-wave reception. The simplest of these occur when a transmission takes simultaneously two paths round the world, one from east to west and the other from west to east.

If, say, the east to west path is the shorter, impulses travelling by it reach the receiving station a little earlier than those which journey by the longer way. Hence a kind of stammering effect is observable. Next come the impulses which whizz twice or three times or more round the world and are received on each journey.

The most mysterious echoes of all are those which occur not split seconds, but even minutes, after the arrival of the original impulse. The longest on record took four minutes and twenty seconds to arrive. This corresponds to a journey of some twenty-three million miles and suggests that the impulses were reflected back to earth by something far out in space.

An Experiment for Listeners

NO one yet has any idea of what or where the distant reflector is. Professor E. V. Appleton, who has done so much valuable work on the journeyings of waves and has a reflecting layer named after him, is investigating the problem in conjunction with the B.B.C.

Signals are to be sent out from the Empire transmitter, probably on a wavelength of 14.5 metres, and listeners will be asked to note the arrival of echoes carefully and to report the time intervals.

Very valuable information may be secured, and once again the amateur will have the chance of adding to the splendid work that he has already done in helping to solve the queer problems of wireless.

Ferranti photo

The busy scene in a British valve factory. Note the unusually high proportion of men

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The Unlicensed Licenser

IT seems almost incredible that a postmaster, part of whose business it is to issue wireless receiving licences to listeners, should have forgotten to take out one on his own account. But this actually happened quite recently. An East Anglian sub-postmaster was summonsed at Yarmouth for using a receiving set without a licence.

Apparently, in his official capacity, the postmaster had forgotten to send to himself, in his unofficial capacity as a broadcast listener, a renewal notice. I trust that in future he will take up a strong attitude with himself. If the postmaster should ever forget again to send the notice, the unofficial other self should

Marconiphone photo

An unbreakable Catkin compared with a Marconi type C.A.T. water-cooled transmitting valve as used by the B.B.C.

immediately write him a strong letter pointing out that this kind of thing must stop at once, since it is apt to lead to appearances in court and £2 fines!

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Super-regeneration

SOONER or later I think we are going to see the super-regenerator circuit stage a "come-back." It is definitely a winner on the ultra-short waves, and although, in the old days, it was a bit tricky to handle, one could get amazing results even with a single-valve "flivver."

Amongst other things I see that it has now been found to give "automatic" volume control—without requiring any variable grid bias—on short-wave working. The detector action is apparently logarithmic, so that signal volume is independent of field strength over a wide range. This certainly seems a promising feature for future development.

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Valve Varieties

A FRIEND of mine, having bought himself a new set, took the old one down to his week-end cottage in the country, to replace a still more ancient outfit of the crystal variety. On arrival—towards the evening—he proceeded to install the new outfit, only to discover that the road journey had proved a bit too much for two of the already much-used valves.

To console himself he strolled round to the local and had a pint with George, who, in spite of being one of the oldest inhabitants, takes a warm interest in "the wireless"—though on a strictly non-technical basis.

"No good, George," he said, blowing off the froth. "Wireless won't work this evening. . . . Valves have given out, I'm afraid."

George's face lit up sympathetically. "Don't 'ee despair yet awhile, sir," he croaked. "Doctor told me ten year ago as how my valves wouldn't last much longer, yet here I be with the old heart going as good as ever."

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Television Problem

NOW that television is on the verge of practical politics the question arises as to whether or not the P.M.G. will be entitled to exercise the same control over picture transmission as he does over broadcasting. It is a fine point, but I am inclined to think that the answer, as they say in Parliament, is in the affirmative.

If so, all television transmissions will, of course, have to be carried out under licence, and reception too—though as regards the latter the ordinary "listeners" licence will no doubt cover both sound and picture programmes. At least it will until the cost of providing a picture service begins to mount up—and then we shall have to wait and see.

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Bravo! Sir Walford!

ALL wireless listeners are, I am sure, delighted to hear of Sir Walford Davies's appointment as Master of the King's Musick. That "k," by the way, is not a slip of the pen; the office dates back to the time of Charles II and the old spelling, musick, is still retained. Another funny old spelling is found in the title of the "Comptroller" of the King's Household.

During the past few years Sir Walford Davies has done work of inestimable value by helping the man-in-the-street to understand something of the meaning and beauty of music. When many other musicians scoffed at wireless, Sir Walford saw in it a wonderful medium for bringing music into people's homes and hearts, and he has made the very fullest use of his opportunities. His Majesty could have made no more popular appointment nor one that was better deserved.

◆ ◆ ◆

Murder at the Mike!

SOME time ago the B.B.C. caused a considerable stir and provoked no small amount of criticism by putting on a spoof news bulletin. Many people believed the appalling items that it contained and were frightened out of their wits. Precisely the opposite happened recently at Tiflis, the Caucasian broadcasting station.

The announcer was actually murdered as he stood before the microphone, and listeners thought that the shots and his cries were a stunt intended to produce a thrill.

He was broadcasting at the moment a description of a man wanted in connection with a big bank robbery. He had just begun the description, when the man in question burst into the studio and fired three shots from a revolver, with fatal results.

Sounds almost too bad to be true, doesn't it?

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Another Lady Announcer

THERE have been persistent rumours that the B.B.C. was about to appoint another woman announcer. "Announcerette" is the title that I have just invented, and I am rather pleased with it! I don't think that there is any likelihood of their doing so in the immediate future, though it is quite possible that in days to come we may again hear the voice that breathed o'er Eden.

Reader: "Hi! the voice that breathed o'er Eden was the serpent's, wasn't it?"

Thermion: "Sorry, I thought it was Eve's."

Editor: "You're both wrong, but *do* get on with it."

It was the women's protests that ousted the last "announcerette." Perhaps the Women's Rights Society, if there is one, will bring its weight (no insinuations!) to bear to secure the appointment of another.

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Poor B.B.C.!

SOME sections of the lay press seem to spend a large part of their time and a good deal of money in working up "sensations" about the B.B.C. AMATEUR WIRELESS has already shown how utterly baseless was the suggestion that the personnel of Broadcasting House was seething with discontent and all that kind of thing. I know a good many of them, and I should say that they are a very happy family.

Not long ago there were scare headlines about the B.B.C.'s mystery organ. There is an organ all right, but there is no mystery whatever. It was stated to have cost £50,000. It didn't. It cost £10,000. It is just a plain straightforward organ of the most modern type and of special efficiency for broadcasting purposes.

The only kind of organ I can play is one which has a handle to turn, but I am told that genuine organists can see and try for themselves, if they want to, the completely unmysterious mystery organ.

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Hard Hit by Broadcasting

WIRELESS has been such a universal benefactor that at first blush it is difficult to imagine that anyone could have been injured by it.

Yet those who listened to Lord Blanesburgh's appeal the other Sunday night must have realised something of the hardship that broadcasting had brought to musicians. I don't think that broadcasting is entirely to blame: the talkie films themselves, or a single cinema organist, for instance, now produces the music that used to require a whole orchestra.

But, definitely, broadcasting is partly the cause of the trouble, and it is up to us listeners to do what we can to help those who have been hard hit. If you haven't already responded to Lord Blanesburgh's appeal, it isn't too late to do so now. Five thousand pounds are needed to meet immediate cases in need of assistance.

H.M.V. photo

"She shall have music wherever she goes," is not idle boast now that so many efficient portables are available

Ma coniphone photo

Listen intelligently and refer to the programmes before you switch on your receiver!

Real-quality Series:—6

How Reaction Affects Quality

By NOEL BONAVIA-HUNT, M.A.

AMATEUR: Our chat on detectors last week was very interesting, Professor, and we seem to have arrived at the conclusion that the diode is best for local reception, while the leaky-grid detector is best for logging the foreigners.

PROFESSOR: That is so. There is no objection to incorporating both types in the same receiver providing a satisfactory switch is used.

Reaction Injurious to Quality

AMATEUR: But there is one question I have been wanting to ask you ever since I got home last Saturday and that is, what about reaction? You will agree that this is very useful in bringing up the strength of weak signals, and it is usual to incorporate a reaction circuit in conjunction with a leaky-grid detector. I suppose you will rule it out of court as injurious to good quality.

PROFESSOR: Well, I am aware that it is considered so, but I can assure you that reaction has been given a bad name without sufficient

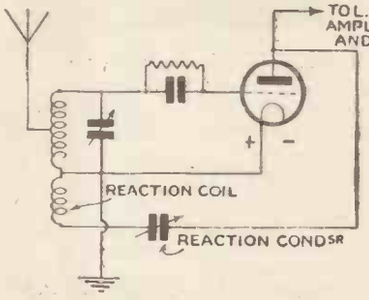


Fig. 1.—Usual detector and reaction circuit for use with a triode

justification. It depends, of course, how it is done; but if it is properly arranged, reaction can be extremely useful and need not adversely affect the quality of reproduction. The old proverb holds good in this case as in so many others: "A thing is to be used, not abused."

AMATEUR: But you cannot apply reaction to a diode.

PROFESSOR: Why not? Although, even if you couldn't, it can be used in conjunction with the leaky-grid detector when the latter is switched into circuit. But it is also possible to make it work with the diode.

AMATEUR: What! with a metal rectifier?

PROFESSOR: Certainly.

Question of High Tension

AMATEUR: But, my dear sir, there is no high-tension circuit in connection with the metal rectifier, and you can't work reaction without high tension.

PROFESSOR: I never said you could. But you must remember that the heated detector valve both detects and amplifies the rectified signals; while the diode does no more than just detect. The first low-frequency amplifying valve that immediately follows the diode corresponds to the amplifying portion of the leaky-grid detector valve.

All you have to do, therefore, in the case of the diode is to tap the first low-frequency valve plate circuit for reaction just as if it were a leaky-grid detector valve.

AMATEUR: Would you mind making a sketch of this circuit? Here, for instance, is the usual detector and reaction circuit (*Fig.* 1). Now please show me how you would fit reaction in the case of a diode.

PROFESSOR: Here you are. This (*Fig.* 2) shows you how the first low-frequency valve can be utilised for the purpose of feeding back the rectified currents to the aerial circuit. It is simple enough.

AMATEUR: So it seems. And does it work?

PROFESSOR: Of course it does! Why shouldn't it? I presume you understand the theory of reaction, don't you? Do you understand it properly?

AMATEUR: I know it boosts up the high-frequency stage of the set, but have often wondered how and why.

PROFESSOR: Well, I suppose I must tell you as briefly as I can, as I don't like to leave my friends in a state of ignorance on any of these little matters. You know, don't you, that the detector is supposed to pass only the modulated component of the wireless signals, that is, it separates the speech modulations from the station's carrier wave. I regret to say that it does not do so as thoroughly as it ought.

No doubt the last time you had a fried herring for breakfast you did not completely succeed in separating all the little bones from the fish, much as you hoped to do so; in fact, I can imagine that you swallowed some of those horrid little bones against your will. That is what the detector does, I fear. It tries to exclude the high-frequency component and pass only the speech modulations, but it does not succeed altogether. It is not a perfect filter.

So, in view of this deficiency on its part, we try to stop the unwanted high frequencies from getting further into the set, that is, into the low-frequency amplifier, by means of chokes and resistances. Now the object of reaction is to side-track the rectified speech modulations from the plate of the detector, where they are amplified, to the aerial circuit in order to be amplified all over again.

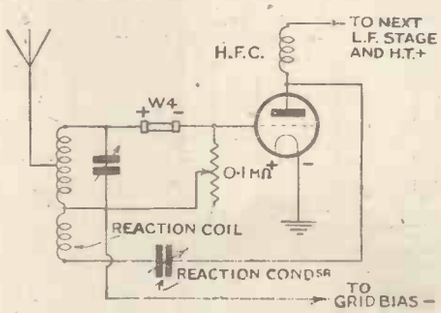


Fig. 2.—Diode detector circuit with reaction applied. The valve acts as a low-frequency amplifier

If there were only the speech modulations present, matters would be considerably simplified, but, unfortunately, some of the carrier wave is also there, and we are apt to feed back this as well as the speech currents. Hence distortion occurs.

AMATEUR: I see. And what causes the whistling sound when reaction is pushed too far?

"Heterodyning" with the Carrier

PROFESSOR: The fact that the set is itself oscillating at a certain frequency which interferes or "heterodynes" with the carrier frequency. But we must not spend too much time on the theory of reaction, as I want to explain to you the method by which reaction can be employed in a high-quality receiver.

AMATEUR: Right you are. Now I understand that in the case of the diode detector you can feed back the speech modulations from the plate of the first low-frequency amplifying valve.

PROFESSOR: Yes, you can. And what I

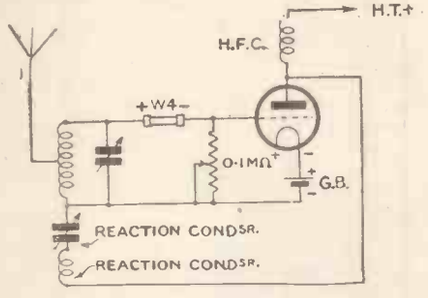


Fig. 3.—Another well-known reaction circuit

more, the reaction effect works much more smoothly and quietly than in the case of the leaky-grid or anode-bend valve detector.

AMATEUR: Well, we have already got the reaction circuit sketched out (*Fig.* 2), so that there is nothing more to be said about it, I suppose.

PROFESSOR: Oh dear yes, there is! I only gave you a sketch of the *usual* reaction circuit. That is not the circuit I am recommending for

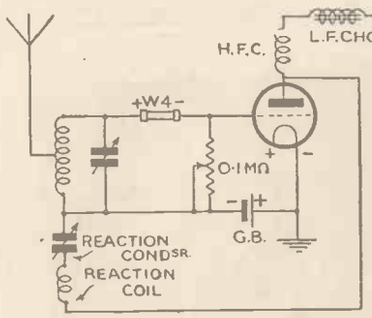


Fig. 4.—Circuit with addition of low-frequency choke

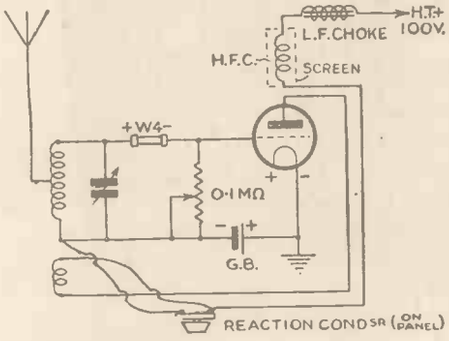


Fig. 5.—Best method of reaction the author has come across

our quality set. Here, for instance, is another quite well-known reaction circuit (*Fig.* 3), in which the condenser is connected between the reaction coil and the aerial coil.

You will note that in both circuits (*Figs.* 2 and 3) a high-frequency choke is included in the plate circuit of the valve. Its work is not only to stop the carrier wave from passing into the low-frequency amplifier, but also to prevent this carrier wave from being fed back to the aerial. But in the position here shown I am afraid it does not fulfil its function very efficiently.

Low-frequency Choke

In order to show you the full circuit in the anode of this valve, I will add a low-frequency choke, which you will see right on top of the high-frequency choke. On the plate of the valve we have, looking upwards from the actual plate sign to the high-tension positive, first the high-frequency choke, then the low-frequency choke (*Fig.* 4).

The high tension, say 120 volts, passes through both coils to the plate. The variable condenser, known as the reaction condenser, is connected in series with the plate and the reaction coil (*Fig.* 2), while here it is placed between the reaction coil and the aerial coil (*Fig.* 3 *and* 4).

AMATEUR: All this is quite clear. Do you recommend the latter method for our set?

PROFESSOR: Yes, as far as it goes; but it does not go far enough. The best method of reaction I have ever struck (as a matter of fact, it was my brother who first thought of it) is this that I am now sketching out for you (*Fig.* 5). Notice that the reaction coil is here *connected* between the bottom end of the high-frequency choke and the plate of the valve, and *placed* alongside the aerial coil (*as in Figs.* 3 *and* 4).

The condenser is in the same position as in these sketches, namely, between the reaction coil and the aerial coil. Of course the condenser is actually mounted on the panel where it can be manipulated, the leads being of the required length for the purpose.

AMATEUR: Do you propose to adopt reaction for the long waves as well as the medium?

PROFESSOR: No, I don't, because reaction invariably spoils the quality when applied to the long waves. What I mean is that the long-wave transmissions can be much more easily picked up without the assistance of reaction, while if reaction is used it has to be pushed too far to do its work of reinforcement and the quality suffers.

AMATEUR: I see. So we shall just use the reaction for the medium waves when we want to bring up the weaker stations to loud-speaker strength. Sometimes there is a good exclusive programme on Midland Regional which to Londoners is rather a coy station, I find. Here is a case where the reaction will be of service.

Now what values do you recommend for the various components employed in the reaction circuit?

PROFESSOR: The number of turns on the reaction coil, which must be wound round the tuned detector coil former (*Fig.* 6), may be fifteen, No. 28 gauge D.C.C. wire being used. The winding is done, of course, in the same direction as the original tuning coil, and an interval equivalent to one complete turn being missed out will suffice between the main winding and reaction winding.

Any of the small reaction condensers on the market will serve our purpose, the capacity being .0003 microfarad. The high-frequency choke should be screened and *exactly* the same as the high-frequency choke employed in the anode circuit of the screen-grid valve.

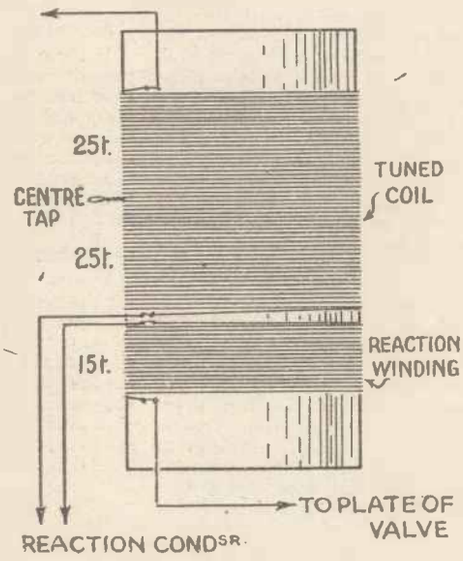


Fig. 6.—Details of tuning coil with reaction for quality circuits

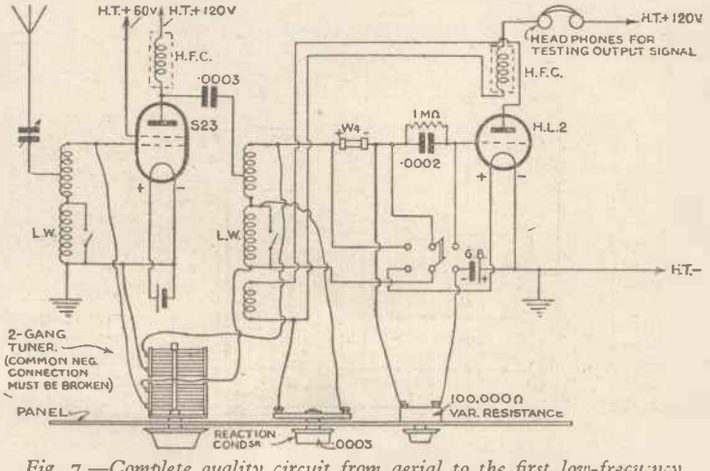
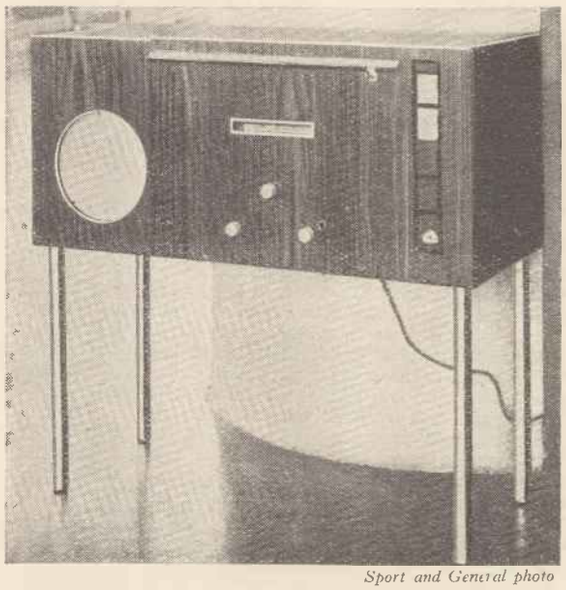


Fig. 7.—Complete quality circuit from aerial to the first low-frequency stage for battery operation. The panel arrangement is also indicated



Sport and General photo

The winning design for a radio gramophone in an Italian competition. It was selected from over 150 entries and has had a mixed reception from the public. The circuit is an eight-valve super-het

Iron-core High-frequency Chokes

This is most important. So we must have a pair of iron-cored high-frequency chokes of the same make, and then we shall be quite safe from error.

AMATEUR: This is all quite simple and easily carried out. Now, shall we just draw up the whole of the receiver circuit from the aerial to the first low-frequency valve, that is, as far as we have got, and see what it looks like?

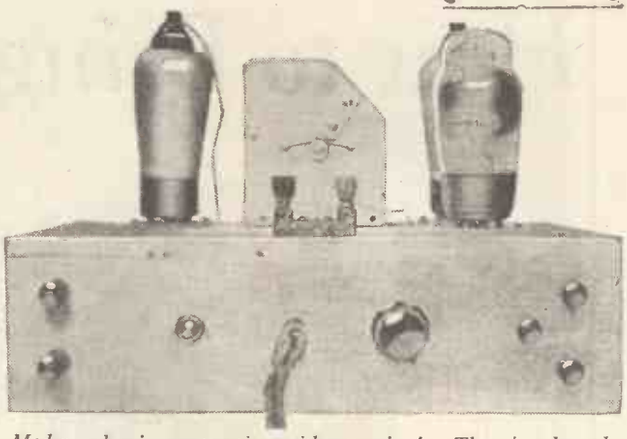
PROFESSOR: All right. If we were to connect a pair of headphones in place of the low-frequency choke (*Fig.* 5) we should have a complete receiver up to this point, and if we were to tune in a local station, we should probably be able to hear some excellent speech or music at this particular hour in the evening.

We will draw up the whole circuit as suggested, showing all battery connections clearly, and also the panel connections. (*See Fig.* 7.) Next week we will proceed to the design of a really good coupling circuit between the first low-frequency valve and the next valve that follows it.

The Hottest Three in History!

The PENTA-QUESTER Leads the Way!

Thousands Take Advantage of Our Free Blueprint Offer



Modern chassis construction without pains! That is what the Penta-quester offers—a wood chassis combining efficiency with simplicity. You simply must Penta-quest!

THREE pentodes in the hottest team of valves ever asked to pull together! And do they pull? *Rather*—and in the right direction. In the direction of greater range, greater volume, greater selectivity and greater ease of control.

Rugged Wood Chassis

That only half states the case for our Penta-quester. Tells you of results, without even hinting about the gallant construction. This is a wood-chassis set—a rugged set with all the advantages of a factory-built job, plus the indisputable superiority of a hand-fashioned product.

Factory-built precision with that priceless asset we call individuality.

Don't forget, you constructors, that we are offering a full-size blueprint of the Penta-quester. Just fill in the coupon on page 432 and you will get the blueprint by return. Your latest date is April 28, though we make allowance for overseas readers.

By now many of you will have read all about the Penta-quester, for we gave you a lot of information last week. By now, then, many of you will have become Penta-quester fans. And no doubt some of the smart ones will already have started Penta-questing.

It is those who don't yet realise the immense potentialities of the Penta-quester that we are now addressing. *Three* pentodes—does that mean anything to you?

It ought to mean great power. That is precisely what it *does* mean in the Penta-quester.

Power at the high-frequency stage—power in terms of great sensitivity, range, and ease of logging foreigners.

Power at the detector stage—power that manifests itself as ultra-sensitive detection without instability or distortion. Power at the output stage, the sort of power only possible from a quiescent push-pull output arrangement using two pentodes.

Oh, yes, there is power enough and to spare in this Penta-quester. And the circuit is so balanced that with all this power to reach out to distant stations, with all this ability to put weak foreigners and nearer-at-hand stations on the loud-speaker at full loud-speaker strength, the selectivity and stability are exceptional.

Pentodes at the high-frequency stages confer not merely the advantage of extra power—useful though that may be under adverse conditions—but the additional advantages of bed-rock stability and extra selectivity. The pentodes reduce the damping on the tuning circuit, and, because they have no "kinks" in their working characteristics, are free from the sudden spasms of "going up the loop" sometimes found in screen-grid valves.

Iron-core tuning coils—two of them—give additional help to the ultra-sharp tuning, which is readily controlled by the tuning condenser—a two-ganger worked by a single knob.

Clock-face tuning adds still further to the attractions—a simple but foolproof mechanism enabling you to tune by time.

Local-station Aerial

Although the most striking feature of the cabinet, the clock-face tuning dial is not all; there are the two vertical chromium bars at each side—providing you with a unique but quite effective local-station aerial system.

Needless to say, the Penta-quester is a battery-operated set, its supply coming from batteries housed in the cabinet, wherein is also fitted the moving-coil loud-speaker.

Talking of batteries, don't forget that the output of the Penta-quester is of the latest quiescent push-pull variety—with a QP21 pentode class-B valve. This valve is really two pentodes in one bulb, and gives the very utmost volume for a given amount of anode current.

Technical Story of the Penta-quester

Battery-operated three-valver, with pentodes for high-frequency amplification, detection, and class-B output.

Table-console set, with self-contained batteries and moving-coil loud-speaker.

Wood chassis, with metallised baseboard and sub-chassis wiring. Two tuning circuits, high-frequency transformer for aerial and intervalve circuits, tuned by two-gang condenser.

Double tone control, one section fixed, the other continuously variable.

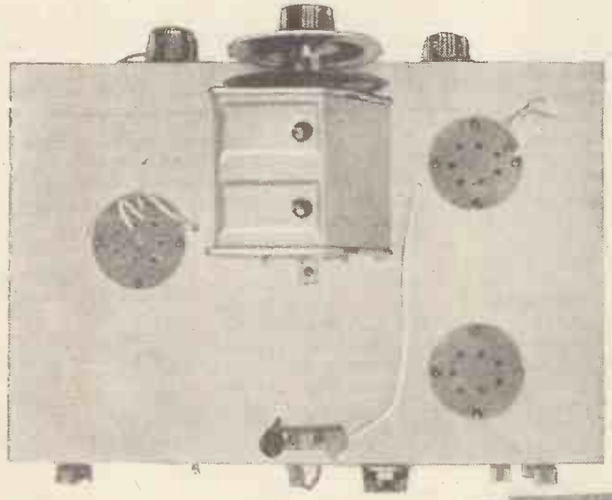
Input volume control, in the form of a .0005-microfarad variable series aerial condenser.

Differential reaction condenser, with additional series resistance for extra smooth control.

Pick-up terminals, applied to grid of detector pentode.

Clock-face tuning dial, worked by chain and sprockets supplied with the cabinet. Independent tuning by condenser knob.

Local-aerial system, in the form of two metal vertical bars down each side of the cabinet.



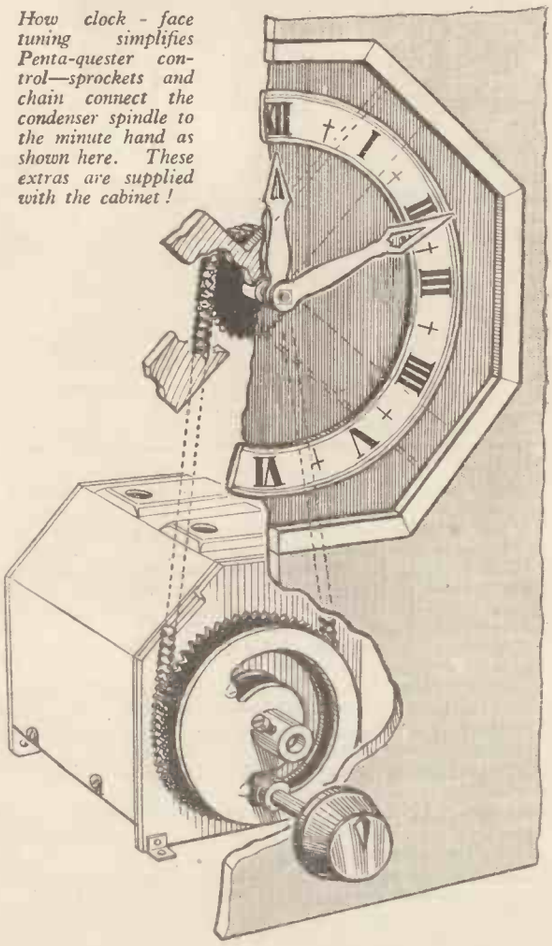
Get a full-size blueprint with the coupon on page 432!

The only time you can "look down" on the Penta-quester is when you are observing the stark simplicity of the plan layout

Our man tuned-in a station on the gang condenser knob—but note the clock-face dial providing a novel alternative method of station logging

How to Bring in Stations with the PENT

Final Constructional and Operating Hints by the "A.



How clock-face tuning simplifies Penta-quester control—sprockets and chain connect the condenser spindle to the minute hand as shown here. These extras are supplied with the cabinet!

BEFORE you go Penta-questing listen to a few words of advice from the designers. We have been testing out this new set under all sorts of conditions and have really got the hang of the controls. So can you in a very short time—if you go the right way about the job.

As you will no doubt have noted from our previous specifications, the Penta-quester is a three-valver for battery operation, using three pentodes for the high-frequency amplification, detection and push-pull output. These three valves provide an unheard-of amount of high-frequency amplification which is readily controlled by the various knobs on the front and back of the set's chassis.

Perhaps at this point it would not be a bad idea to run over these control knobs, just to get our bearings. Take first the four knobs on the front of the cabinet. They are arranged three in a row along the bottom and one above the centre one.

The *left-hand* knob is for *reaction*, the *right-hand* knob for *volume control*. Between these is the wave-change switch, and above it the tuning control knob.

Reaction needs little explanation in so far as its effect on the volume of distant stations is concerned—but it has a more subtle function when considered in conjunction with the volume control.

Series Condenser for Volume Control

As you may have gathered, the volume is controlled by a series condenser in the aerial lead, arranged so that it will reduce even the locals to a very low output level, with a useful range of audibility for all stations received.

In addition to this function of increasing or decreasing the volume, *the control acts as a selectivity device*. As you decrease the capacity of the condenser you do more than simply reduce the signal input—you reduce the damping on the aerial tuning, and thereby increase the selectivity.

It often happens that you want the maximum selectivity on quite a weak station, and the question arises as to how you can get such a station at good strength when the selectivity-cum-volume control is reduced. The answer is: *make an intelligent use of reaction.*

The idea is to work the volume control against the reaction, increasing the latter as the former has to be decreased for selectivity needs—thereby maintaining good volume output.

This particular method of obtaining reaction is very useful in a three-valver; by its aid you are able to perform most miraculous feats of selectivity.

Important!

Remember that even with a fairly strong signal better selectivity will be obtained by increasing reaction and decreasing the volume control.

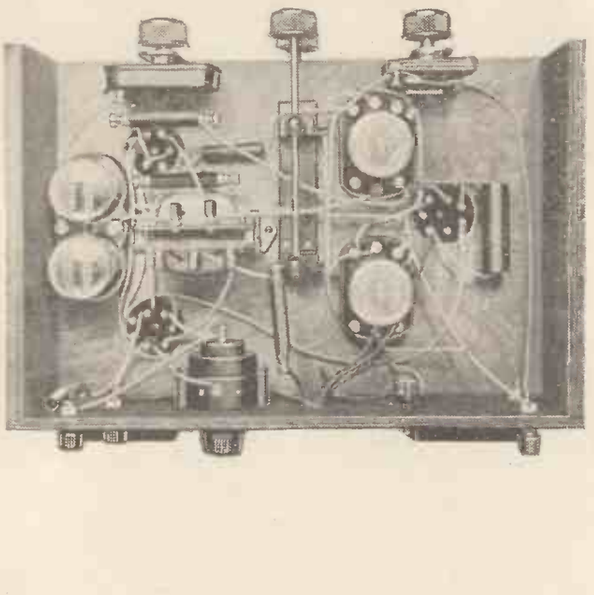
We have been testing the set's selectivity under all settings of the input volume control; we give you here just a few of the many figures we have obtained.

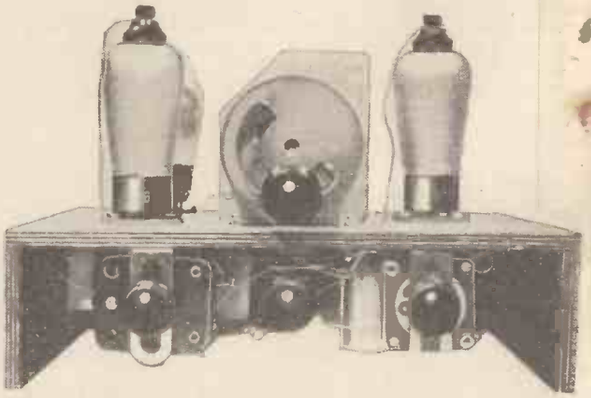
Selectivity, in general terms, can be thought of as the set's ability to cut out all unwanted stations in favour of the one that you do want; a little more definitely, this factor of selectivity can be regarded as *the amount you have to detune to "lose" any given signal.*

If we tune-in a station we can measure the amount of detuning required to reduce that signal to inaudibility in terms of so many kilocycles frequency. And that is just the way we went about the job with the Penta-quester.

We took readings at three different parts of the wave-range. At 280, 330 and 420 metres.

With the input control at zero and reaction at maximum, the 280-metre signal needed detuning 11 kilocycles. With the input control a third in the selectivity fell to 35 kilocycles. This shows how much the selectivity depends on the proper use of input control. Of course, you cannot expect to get much volume with the control at zero, but you must find the happy compromise between that and a certain point towards the maximum setting.





OUR FREE BLUEPRINT OFFER

is repeated again this week, but only one blueprint can be sent to each reader. If you did not send for a free full-size blueprint of the Penta-quester last week, you can get one this week. Send to-day, for this offer will definitely not be repeated. A full-size 1s. blueprint for the cost of ½d. stamp—

GET YOURS WITH THE COUPON ON PAGE 432

At 330 metres, again with the input control at zero, the selectivity was 10 kilocycles. A third in on the volume control it was 25 kilocycles, and three quarters in it was 100 kilocycles.

At 420 metres the selectivity was 20 kilocycles with the control one third in, and 75 kilocycles with the control three quarters in.

We might mention that London Regional, with fair volume—corresponding to 20-milliwatts undistorted output—was cut out within 15 kilocycles, which is very good going for two tuned circuits.

It means that stations two channels away from London could be heard without any interference.

On the long waves our readings proved that Eiffel Tower could be heard clear of Daventry, and Königswusterhausen clear of Radio Paris.

You need not fear that the sensitivity has been sacrificed to selectivity. Even in quite selective positions of the input control the pentodes provide an ample reserve of amplification, giving full loud-speaker signals from a large number of foreigners.

The maximum undistorted output from the class-B stage, assuming a large input signal such as the local, is about 500 milliwatts, more than enough for the average-sized room.

Nor need you fear that the good volume, obtainable alike from locals and foreigners, is gained by the excessive consumption of high-tension-battery current. Here again our laboratory figures prove that the Penta-quester is soundly designed.

Anode-current Consumption at Each Stage

With a maximum high-tension voltage of 120 and 84 volts on the screen of the high-frequency-amplifier pentode, we found that the first stage took 1.5 milliamperes. The detector, when the reaction was well off the oscillation point, and no signal coming in, took 3.5 milliamperes.

The output stage takes current according to the volume. The quiescent or no signal current with 7.5 volts negative grid-bias is only 2 milliamperes, and with 6 volts bias this rises to 4.5 milliamperes.

So much for the actual test figures. We have elaborated them to demonstrate the fact that the Penta-quester has been put very thoroughly through the mill of our laboratory.

Speaking about the other controls, you need little information about the tuning knob. That works the two-gang condenser tuning the two high-frequency transformers, which with their iron cores have exceptional selectivity.

As you turn the control knob you actuate the minute hand on the clock-face dial. The hour hand is fixed at 12-o'clock—quite arbitrarily, and merely as a point of reference for the rotating minute hand.

This minute hand works round from one minute past twelve to 59 minutes to twelve, giving you a convenient method of logging

FIRST GET

CHASSIS
1—Peto Scott Metaplex

CHOKE, HIGH-FREQ
1—Graham Farish scr
Telsen).

COILS
2—Telsen dual-range s

CONDENSERS, FIXE
2—T.M.C. Hydra, tu
.006-microfarad (D
1—Dubilier .1-microf
T.C.C.)

CONDENSERS, VAR
1—British Radiopho
farad with slow-mo
1—Graham Farish .00
(or Lissen, Telsen)
1—Telsen .0003-micro
type (or Graham-F

HOLDERS, VALVE
3—Clix seven-pin, cha

TA-QUESTER

W." Technical Staff

stations by time instead of by the usual dial degrees.

Due to the sprocket wheels and chain connected between the condenser knob and the hand of the clock, you get a two-to-one reduction, which means that the hand does 360 degrees rotation to the 180 degrees of the condenser plates of the condenser.

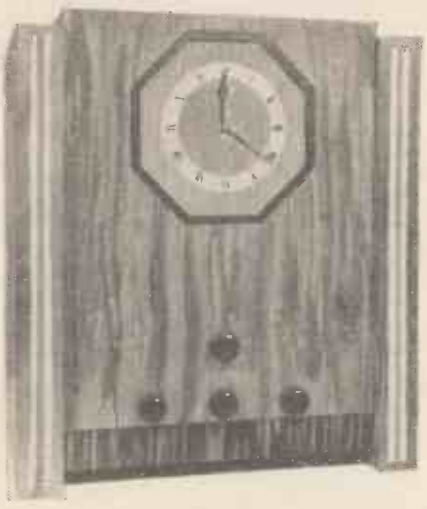
Adjust Reaction for Sensitivity

So much, then, for the tuning. It might be added that as you turn the knob from one part of the tuning range to another there is the usual slight difference in sensitivity—the lower end of the waveband being more sensitive than the top end. Less reaction is needed from 250 downwards than from that point upwards. The sensitivity at 450 metres is actually about two thirds that at 250 metres.

No need to say much about the centre knob for wave-changing, save to remind you that you move this knob to the *right* for *long waves* and to the *left* for *medium*.

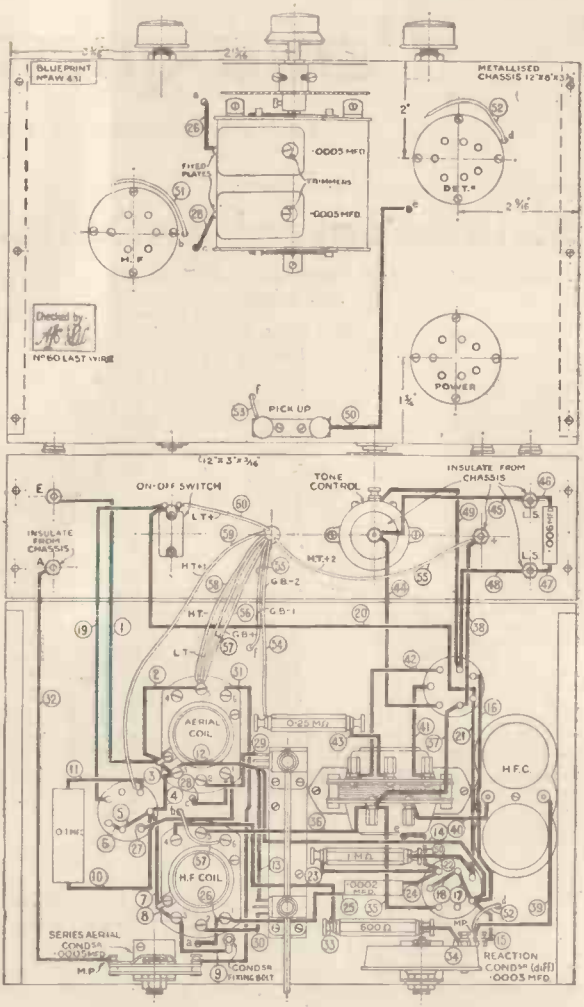
Don't forget that the on-off switching is done by the little toggle at the back of the chassis, where also you will find the variable tone control.

This control is very useful in altering the response for the differing needs of speech and music. In general you will need more "top" for speech broadcasts than for music.



When atmospherics or other background is a little trying on foreigners you can ameliorate conditions by reducing the high-note response. This applies also to the suppression of needle scratch when you use a pick-up—as you can do by connecting one with an integral volume control to the two terminals provided at the back of the chassis.

Little more need be said about working the Penta-quester. You will have some fun testing with the chromium aerial-and-earth system, we are sure. The locals should come in well, and if you use an earth wire you may manage to pick up a foreigner or so on one pillar used as the aerial



Quarter-scale reproduction of the full-size blueprint. Why not work from the print—it is offered to you free of charge if you send in the coupon on page 432 of this issue.

—an indication of the great sensitivity of the three-pentode circuit.

Well, that's about all we think we need tell you about our Penta-quester. We have given you, we hope, enough facts to work upon—enough to convince you that this set is well worth your while. It is a set that will do great things on quite indifferent aerials—as our far-flung tests in different parts of the country have amply proved.

With the imminent seasonal waning in signal strength of the foreigners you will need a set having just that little extra sensitivity the others haven't got. The Penta-quester, with its balanced triple-pentode circuit, has the extra something—and will prove its exemplary powers during the coming months.

YOUR FULL-SIZE BLUEPRINT BY USING THE COUPON ON PAGE 432 AND THEN GET THESE COMPONENTS FOR THE PENTA-QUESTER

x, 12 in. by 8 in. by 8¾ in.

QUENCY
ened, type LMS (or Bulgin,

screened, type W349

D
bular type, values: .0002-, bilier, T.C.C.)
arad, tubular type (T.M.C.,

IABLE
ne two-gang .0005-micro-tion drive, type PQ
·05-microfarad, reaction type

ofarad, differential reaction Parish).

assis-mounting type.

PLUGS, TERMINALS, ETC.
6—Belling-Lee wander plugs, marked: H.T.+1, H.T.+2, H.T.—, G.B.—1, G.B.—2, G.B.+ (or Clix, Eelex).
2—Belling-Lee spade terminals, marked: L.T.—, L.T.+ (Clix, Eelex).
5—Belling-Lee terminals, type R, marked: A, E, L.S. (two).
1—Telsen terminal block.

RESISTANCES, FIXED
3—Graham-Farish 1½-watt type, values: 600-ohm, ¼ and 1-megohm, (or Ferranti, Lissen).

SUNDRIES
4 yds. thin flex. Connecting wire and sleeving.
2 British Radiogram 1½ in. metal mounting bracket.
1 Bulgin knob, type K14.
1—Strip of wood 4¼ in. by ¾ in.
1—Bulgin tone control, type CT2.

SWITCHES
2 Bulgin on-off toggle, type S80B, complete with 6 in. by 5/32 in. rod.
1 Bulgin on-off toggle, type S80T.

TRANSFORMER, LOW-FREQUENCY
1—Wearite, type PPA.

ACCESSORIES

BATTERIES
1—Drydex 120-volt high-tension, type H1012 (or Lissen, Ever Ready).
1—Exide 2-volt accumulator (or Lissen, Fuller).
1—Drydex 9-volt grid bias (or Lissen, Ever Ready).

CABINET
1—Peto Scott, type PQ, with clock-face dial and chain drive.

LOUD-SPEAKER
1—W.B., type PM1A (or Amplion, Blue Spot).

VALVES
High-frequency amplifier, Mullard VP2.
Detector, Mullard SP2.
Output, Marconi or Osram QP21.

SUITABLE MAINS UNIT
1—Atlas CA25 (or Ekco) for A.C. mains, or
1—Atlas DC 15/25B (or Ekco) for D.C. mains.

Penta-questing in the West

The Penta-quester Adds to its Reputation in Cornwall

Stations Logged at Calstock

A indicates indoor-aerial reception and B indicates reception on a 9-ft. copper rod

MEDIUM WAVES

Dial	Station
12.02½	Plymouth—AB
12.03	Fecamp—AB
12.05½	Tampere
12.06½	Salzburg
12.07¼	Königsberg
12.07¼	Radio Vitus—AB
12.08	Dublin—AB
12.08½	Montpellier
12.09¾	Nurenburg—AB
12.09	Frankfurt—AB
12.09¾	Morovska-Ostrava
12.10	West National
12.10½	Madona—AB
12.11	Turin—A
12.11½	Horby
12.11½	Bordeaux
12.12½	Heilsberg—AB
12.13½	Hilversum
12.14	West Regional
12.14½	Grenoble
12.14¾	Poste Parisien—AB
12.15½	Goteberg
12.16	Algiers
12.16½	Brussels—AB
12.18	Brno—AB
12.18½	Hamburg
12.19½	Helsinski—AB
12.20½	London Regional
12.21½	Poznan—AB
12.22	Strasbourg—A
12.22½	German
12.23	Bergen—A
12.23½	Berlin
12.24½	Moscow
12.25½	Bucharest—A
12.26½	Milan
12.27	Scottish Regional
12.27½	Lwow
12.28½	Leipzig
12.29	Toulouse
12.30	Midland Regional—A
12.34	Rome—A
12.35½	Stockholm—AB
12.36½	Sottens—AB
12.39	North Regional—A
12.39½	Langenberg
12.40	Lyons
12.40½	Prague
12.41½	Trondheim
12.42½	Brussels—AB
12.44½	Florence—AB
12.45¾	Rabat—A
12.46¾	Vienna
12.47	Riga
12.47½	Stuttgart
12.48	French
12.50½	Palermo
12.52	Athlone
12.53½	Beromunster
12.55	Budapest—AB
12.56	Wilno
12.59	Ljubljana—AB

LONG WAVES

Dial	Station
12.09	Plymouth Beacon
12.11	Leningrad
12.16	Kalundborg
12.18	Luxembourg
12.18¾	Motala
12.21½	Eiffel Tower
12.26	Warsaw
12.30	Daventry
12.33	Zeesen
12.36	Radio Paris
12.39	Russian
12.45½	Kootwijk

SO great is our faith in the ability of the Penta-quester to bring in the stations that we have purposely sent out test models to many different parts of the country.

Already you will have read of the reports from such widely separated counties as Essex, Surrey and Yorkshire, all the tests so far having borne out our claims. But we were not satisfied that the Penta-quester had been completely put through the mill.

We therefore sent a model right down into the heart of the West Country, to a spot that is notoriously bad for the reception of broadcasting. Actually to Calstock, between Liskeard and Tavistock.

Very Poor Conditions

Down there the West Regional is the only reliable and worth-while station, although Plymouth is also a weak local relay. Probably due to the ore deposits, reception conditions are definitely poor.

So that when we say that the Penta-quester has come through its Calstock tests with flying colours, you can begin to understand this set is no ordinary three-valver.

The set was placed in the hands of a well-known West Country research worker, whose private laboratory is one of the finest in this country. He has aerials of all kinds, suitable for every type of set, and apparatus enabling him to identify without question any station received.

Even allowing for his expert knowledge, the results this Cornish research worker has obtained are remarkable.

He logged seventy-three stations at loud-speaker strength, all good enough to provide entertainment. The stations proving hard to identify or difficult to hear were ignored. You may therefore take it that the seventy-three stations put down in the log represent that number of *programmes*.

This extraordinary result should give confidence to the thousands of worried listeners in the West Country—listeners who, with indifferent apparatus, are unable to tune-in the stations providing the interesting programmes.

From the log you will see that certain stations notoriously difficult to get clear of one another are included. In fairness we must state that clear reception of such stations—about half a dozen altogether—was only possible when adjacent stations were off the air. We mention this in order to dispel any ideas that might arise about the long bow being drawn.

For example, the West National was received clear of Morovska-Ostrava only when the Czech had closed down. While London Regional interfered with Poznan in the early part of the evening.

Aside from these, though, the set was able to get over sixty stations clear of all trace of serious interference. That is surely good going for such a straightforward sequence of valves?

From this test our West Country listener was able to gain an idea of the tuning ranges of the set. On medium waves he got Plymouth at 12.02½, which gives the low limit as just under 200 metres.

At the other end of the medium waveband Ljubljana came in at 12.59—and as that station is on 569 metres, the maximum wavelength is a trifle over 570 metres.

On the long waves the first commercial station received was Leningrad at 12.11. This Russian transmits on a wavelength of 1,224 metres, but Plymouth beacon station, with a wavelength of about 1,000 metres, came in at 12.09.

It was found that the maximum wavelength was well over 2,000 metres, the highest station being Kootwijk, on a wavelength of 1,875 metres.

For the compilation of the report our Cornish critic used an aerial with a total length of 47.5 ft. erected out of doors well clear of buildings—in fact, a first-class aerial system.

Trying an Indoor Aerial

On this aerial, as mentioned, seventy-three stations were tuned in on the loud-speaker. As the majority of these stations came through at colossal strength it was decided that an indoor aerial might be tried.

This aerial was around the picture rail, with a total length of 65.5 ft. Still remembering the remote locality, it is amazing to record that on this aerial the Penta-quester brought in no fewer than twenty-seven stations at loud-speaker strength. The weaker stations that might have been heard with reaction pushed to its limit were ignored.

Seeing that the set had a most unusual amount of high-frequency amplification, the listener tried a freak aerial—an inverted L of special design, the aerial consisting of ½-in. copper tube, with a 9-ft. horizontal portion and 4-ft. down-lead. The end of this rod terminated in a mercury junction to give perfect contact as the aerial system was rotated on its ball bearings.

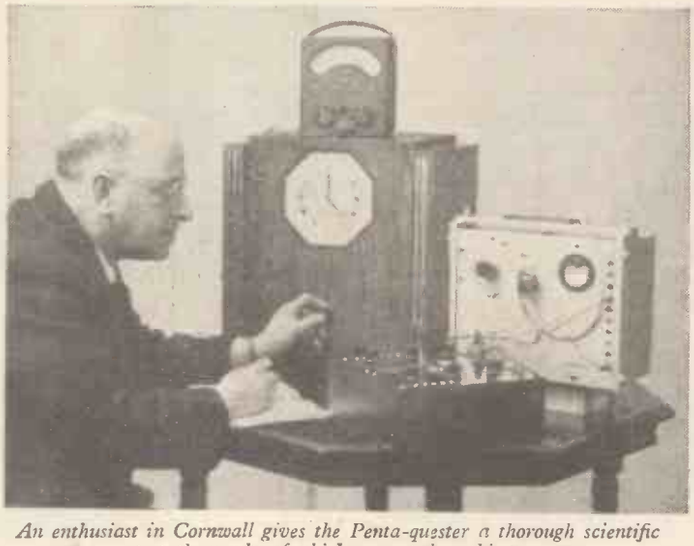
On this very inefficient aerial nineteen stations were tuned-in direct on the loud-speaker. Small wonder that we suggest using the chromium bars provided with the cabinet!

Plenty of Stations

So great is the amplification that even in a remote part of the West Country, far from the high-power regionals, the Penta-quester can bring in plenty of stations—no matter how meagre the aerial system.

Our photograph is of the Cornishman who kindly undertook the test. He prefers to remain anonymous, but we can assure you that he is really delighted with the performance of the Penta-quester—especially on the medium waves.

Clock-face tuning met with great approval, the dial being so easy to read at even a considerable distance. From the log, too, you will appreciate that this method of tuning simplifies the operation considerably.



An enthusiast in Cornwall gives the Penta-quester a thorough scientific test, the results of which are noted on this page

WABC—America's "2LO"

By Our American Correspondent: LIONEL MERDLER

WABC is probably one of the best known of American transmitters and, like 2LO, has made radio history in the States. It is the key station for the Columbia broadcast system and serves the densely populated New York area. The location is at Wayne, about 30 miles out from the city and in a marshy area of the state of New Jersey.

The sign "WABC" over the main entrance to the station building

Approaching the station, one of the first things to take one's attention is the 600-ft. mast, tending to give the aerial system an incomplete appearance to those accustomed to the normal twin-mast system. This 600-ft. mast or tower is, however, the actual radiating system.

Based on entirely new principles and designed to give greater efficiency than the usual twin-mast system, the scheme has proved highly successful and is stated to be equivalent to doubling the output power. The tower is shaped like an elongated diamond and is supported by four guy wires at the centre, the top half being without strainers. The mast finishes off with a pointed steel shaft and the whole structure is supported on two porcelain insulators mounted on a concrete block. Although weighing but 60 lb. each, these insulators take the full weight of the tower.

As there is a potential of several thousand volts between guy wires and the steel lattice work, special string insulators have been found necessary and these are similar to those used on high-voltage transmission lines for electric-power supplies.

From the base of the tower, where the voltage is very much lower, a line is taken into the junction house, where a 4-ft. diameter coupling coil matches the station transmission line to the aerial. An interesting feature inside the junction house is the motor generator mounted on 18-in. insulators for feeding the warning beacon lamps for aeroplane guidance.

As a further precaution, the mast is painted in alternate red and white bands and for lightning protection a spark gap is placed across the supporting insulators.

The transmitter house, with its "WABC" engraved on the front porch, is a marvel of neatness and efficiency; it was made by the Western Electric Company and has a power output of 50 kilowatts. Low-power modulation is used with a crystal-controlled frequency; this is the first unit on the extreme left. A class-B 1-kilowatt unit comes next, working into a 20-kilowatt stage which comprises the third unit. The output stage has four 35-kilowatt water-cooled power valves and is the third unit from the right. Behind the operator can be seen the six-phase high-tension supply unit which feeds some 20,000 volts to the anodes.

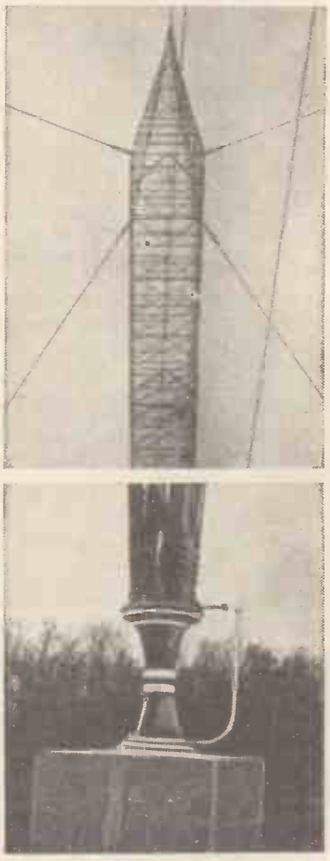
Inside the transmitting hall at WABC—America's "2LO"

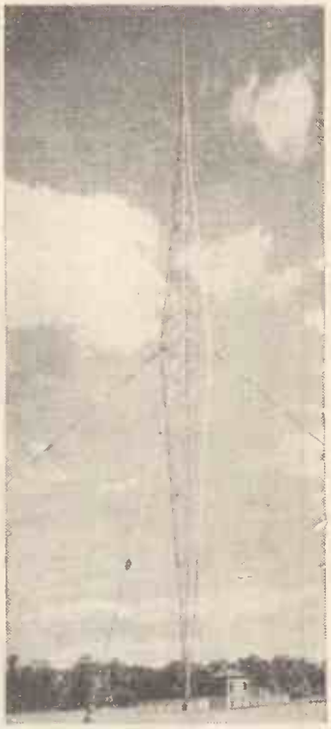
Distilled water is used for cooling the anodes as this has been found better for general reliability. The water is cooled by three giant fans drawing air across a radiator system. Filaments of the power valves are fed from a separate motor generator.

The whole station operates from a choice of two 440-volt supply lines and there is an absolute minimum of rotating machinery. The high-tension transformer, smoothing chokes and condensers are situated in the basement directly below the transmitter and a clean system is thus assured.

In one corner of the transmission hall is W2XE, the short-wave transmitter that is frequently picked up in England. The power is now 1 kilowatt and the WABC programme is taken.

Part of the WABC transmitting plant, which is about 30 miles from New York





(Left). — Views of the top and bottom of the aerial mast at WABC. (Above).—The complete 600-ft. mast, shaped like an elongated diamond

Abominable Road

The station buildings are approached by the usual abominable road that leads to all transmitters and a boat is provided for the station engineers in time of flood, a necessary arrangement in view of the marshy nature of the surrounding land. The buildings are raised well up to free the apparatus from any possible danger of flooding.

Station breakdown times can be reckoned in minutes over a period of years that the transmitter has been on the air and this speaks well for the station direction, which is under the charge of A. B. Chamberlain, the Columbia Chief Engineer.

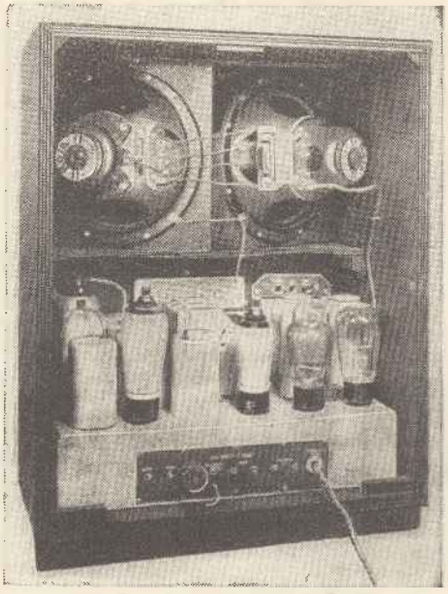
Are you Penta-questing yet? If not, you should certainly look into the special merits of the latest AMATEUR WIRELESS three-valver. Eight pages of the preceding issue were devoted to a full description of the Penta-quester and there are four further pages describing the set in this issue. Extensive tests have proved beyond doubt that the Penta-quester is a real winning design. Send for your free blueprint and start building it this week!

Sets of the Season Tested

Drummer MS6 Set

FOR the listener who wants a receiver a little better than the average run of four-valve super-hets and not quite so expensive as the large seven-valve super-hets, the Drummer M.S.6 is a receiver which should be given close consideration. The de-luxe six-valve super-hets have been very badly overlooked by the majority of set manufacturers, so that the range is comparatively limited.

The Drummer people have gone into the



Note the dual loud-speaker assembly in this new Drummer receiver. It is a high-class job from every point of view

design of a high-class super-het with twin moving-coil loud-speakers. The receiver has not been designed for low price, but it has been designed to give a pre-determined performance. The result is a set above criticism.

Owing to the two loud-speakers, the cabinet is larger than usual, but it is still of the upright type, of figured walnut and really excellent finish. There are four controls, although there is a fifth which governs the overall sensitivity of the receiver and is situated at the back of the cabinet.

The four important controls are the tuner, which actuates a knife-edge pointer, wave-change and gramophone switches, volume and tone control. The wavelengths are marked on the tuning dial and range between 200 and 550 metres on the medium waveband and 900 to 2,000 metres on the long-wave band.

High-frequency Pentode

There are six valves, five receiving valves and a full-wave indirectly heated rectifying valve, which gives 350 volts high tension. A high-frequency pentode is in the first position to give additional range, particularly in daylight. This also prevents re-radiation, keeps second-channel interference to a minimum, and makes the receiver more simple to handle.

The second valve is a combined detector-oscillator, an AC/S2/Pen, while for the single intermediate-frequency stage there is another high-frequency pentode, a Mullard VP4. The overall stage gain of the receiver is varied by means of alteration in bias to the VP4. For second detection, low-frequency amplification and automatic volume control a Mullard three-in-one valve is used.

This is resistance-capacity coupled to a power pentode output valve, a Mazda AC/2Pen. This valve gives an undistorted output of 3,500 milliwatts with an input of only 2.5 volts. In practice this means that only a very small signal input is necessary to give loud-speaker volume.

For the Fastidious Listener

We are very much in favour of twin loud-speakers if they give quality as in the M.S.6 set. The reproduction is good enough for the most fastidious listener. Broadcasts such as symphony concerts from the Queen's Hall sound like the real thing, and you would have to be there to improve upon it.

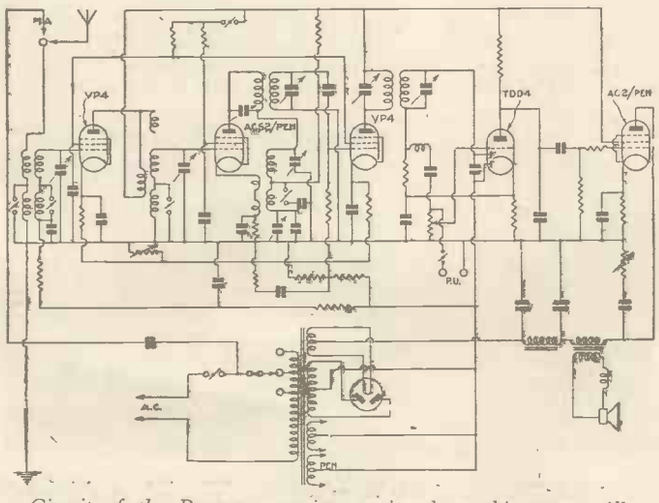
Instead of giving a long report on the number of stations heard, we are going to tell you something about the production methods which ensure 100 per cent reliability with Drummer sets. Being a new firm, they realise that before a set can be universally popular it must be trouble-free. So to make quite sure nothing can go wrong, they have the most elaborate system of cross-checking.

Every chassis is subjected to severe mechanical and electrical tests. All joints, switches, and movable parts are carefully examined, and after this all components are tested for values and efficiency before the coils are aligned by the cathode-ray equipment. Then the ganged condenser is checked and the sensitivity of the receiver measured at different points to see whether it is up to the standard of the laboratory model.

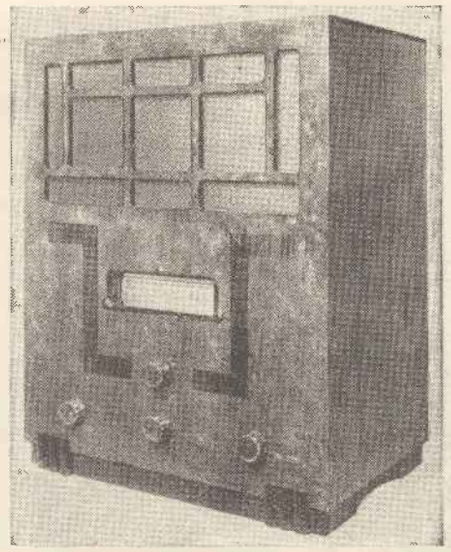
The "Soaking" Test

Finally comes a very unusual test, called the "soaking" test. The Drummer people have found that sets can go wrong after they have been used for only an hour or so, and that the faults which cause these breakdowns cannot always be traced to the factory.

To overcome this, every set, before it is issued, is left running for a period of four hours, after which it is very unlikely that there will be any trouble. Any little faults that might crop up almost invariably show up within this period.



Circuit of the Drummer receiver reviewed on this page. All constructors will be interested in its electrical arrangement



There is no doubt about the attractive appearance of this new Drummer set

IN A NUTSHELL

Makers : Edge Radio, Ltd.
Type : Drummer M.S.6.
Price : £19 19s.
Valve Combination : High-frequency stage (Mullard VP4), combined detector-oscillator (Mazda ACS2Pen), single intermediate-frequency stage (Mullard VP4), double-diode-triode second detector (Mullard PDD4), power pentode output (Mazda AC2Pen), and full-wave indirectly heated rectifying valve (Mullard IW3).
Power Supply : A.C. mains 200 to 250 volts, 40 to 100 cycles.
Type : Self-contained upright table model.
Remarks : One of the most powerful six-valve supers we have tried that gives remarkable quality from twin moving-coil loud-speakers.

After knowing all about these tests, we expected a lot from this set and gave it an unusually thorough examination, but there is not one adverse criticism that we can possibly make.

Almost every European station was received at good loud-speaker strength. Selectivity was a little better than 9 kilocycles, which is good enough for anyone, while on the long waves between 1,400 and 2,000 metres the selectivity was increased to approximately 7 kilocycles.

Although most super-hets will pick up American stations, it is usually the background noise which mars reception. With this set we heard over twenty Americans with the volume control only two-thirds on. Consequently, the background noise was reduced to a very low level. Over a period of a week, we heard numerous American stations, some as early as 11.30 p.m., which shows that reception was quite reliable and not due to freak conditions.

The automatic-volume-control is highly efficient, due to the exceptional stage gain, so that the majority of long-distance stations can be held for long periods without fading or "dither." The tone control cuts off what background noise there is and reduces the intensity of heterodyne whistles from stations that are almost on the same wavelength.

To sum up, we can recommend this set as a superb instrument.

PENTA-QUESTER

LUCERNE RANGER—LUCERNE MINOR

PILOT AUTHOR KIT

EXACT TO SPECIFICATION

The Pilot Kit SERVICE was founded in 1919

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1 Peto-Scott Metaplex chassis, 12 in. by 8 in. by 3½ in.	3	6
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2 Telsen dual-range screened coils, type W349	17	0
2 T.M.C. Hydra condensers, tubular type, .0002-mfd., .006-mfd.	1	3
1 Dubilier type tubular .1-mfd. condenser	1	4
1 British Radiophone two-gang condenser, .0005-mfd., with S.M. drive, type PQ	18	0
1 Graham Farish .0005-mfd. reaction condenser	2	0
1 Telsen .0003-mfd. condenser, differential type	2	6
3 Clix seven-pin chassis-mounting valve holders	3	0
6 Belling Lee type wander plugs	1	0
2 Belling Lee spade terminals		4
5 Belling Lee type R terminals	1	3
1 Telsen terminal block		6
3 Graham Farish Ohmite resistances, type 600, and 1-meg. and ½ meg.	4	6
2 Bulgin on-off toggle switches, S80B, with 6 in. by 5/32-in. rod	4	6
1 Bulgin on-off toggle switch, type S80T	1	3
1 Wearite transformer, type PPA	13	6
1 Bulgin tone control, type CT2	5	0
2 B.R.G. brackets and Bulgin knob, wire, screws, flex, etc.	2	6
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Balance in 11 monthly payments of 6/6. Send only **6/6**

KIT "C"

As for Kit "A," but with Valves and Peto-Scott Lucerne Cabinet. Complete with B.A. Cone Speaker. Cash or C.O.D. Carriage Paid, £4/12/6. Balance in 11 monthly payments of 8/6. Send only **8/6**

ASSEMBLED LUCERNE PARTS

★ If Ready-assembled Lucerne Coils, H.F. Choke, and L.F. Transformer required with Kit in place of parts for same add 5/- to Cash or C.O.D. prices or 6d. to each monthly payment.

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KIT "A" *CASH OR C.O.D. Carriage Paid.* **27/6**

Author's Kit of First Specified Parts, including Metallised Baseboard and wood for Panel, 10 in. by 7 in. but less Valves and Cabinet. Cash or C.O.D. Carriage Paid, £1/7/6. Or Yours for 4/-. Balance in 7 monthly payments of 3/9.

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As for Kit "A," but with set of Valves only. Cash or C.O.D. Carriage Paid, £7/1/0.

Or 12 monthly payments of 13/-.

KIT "C"

As for Kit "A," but with Valves and Peto-Scott type PQ Cabinet. Cash or C.O.D. Carriage Paid, £8/16/0.

Or 12 monthly payments of 16/-.

RECOMMENDED PETO-SCOTT PERMANENT MAGNET MOVING-COIL SPEAKER. Cash or C.O.D. Carriage Paid, 19/6, or add 1/9 to deposit and each monthly payment.

PETO-SCOTT *Exclusively Specified* PENTA-QUESTER WALNUT CABINET

Designed at the special request of "Amateur Wireless." In handsome hand-french polished Walnut. With unique 360-degree Tuning Scale and 2-1 reduction sprockets, driving chain, scale and speaker baffle.

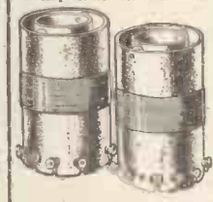
35/-

Carriage 2/6 extra.

Or 7/6 deposit and 5 monthly payments of 6/6, Carriage Paid

LUCERNE PARTS

Complete kit comprising 2 ready-drilled Formers, 2 Reels of enamelled Wire, 6 B.A. Terminals, Nuts and Screws. Exact to specification for Aerial or Grid Coil. Postage 6d. extra. **2/6**
2 Complete Kits for both Aerial and Grid Coils, 5/-. Postage 6d. extra



Ready Wound

LUCERNE AERIAL COIL OR GRID COIL Each **3/-**

Wound exactly to 'Amateur Wireless' specification. Manufactured, Tested and Guaranteed by Peto-Scott.

Postage 6d. Extra
6/3 Per Pair Post Free

H. F. CHOKE PETO-SCOTT KIT, comprising machined and slotted ebonite former, ready drilled, complete with terminals, fixing screw and 44 enamelled wire to "Amateur Wireless." specification. **1/6** Postage 6d. extra.
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L.F. TRANSFORMER PETO-SCOTT KIT, comprising moulded bakelite case, ready-drilled and completed with ready-wound bobbin, 25 pairs of laminations and terminals, to "Amateur Wireless" specification. Postage 6d. extra. **3/6**
Ready assembled and tested by Peto-Scott, 5/-, postage 6d. extra.

MAINS L.F. CHOKE Complete Kit of Parts, exact to "A.W." specification, comprising ready-wound bobbin, laminations, clamping strips and bolts. Postage 6d. extra **6/9**
Ready assembled, tested and guaranteed by Peto-Scott. Postage 6d. extra. **8/9**

A.C. MAINS TRANSFORMER Complete Kit of Parts, exact to "A.W." specification, comprising ready-wound bobbin, with coloured leads, set of laminations, clamping strips, fixing screws. Postage free. **13/6**
Ready assembled, tested and guaranteed by Peto-Scott. Postage free **16/6**

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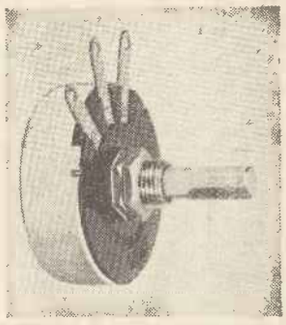
Conducted by J. H. REYNER, B.Sc., A.M.I.E.E.

Our Tests of New Apparatus

ERIE VOLUME CONTROL

THE Erie fixed resistor has established such a name for itself that it is not surprising to find a volume control marketed by this firm. This component is particularly neat, measuring only $1\frac{7}{16}$ in. diameter and $\frac{1}{2}$ in. thick.

The resistance track is in the form of a washer of carbon-impregnated material, on which the contact rides. The contact itself appears to be of graphite or similar material and is carried in



Erie volume control

a spring housing which supplies firm pressure over the whole travel.

Test Results.—The component proved quite satisfactory in operation; it was quiet and smooth in use.

The rated value was 50,000 ohms and the actual maximum value was measured at 57,000 ohms. The instrument is nicely graded.

The volume controls, which are of the three-terminal type so that they may be used either as series resistances or potentiometers, are made in values ranging from 25,000 ohms to 250,000 ohms.

Makers: Radio Resistor Co., Ltd.
Price: 3s. 6d.

GOLTONE LIGHTNING ARRESTER

A SIMPLE but effective lightning arrester has recently been introduced by Ward and Goldstone, Ltd. This has been designed to provide protection against static charges on the aerial without causing leakage or serious capacity effects to earth.

Goltone lightning arrester

The apparatus consists of two brass stubs brought relatively close to one another, the spacing being controlled by a thin mica washer. These stubs are located in a bakelite cowl which shields the apparatus from the rain and provides a long leakage path.

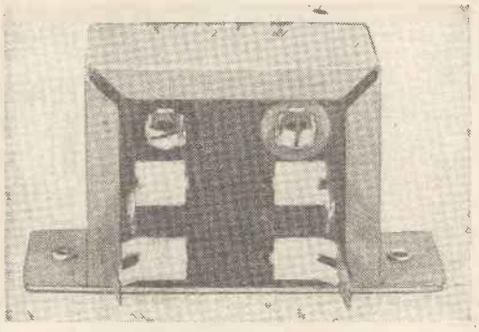
The aerial terminal is connected to the top of the instrument, a wing nut being provided for the purpose, while the bottom stub is carried on a small bracket in some convenient location and connected to earth.

Test Results.—We found the instrument quite satisfactory in use. It introduced a negligible extra capacity into the circuit and did not affect the quality of reception at all. While we did not actually produce any artificial lightning, we have no doubt that it will operate successfully under the conditions for which it is intended.

Makers: *Ward and Goldstone Ltd.*
Price: 2s. 6d.

BENJAMIN AUTOCONTROLA

THIS battery-economy unit has one or two novel features, the most useful of these being that the range of control is variable



Benjamin Autocontrola—for battery economy

at will according to the value of resistance used in series with the feed from the anode.

Both resistance and metal rectifier are mounted externally and have to be supplied by the user. The remainder of the network, including the de-coupling resistance and condenser, is housed inside the unit.

The equipment is mounted on two sheets of bakelised board carried in a small metal pressing. There are four terminals, each with a different colour backing.

Test Results.—We tried the Autocontrola under various conditions and found that it operated very satisfactorily.

The wide range of control obtainable can be gauged from the fact that with a 20,000-ohm resistance, 50 volts low-frequency applied to the input terminals of the Autocontrola produced 23 volts bias, which is more than sufficient, even for a super-power valve.

A typical two-valve set was taken, having a small pentode valve in the last stage. Under normal quiescent conditions the current consumption from this valve was only 2 milliamperes rising to 10 milliamperes under full load.

Makers: *Benjamin Electric, Ltd.*
Price: 7s. 6d.

FERRANTI RESISTANCES

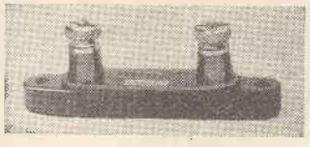
FERRANTI have recently introduced a composition type of resistor having a nominal rating of .75-watt. The resistance element is sprayed on to a rod to the required thickness. Small metal caps with connecting wires attached are then forced over the ends and the whole is colour-coded.

For the higher values the effective resistance is increased by cutting a spiral on the rod in the usual manner, thereby causing the current to take a longer path.

The resistances are supplied in two types, one consisting of the simple resistance with wire ends and the other a constructors' type in which the resistance is housed in a small bakelite moulding provided with two terminals.

The constructor type is a very neat assembly and will easily screw down to the baseboard. In this case the value of the resistance is clearly marked on the top of the moulding.

Test Results.—We checked a number of samples ranging from 750 to 20,000 ohms. In every case we found the resistance within 10 per cent of the rated value and the dissipation quite up to the



Ferranti resistance

makers' rating of .75 watt. In fact, many of the resistors will stand well over 1 watt.

Makers: *Ferranti, Ltd.*
Price: *terminal type* 1s., *wire-end type* 6d.

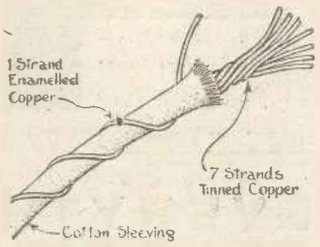
HELIX AERIAL

THE new Helix aerial consists of a seven-strand wire covered with rubber insulation and surrounded by a weatherproof wrapping. Round the outside is an open spiral of enamelled copper wire which runs from end to end of the aerial and forms an effective earth screen. The whole wire is little more than $\frac{1}{8}$ in. thick, so that it can be handled with the same ease as an ordinary insulated aerial wire.

The external helix is intended to be connected to earth either directly or through a small condenser; when this is done it serves to screen the aerial from direct pick-up, although at some expense of signal strength.

Test Results.—We found the aerial very effective in operation. For all normal purposes it is sufficient to connect to the earth screen through a .0005-microfarad condenser. Under these conditions the signal strength drops quite appreciably, but the interference is cut down much more.

It is, in fact, possible to grade



Helix weatherproof aerial

the amount of screening obtained by using a variable condenser in the earth lead and the curve herewith shows the voltage developed in terms of the capacity of the earth condenser.

If the screen is earthed direct there is a considerable drop in signal strength, but this will not be necessary except in extreme cases. The capacity between the aerial and the screen is approximately 25-micromicrofarads per foot.

Makers: *Lamplugh Radio, Ltd.*
Price: 2s. 6d.

CLIX NINE-PIN VALVE HOLDERS

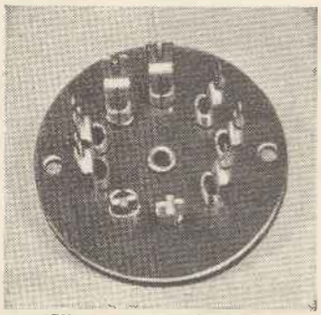
THESE Clix nine-pin holders are made up in the usual Clix style, the sockets being mounted on one sheet of paxolin and a second sheet being riveted over the top to serve as a protection against wrong insertion or accidental contact with the wrong pin.

One of the types uses the well-known socket with the spiral slot terminated in a small screw terminal.

The contact was good despite the multiplicity of pins.

The other type is more in the nature of a manufacturer's model, consisting of an oval section stamping terminated in a soldering tag forked at the end to facilitate the gripping of the wire during the soldering operation. Despite the fact that this socket is apparently much simpler in construction it provided a satisfactory contact due, no doubt, to the spring action of the oval formation.

Makers: *Lectro Linx, Ltd.*
Price: 1s. 3d. *with terminals*, 1s. *without terminals.*



Clix nine-pin valve holder

The ABC of Mains High Tension

Continued from page 414

Another view of the completed mains transformer for the A.C. unit

primary wire—it is 29-gauge enamelled wire—a short length of lead-out wire. This is very strong stranded and insulated wire for external connections.

Wind on, either by hand or in a machine, 1,400 turns of the thin wire. Clean off the enamel from a short length of the wire and solder on some more of the lead-out wire. Bring this lead-out through a small hole at the outer portion of the bobbin, in line with the hole at the centre.

Wire Not Broken

Then wind on with another 140 turns of the thin wire, which of course has not been broken. Clean again, make another connection, drill another hole in the bakelite and bring out with the stouter wire. That makes a total of 1,540 turns. Carry on with still another 140 turns and at this point break the wire, clean the end, solder on another piece of lead-out wire and bring through the hole in the side.

This gives you four wires coming out of the side of the bobbin, the one nearest the core at the centre being the low-potential or common point, which with the lead next to it gives you the correct winding for 200-volt mains.

The common wire and the third tapping are used for 220-volt mains, and the common wire and the fourth tapping are for 240-volt mains.

If you wind on the wire carefully you will be able to interleave each layer with a piece of thin tissue paper. Do this and you will get the maximum insulation and the chance of faults in the winding will be greatly reduced.

That gets rid of the primary. Wind over this some tissue paper; or thin Empire tape will do. Then start with the secondaries. Do the high-tension one first. A different gauge in wire is used here. It is No. 37-gauge enamelled.

Drill a hole about half way in towards the centre of the cheek, clean the end of the wire, solder on to it some stout flexible wire, wind one turn of the stout stuff round the bobbin to take the strain, and then carry on with 1,850 turns.

Getting to the End

When you get to the end you can either break the wire and remake the connection after you have soldered a tapping lead to a bared portion, or you can simply clean a short length of the wire and solder on a piece of twisted flex and carry straight on—with another 1,850 turns. At the end of this clean up and solder on another lead to complete the high-tension winding.

Now we come to the low-voltage windings. First there is the rectifier winding, giving 4 volts at one ampere. This consists of 30 turns of 22-gauge enamel, with a tapping in the centre as before, the two ends being the heater connections, and the tapping at the centre being the high-tension positive.

Then you have to wind on the 4-volt heater winding for any receiving valves you may want to run. This consists of 30 turns of No. 18 gauge enamelled wire, tapped at the centre.

If you wind your own bobbins, we suggest that you cover all your winding leads with coloured sleeving, using the same coloured-coding as in our original. The primary leads are all covered with black sleeving; the high-tension "outers" with red, the centre tap with black; the 4-volt 1-ampere winding with green for the outers, and variegated for the centre tap; the 4-volt 4 ampere filament winding with yellow for the outers, and variegated for the centre.

The next part of the work is the fitting of the core laminations. Here you have to interleave 55 T pieces with 55 U pieces, as shown by the diagram.

The piece of metal channeling is pushed over the laminations and stops vibrations, keeping the whole job rigid. But we decided that to make quite sure of the elimination of buzzes and all that by fitting a little piece of presspahn or cardboard across the bottom of the laminations, held in place by the channeling. This really is effective and we don't advise you to omit it.

From the blueprint layout you can see how the home-made transformer is connected in the high-tension mains unit circuit. Follow this implicitly and you will have a really first-class mains unit. Full-size print, price 1s.

The completed bobbin is designed to give good results on mains from 200 to 250 volts 40 to 60 cycles, and will give an output of 250 volts at 60 milliamperes, 4 volts 1 ampere for the rectifier valve, and 4 volts 4 amperes for the valves in the set.

Next week, if the Editor lets us, we will give you an idea as to how this unit can be connected up to existing battery sets—thereby all-electrifying them. Oh, and by the way, we hope to tell you later on how to convert our Lucerne Ranger for A.C. mains—using the unit here described.

On reading this over, we are a little depressed by the apparent complexity of the winding instructions. Please don't let them depress *you*—the winding is not so very difficult. And, anyway, you can get the bobbins already wound, can't you?

COMPONENTS NEEDED FOR THE A.C. MAINS UNIT

BASEBOARD
1—12 in. by 7 in.

CHOKES, LOW-FREQUENCY
2—As described in AMATEUR WIRELESS, dated April 7 (kits of parts available from Peto-Scott, Ohmic, McDaniel).

CONDENSERS, FIXED
4—1-microfarad, 250-volt D.C. peak.
1—2-microfarad, 250-volt D.C. peak.
1—4-microfarad, type electrolytic.
1—8-microfarad, type electrolytic.

HOLDER, FUSE
1—Twin, complete with fuses.

HOLDER, VALVE
1—Four-pin.

PLUGS, TERMINALS, ETC.
6—Plugs and sockets, shrouded type, marked :—H.T.+, H.T.+1, H.T.+2, H.T.+3, H.T.+4, H.T.—.
1—Terminal marked "Earth."

RESISTANCES, FIXED
1—20,000-ohm.
1—75,000-ohm.

RESISTANCES, VARIABLE
1—5,000-ohm.
1—100,000-ohm.

SUNDRIES
Connecting wire and sleeving.
2—Condenser mounting brackets.
Ebonite strip, 7 in. by 3 in.

SWITCH
1—On-off toggle.

TRANSFORMER, MAINS
1—As described this week (kits of parts available from Peto-Scott, Ohmic, McDaniel).

VALVE
1—Mullard IW2 (or Mazda UU2).

Short-wave Notes

By KENNETH JOWERS

FOR the past few weeks a number of readers have written to me saying how well the 20-metre amateur stations are coming in. I passed this information on in the usual way and to my surprise the following week's post-bag consisted mainly of letters from listeners who fail to hear any 20-metre stations at all!

I have been checking up reception conditions on this waveband and from results I have obtained it looks very much as if the majority of readers have been listening in at the wrong time of day. It is a well-known fact that the 20-metre band is usually better during daylight and is not very much use later in the evening.

At the moment, however, for some reason or other, conditions are very poor until 21.00, after when the east-coast American stations come in extraordinarily well. For example, on Sunday evening, at 21.30, WIBES was calling CQ at R9 on and off for about an hour and a half. Signal strength was sufficient for the speech to be heard at a distance of 50 yards.

To prove this was not freak reception on the following two evenings, round about the same time, upwards of twenty American stations were heard at varying strength between R6 and R9.

An interesting point that I noticed was that although the amateur stations with their comparatively low power were at good strength, the 19-metre commercial stations could not be heard after 20.00.

◆ ◆ ◆

I had never been very much in favour of a short-wave receiver having an untuned high-frequency stage, such as are so popular in America. The Stratton people have sent me a Kilodyne Four, a kit for the home constructor, and in this receiver instead of the usual tuned aerial coil they use a high-frequency choke.

This arrangement certainly makes tuning simple, enables single-dial control to be very efficient, and, contrary to my expectations, the results were remarkably good. After only a few hours' test, amateur and commercial stations have been logged from all over the world.

So I am rather of the opinion that this type of circuit is worth looking into. A single-control short-wave set should certainly become popular, particularly when the user does not want a set with a multiplicity of tuning controls.

◆ ◆ ◆

The Post Office engineers seem to be having a very busy time at the moment. I have already had about half a dozen visits from the local engineer this year. I wonder if it is due to the pirate transmitters which appear to be flourishing at the moment? What with two stations up in Norwich, one in Yorkshire, and now Station Z, it seems about time that the Post Office did something about it.

This is the first time that there has been any serious attempt at pirate broadcasting and the comparatively ineffective measures taken to prevent it will not act as a deterrent. In the case of the Norwich transmitters, nothing was done except to confiscate the apparatus, while I believe that the Yorkshire man was fined about £2 or so.

Listeners' Letters

WE LOSE A READER—

To the Editor, AMATEUR WIRELESS.

WHY not re-name your book "Schoolboy's Own Wireless"? This week AMATEUR WIRELESS is no more than a pictorial and is not worth a penny.

I will on no account buy it again.

ANONYMOUS.

Brighton. [1059

[The above anonymous message was attached to a copy of AMATEUR WIRELESS for April 7—the whole being returned to us minus a postage stamp!—ED.]

—AND GAIN SOME PRAISE!

THE fact that you have secured the pen of Noel Bonavia-Hunt is proof that it is your aim to provide your readers with the best possible information on the all-important subject of real quality. No more worthy writer on this subject could, I am sure, have been chosen.

I am certain that your readers will appreciate the way in which these real-quality articles are written; they cannot fail to be understood by all and are therefore invaluable as compared with the kind of article so interspersed with mathematical formulae that the reader is often so confused that the text of the subject remains a deeper mystery than ever.

With information presented to us in this question-and-answer form, we must of necessity grow wiser. I therefore hold up AMATEUR WIRELESS as the best and most informative radio journal—and the price, threepence. I congratulate you.

In conclusion I might add to my best wishes the cry, "More and more on quality from Mr. Bonavia-Hunt."

D. V. TURNER.

Dagenham, Essex. [1060

"STALE" BATTERIES

I AGREE that the triple-capacity battery of best quality is the best for sets using three valves or more.

Still, a cheap standard-capacity represents good value for a two-valver particularly if the set's transformer is also of the five-bob variety (incapable of amplifying at the bass frequencies where distortion would occur).

It is the high resistance of the cheapest batteries which causes the trouble. A real transformer, such as Ferranti, soon shows up a dud battery because it can amplify practically dead true from bottom to top.

I think a good reason for the cheap battery's popularity is that being cheap it has a ready sale and is seldom stale.

All manufacturers should stamp the date of manufacture on the battery. When buying a battery it is better to buy a cheap stale one than an expensive stale one.

W. H. MORRIS.

Wimbledon. [1061

LONDON REGIONAL'S SPREAD

IN your issue dated March 31 the article "Designing Your Aerial Circuit for Quality," by Noel Bonavia-Hunt, states that an aerial coil shunted by a .0005-microfarad variable condenser (aerial top end of coil, earth at bottom) is useless owing to the fact that a powerful station would spread itself half over the dial.

The tuning of my one-valve set is coupled this way and I find I can without any trouble separate London Regional from Poste Parisien, even a station between these two comes in without interference.

I think your paper is an exceptionally good one; it makes difficult things appear simple.

"SCHOOLBOY."

Old Oxted, Surrey. [1062

On the back of this announcement is a coupon entitling you to a free full-size blueprint of the

PENTA-QUESTER

Each blueprint is a genuine full-size engineer's contact print made from the original drawing prepared by the AMATEUR WIRELESS draughtsmen. It is in every way identical with the blueprints normally sold at 1s. and 1s. 6d. By using the coupon you will get a real 1s. blueprint for the cost of ½d. postage. Send your coupon to-day and get a full-size Penta-quester blueprint by return of post! This offer definitely closes on April 28, but an extension of time will be made in the case of overseas readers.

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Send this coupon, in an unsealed envelope bearing ½d stamp, to "PENTA-QUESTER BLUEPRINT," Amateur Wireless, 58-61 Fetter Lane, London, E.C.4, and write your name and address CLEARLY below AND in the space on the right. This coupon is not valid after April 28 (except in the case of overseas readers)

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"A.W.", April 21 .....

My Name and Address :

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My Broadcast Diary—

The Week's

Monday

NOT a great deal of outstanding value during the day but, being Easter Monday, most people would themselves be out—standing somewhere or other.

Entertainment Hour better than the last. Tessa Deane and Frank Drew sang plenty of tuneful slop. Am sure it appealed widely. Like a little slop myself, now and then, if decently sung. This was.

[*Photopress photo*

Tessa Deane

Eric Barker, promoted from the Tea-caddy, quite good. Once or twice I thought he was rather like weak China tea, but on the whole he was not a bad brew, as Mr. Brewer would probably agree. A bit refaned, though. Talked about a *make-rophone*. Otherwise no complaints.

Horace Kenney swam the Channel again. He must fly over Mount Everest next time for a change.

Altogether, the Easter programmes not so bad.

Tuesday

THE scream of the week to-night—*The Fifth Form at St. Pontefract's*. Heard it last time it was done, but laughed just as much.

No doubt about it : good burlesques can't be beaten for broadcasting. Hope the Mellhuish Brethren are thinking out something else as good.

Wednesday

LIKED Geraldo and his orchestra, but expected to. For all that, he rather whirled me from one tune to another. I got round the Marble Arch so quickly that I was in Park Lane again before I knew it. Very upsetting.

Still, it was a smart show. People like Ina Souez, John Hendrik, and Leslie Holmes help to make any show good.

Thursday

QUITE surprised at Reginald King's orchestra to-night. Imagine he has been working at it very hard lately, for the tone has improved out of all recognition. Very pleased with it playing *April in Paris*. Not that I shouldn't have liked the work just as much had it been called *September in Ceylon*.

Percy Manchester did not seem in quite such good voice as I have heard him. I switched into the programme entirely on his account, as a matter of fact. Liked him in the *King's Way* very much, but part of my liking was for Elgar's music, of course.

◆ ◆ ◆

All this was really while waiting to hear Cecil Lewis's dramatic chronicle, *The Magnificent Charlatan*.

[*Photopress photo*

Reginald King

—By WHITAKER-WILSON

Programmes

Wanted to hear it because on Wednesday morning such a lot told me they had switched it off. I didn't. I will say it was half an hour too long, but I think all plays exceeding an hour are too long.

Of course, Columbus was an impossible sort of fellow. I imagine that made it fairly easy to broadcast him, though perhaps not without making him more impossible than he really was. Ernest Milton played magnificently, but I felt all the time he was too cultured for Columbus.

Dramatic chronicles are not easy to write at any time, but I think Mr. Lewis wrote superbly in parts. So good were those good parts that I wished he had used a blue pencil over some of the rest. Not that any of it was bad, but simply too long.

By 9.25 (pardon, I mean 21.25) I didn't care two hoots whether he discovered America or not. I *still* say a play must be almost a miracle if it is to last more than an hour and not tire the listener.

Friday

LILAC DOMINO first rate. Surprised it didn't date. Obviously it can be done again next year quite successfully, especially if Natalie Hall is in it.

Saturday

S. P. B. MAIS, on voluntary help for the unemployed, spoke convincingly. He left me feeling very sad. Shall try to listen to the talks by those who *are* unemployed. Feel nothing but good for them can come out of the great publicity the microphone offers.

◆ ◆ ◆

In Town To-night quite a good show. Delighted with the typist's speed. Think of asking her to take down these notes for me. As for the short-hand lady—is three hundred words a minute all she can do? Some people *are* slow.

[Collins photo

Arthur Catterall

After hearing Sir Alan Cobham and the Gaby Gliding lady, have decided to take up gliding myself. Rather nice on the Thames with a decent portable set aboard.

◆ ◆ ◆

Carrying on to London, listened to Mamie Souter being two nasty little boys and one ditto little girl pulling a worm to pieces. Even the worm will turn, Mamie. Very funny, but do something about a tadpole next time. Mustn't repeat, must you?

Al and Bob Harvey splendid. Is that all we are going to hear of them now that they have come all that long way? Hope not.

Mose's new Alexander very good. Think their voices match rather well. Was quite sorry when they wanted their sarsaparilla.

The sketch, though well played (especially by Donald Calthrop and Sylvia Cecil) hardly suitable. Length against it. The soul of these St. George's Hall shows is the brevity of their wit. And they tell me that's the last of the Octet of Gyrating Relatives!

Sunday

THOROUGHLY enjoyed Arthur Catterall in the Respighi violin concerto. First time I have heard it. Also the Bersoni Symphony, which was *almost* perfectly played.

Notes and Jottings

IT has been suggested that a radio society in North Hertfordshire is long overdue. Such a society, to include television, short-wave reception, transmission, and other radio interests, is being formed, and all who are interested should write to A. K. Jowers, of 9 Cowslip Hill, Letchworth, Herts.

◆ ◆ ◆

His Master's Voice are introducing a new super-het radio gramophone, complete with automatic record changer, for the remarkably low figure of twenty-seven guineas. The cheapness of this receiver will be appreciated if one remembers that two or three years ago a receiver set with automatic record changer was in the region of eighty to ninety guineas.

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Home constructors will be interested in the coil screens manufactured by White Bros. and Jacobs, Ltd. The screens are 2⅝ inches in diameter, and are available in various lengths. The distribution of these screening covers has been taken over by Mains Power Radio, Ltd., of Broadway Works, Eastern Road, Romford, to which address all inquiries should be sent.

◆ ◆ ◆

The Lissen five-valve portable receiver, model LN8055, has been reduced in price from £11 11s. to £9.

◆ ◆ ◆

Andrew Bryce & Co., of Woodfield Works, Bury, Lancs, are taking over the Peak condenser business, which has in the past been carried on by Wilburn & Co,

◆ ◆

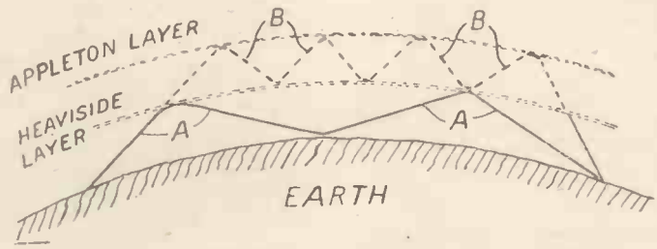
All secondhand cars being sold by Pass and Joyce are fitted with car radio. The receivers used are Philco Transitones. The idea of fitting radio to secondhand cars was conceived by Mr. Joyce while he was competing in the Monte Carlo Rally.

Echoes from Space

By MORTON BARR

AN organised effort is about to be launched under the guidance of Professor E. V. Appleton—and with the help of the B.B.C.—to solve one of radio's deepest mysteries.

The story really dates back to the first wireless message sent by Marconi across the Atlantic from Poldhu to Newfoundland. There were not wanting, even at that time, scientists who argued bluntly that the thing could not be done. Wireless waves, they said, must travel like light in a straight line, and for this reason it was hopeless to expect that they could be made to bend and follow the curved surface of the earth for several thousand miles.



How waves are reflected between the earth's surface and the Heaviside Layer.

However, Marconi proved otherwise, and we know to-day that high above the ordinary atmosphere there is a radio "ceiling"—the Heaviside Layer—which reflects the waves and so prevents them from escaping into interstellar space. In the case of long waves they travel, so to speak, with one foot on the earth's surface and the other on the layer, whilst shorter waves "ricochet" between earth and sky in a succession of skips or hops.

"Transparent" Layer

Broadly speaking, the shorter the wave the longer is the "skip distance," until one reaches a certain limit, somewhere in the neighbourhood of 7 metres, where the layer becomes "transparent," and instead of reflecting the waves back to earth, lets them slip through into outer space.

Professor Appleton has recently shown that the so-called Heaviside Layer really consists of three separate layers.

One lies at a height of roughly 40 miles above the ground and "handles" the longer waves. The second is twice as high and serves to return any short waves that succeed in penetrating the first layer. The third layer lies somewhere betwixt and between the first two. It is more ephemeral than either of the others, and is only mentioned to show that the radio "ceiling" is, in fact, a much more complicated structure than was at first imagined.

But all this leaves the real mystery of long-distance radio "echoes" unsolved.

Twenty-second Echoes

They were first noted by a Norwegian amateur named Jorgen Hals, who reported his discovery to Professor Stormer. The latter made a series of experiments to probe the matter and discovered the existence of echoes having an interval of as much as 20 seconds. The frequency of the echo was always the same as that of the signal, so that there could be no doubt of their identity.

Now, seeing that wireless waves travel at a speed of roughly 200,000 miles a second, it is obvious that there is something very unusual in an "echo" which takes 20 seconds to return.

At a low estimate it must have travelled two million miles before meeting with the reflector which sent it back on its return path. Mystery still surrounds both the location of the reflector and the "stuff" of which it is made.

Dr. Van der Pol has suggested that signals may sometimes follow a tortuous course between the transmitter and receiver. For instance, instead of taking the usual series of "skips" between one layer and earth, some of the waves may get "trapped" between the upper and lower layers, as shown at B in the diagram.

Quite apart from the longer track, which in itself would not account for the observed times, Van der Pol points out that under certain conditions the ionisation of the layers may result in a considerable "slowing down" of the speed of the waves. This combination of longer path and slower speed is put forward as one possible explanation.

It is, of course, well known that "echoes" of a signal may occur after it has made two, three, or even more complete journeys around the world.

For instance, in short-wave beam working, it is quite a common experience to receive first the direct signal and subsequently as many as six or seven "repetitions," which follow each other at intervals of roughly one-seventh of a second—which is the normal time taken by a radio wave to travel 25,000 miles. But here the total time, from first to last, is barely one second, so that it cannot be placed in the same class as the "mystery" echoes.

The suggestion has also been made that there are vast "clouds" of electrons, emitted from the sun and located somewhere in space at distances varying from a few hundred thousand up to several million miles—sufficient, in fact, to account for an outward radio journey of 10 seconds plus another 10 seconds for the return.

Short-wave signals, which have managed to escape through the heaviside and Appleton layers, may meet these masses of electrons in outer space and be reflected by them back to earth.

Valve Patent Battle

A LONG patent battle has been going on in Europe, Philips and Tungsram being involved over some very interesting technical points. Of certain claims put forward by Philips, one of the most important of those disallowed by the Courts concerned the "cascade" patent (re-tuned circuits), on which this company would have been entitled to royalties from Czechoslovakian set-makers, but which has been declared as not valid.

Similarly, Tungsram succeeded in a case against the centre-tapped patent.

But a third patent of this group, the grid-detection patent, has simply been restricted in Czechoslovakia in such a way that it no longer covers all variations.

In Hungary important issues centred round a Philips patent for horizontal-electrode structure and one on cathode manufacture by vapour process. The Supreme Court has finally found both these to be invalid.

A new patent application on slanting electrodes, put forward in Germany by the Valvo Company of Hamburg (a sister concern, by the way, of Philips) has been refused in the Supreme Court.

Broadcast Wavelengths

This week we give details of the principal short-wavers and the European long-wave stations. Next week we shall publish a list of medium-wave transmitters.

Principal Short-wavers

Metres	Kilo-cycles	Station and Call Sign	Country
16.86	17,790	Daventry (GSG)	Great Britain
16.878	17,772	Boundbrook (W3XAL) NJ	United States
16.89	17,760	Zeesen (DJE)	Germany
19.55	15,340	Schenectady (W2XAD)	United States
19.67	15,242	Boston (WIXAL)	United States
19.68	15,234	Paris (Colonial) (FYA)	France
19.71	15,210	East Pittsburgh (W8XK)	United States
19.73	15,200	Zeesen (DJB)	Germany
19.82	15,140	Daventry (GSF)	Great Britain
19.84	15,120	Vatican (HVJ)	Italy
24 53	12,230	Lisbon (Eddystone)	Portugal
25.00	12,000	Moscow (RNE)	U.S.S.R.
25.25	11,880	Paris (FYA)	France
25.25	11,870	E. Pittsburgh (W8XK)	United States
25.28	11,865	Daventry (GSE)	Great Britain
25.32	11,840	Wayne (W2XE)	United States
25.40	11,810	Rome (2RO)	Italy
25.45	11,780	Boston (WIXHL)	United States
25.53	11,750	Daventry (GSD)	Great Britain
25.57	11,730	Huizen (PHI)	Holland
25.58	11,720	Middlechurch (VE9JR)	Canada
25.63	11,705	Paris (Colonial)	France
30.0	10,000	Madrid (EAQ)	Spain
31.25	9,600	Lisbon (CTIAA)	Portugal
31.26	9,593	Philadelphia (W3XAU)	United States
31.26	9,590	Sydney (VK2ME)	New South Wales
31.297	9,585	Daventry (GSC)	Great Britain
31.33	9,570	Boston (WIXAZ)	United States
31.38	9,560	Zeesen (DJA)	Germany
31.46	9,530	Schenectady (W2XAF)	United States
31.545	9,510	Daventry (GSB)	Great Britain
31.55	9,510	Caracas (YV3BC)	Venezuela
37.33	8,035	Rabat (CNR)	Morocco
38.47	7,797	Radio Nations (HBP)	Switzerland
42.92	6,880	Oslo (LCL)	Norway
43.86	6,840	Budapest (HAT2)	Hungary
45.38	6,610	Moscow (RW72)	U.S.S.R.
46.53	6,447	Barranquilla (HJIABB)	Colombia
46.66	6,425	Boundbrook (W3XL)	United States
48.86	6,140	Pittsburgh (W8XK)	United States
49.02	6,120	Wayne (W2XE)	United States
49.07	6,110	Halifax (VE9HX)	Nova Scotia
49.08	6,112	Caracas (YV1BC)	Venezuela
49.15	6,110	Chicago (W9XF)	United States
49.15	6,110	Boundbrook (W3XAL)	United States
49.19	6,095	Bowmanville (VE9GW)	Canada
49.23	6,090	St. John (NB) VE9EJ	Canada
49.31	6,080	Chicago (W9XAA)	United States
49.39	6,070	Vancouver (VE9CS)	Brit. Columbia
49.39	6,070	Maracaibo (YU5BMO)	Venezuela
49.4	6,073	Skamlebaek (OXY)	Denmark
49.47	6,065	Nairobi (VQ7LO)	Kenya Colony
49.48	6,060	Byberry (W3XAV)	United States
49.48	6,060	Mason (W8XAL)	United States
49·5	6,060	La Paz (CP5)	Bolivia
49.59	6,050	Daventry (GSA)	Great Britain
49.83	6,020	Zeesen (DJC	Germany
49.93	6,005	Montreal (VE9DR)	Canada
50.0	6,000	Moscow (RNE)	U.S.S.R.
50.26	5,969	Vatican (HVJ)	Italy

Long-wave Stations

Metres	Kilo-cycles	Station and Call Sign	Country	Power (Kw.)
1,107	271	Moscow (RCZ)	U.S.S.R.	100
1,185	253	Oslo *	Norway	600
1,224	245	Leningrad *	U.S.S.R.	10.0
1,250	240	Vienna (Exp)	Austria	3.0
1,261	238	Kalundborg	Denmark	30
1,304	230	Radio Luxembourg	Grand Duchy	200.0
1,345	223	Kharkov *	U.S.S.R.	35.0
1,389	216	Motala	Sweden	30
1,395	215	Eiffel Tower (Paris)	France	8.0
1,402	214	Warsaw *	Poland	120
1,442	208	Minsk	U.S.S.R.	35.0
1,500	200	Daventry National	Great Britain	30
1,554	193	Ankara	Turkey	7
1,570.7	191	Deutschlandsender	Germany	60
1,621	185	Istanbul	Turkey	5.0
1,639	183	Reykjavik	Iceland	21
1,648.3	182	Radio Paris	France	50.0
1,724.1	174	Moscow (1)	U.S.S.R.	500
1,807.2	166	Lahti	Finland	40
1,875	160	Kootwijk (Huizen prog.)	Holland	50
1,875	160	Brasov	Roumania	20.0
1,935	155	Kaunas	Lithuania	7

* Will probably be heard testing on another wavelength after broadcasting hours.

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Will every querist please observe the following revised rules?

Please write concisely, giving essential particulars.

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

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

The designing of apparatus or receivers cannot be undertaken.

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

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

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

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

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

Postcard Radio Literature

Here "Observer" reviews the latest booklets and folders issued by well-known manufacturers. If you want copies of any or all of them FREE OF CHARGE, just send a postcard giving the index numbers of the catalogues required (shown at the end of each paragraph) to "Postcard Radio Literature," AMATEUR WIRELESS, 58/61 Fetter Lane, E.C.4. "Observer" will see that you get all the literature you desire. Please write your name and address in block letters.

Ferranti's Latest

A NEW catalogue describes the Ferranti AF4 transformer, which was introduced in 1925 and is still very popular. The transformer is ideal for use in sets to be used under tropical conditions.

The ratio of this transformer is 1 to 3.5 and the primary inductance at zero current is 45 henrys and at 5 milliamperes is 20 henrys. The catalogue also describes suitable methods of volume control.

By the way, it is possible to mount the transformer on any of the four sides by means of the adjustable feet. **156**

Watmel Volume Controls

WATMEL are well known for their excellent variable resistances and volume controls. The latest catalogue describes the complete range.

A very comprehensive range, too, including the new heavy-duty and totally enclosed metal-cased types which are the latest addition. The ganged units will be very useful in many receivers for high-frequency and low-frequency volume control.

The ganged units are also available with switches, so that the various circuits can be switched in or out with only the one knob on the panel. **157**

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Big Power Melody Two, with Lucerne Coils (SG Trans)	AW338A
B.B.C. National Two, with Lucerne Coils (D, Trans)	AW377A
Screen-grid Two (SG Det, Trans)	WM289
A Two for 7 Metres (D. Trans)	WM295
New-style Radiogram (D, Trans)	WM299
A.C. Quality Gem (D, Trans)	WM312

THREE-VALVE SETS (1s. each)

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A.C. Triodyne (SG, D, Pen)	AW399
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Fan and Family Three (D, 2LF)	AW410
£5 5s. S.G.3 (SG, D, Trans)	AW412
A.C.-D.C. Universal Three (SG, Det, Pen)	AW414
1934 Ether Searcher (SG, Det, Pen) Baseboard	AW417
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Lucerne Ranger (SG, Det, Trans)	AW422
1933 Economy S.G. Three (SG, D, Trans)	WM306
A.C.Calibrator (SG, D, Pen)	WM309
£6 6s. Radiogram (D, RC, Trans)	WM318
Simple-tune Three (SG, SG Det, Pen)	WM327
Tyers Iron-core Three (SG, SG Det, Pen)	WM330
I.C.B. Three (D, LF, Class B)	WM333
Economy Pentode Three (SG, D, Pen)	WM337
Three-range Three (SG, D, Pen)	WM336

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

"A.C. Melody Ranger" (SG. D, RC, Trans)	AW380
"A.W." Ideal Four (2SG, D, Pen)	AW402
"Words and Music" Radiogram (2SG, D, Trans)	WM307
"Words and Music" Radiogram de Luxe (2SG, D, Q.P.P.)	WM307A
Home Short-waver (SG, D, RC, Trans)	WM311
Empire Short-waver (SG, D, RC, Trans)	WM313
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Saturday, April 21, 1934

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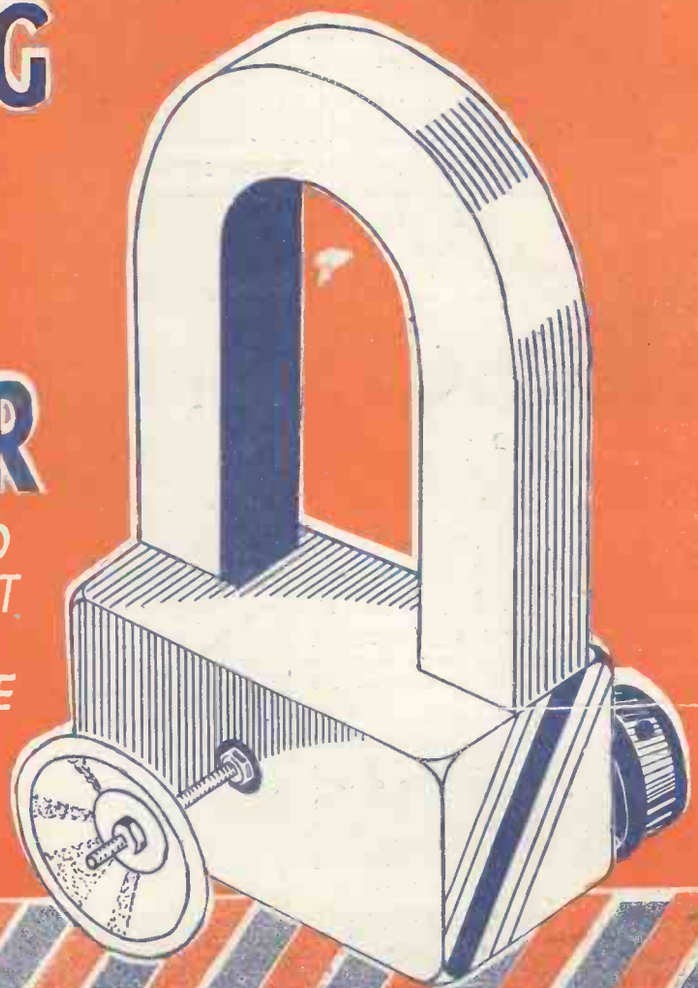

PENTA-QUESTING IN SUSSEX :: RADIO IN THE OPEN AIR

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News and Gossip of the Week

Twenty-four Hours

Do you now get up at 07 hours —or still at 7 ack emma? In brief, is your life now regulated by the twenty-four-hour clock or by Old Father Time's simpler divisions of ack and pip emma?

Rhetorical questions aside, this twenty-four-hour clock business the B.B.C. is trying to wish upon a wondering world has come into being without much comment.

Unmentionable!

That the B.B.C. means to abandon the old system entirely is proved by the significant fact that as from May 18 they will not even mention old time in any announcements or publications.

By then the Corporation assumes the public will have learned to think twenty-four-hour clock-wise. Gently, ever so gently, we might hint that perhaps the public will simply ignore the whole thing.

Which is quite the most shattering thing it could do—what?

B.B.C. Variety Moves

Quite literally, B.B.C. variety has moved on—to more elbow room above St. George's Hall. Lock, stock, and all that, Eric Maschwitz and his gang have decamped from Broadcasting House.

They will ease the congestion there, certainly. Is there, though, a deeper significance; does Variety want to escape the quarter deck we hear so much about these days?

Television on 150 Metres?

Someone with a realistic turn of mind has suggested to the B.B.C. that it might temporarily fit television into the old amateur waveband between 100 and 200 metres.

Higher-ups at the Big House are favourably impressed with the idea. Certainly it would be a popular move with listeners and lookers, who could easily adapt sets for such wavelengths.

Henry for Droitwich

As we, in our omniscient way, hinted some weeks ago, Henry Hall and his afternoon dance music will be broadcast from Droitwich when Daventry shuts down—thereby limiting the London-Daventry Children's Hour to reception by those inside the range of London Regional.

Not always will dance music be broadcast at the 5.15—or should we have said 17.15 hours?—interlude from Droitwich.

Light music by quintets will also figure.

Respite from Talks

As in previous years, the B.B.C. will cut out *all* serious talks from its summer programmes during the period 6.30 to 8 p.m., or, if you perfer it, 18.30 to 20.00.

This lighter-broadcasting policy takes effect from the beginning of July and continues merrily until the middle of September.

Such humanitarianism leaves us speechless.

Precious News

Robust elements in the Empire seem to be rucking a little at the slightly precious tinge of the special Empire news bulletins.

Man from Persia tells us that out there signals are great from the Daventry short-wavers, but English-speaking people are bored with the daffodils in Hyde Park stuff.

They want he-man news, same like England gets.

National Economy Again?

Will the separate National programmes be curtailed again this summer as last year? That is a question many listeners are asking us.

Since the little Nats are due to be closed anyway within six months or so, perhaps it does not matter much what is done.

The great point is to make the Daventry programme bright, so that Droitwich will have something to live up to.

For Midlanders

You "Brum" chaps might note that your local station, when its programmes come to you from Droitwich, will radiate on a lower wavelength than at present.

With the pepped-up London National plant transferred to Droitwich, giving you 70 kilowatts of aerial power from a two-section aerial slung from the 700-ft. high Droitwich masts, you can afford to go down a little, especially as the station site is so much nearer to Birmingham.

No Idle Wavelengths

Terrified lest other countries might "pinch" our wavelengths, the B.B.C. has decided that during the changeover from little nationals to additional regionals, it will shift around so that at no time will any of them be "free."

Between the closing of the little Nats and the opening of these stations elsewhere as regionals, some of the low-power relays will probably use up the released waves.

Biagini photo

Congratulations to Marchese Marconi, who celebrated his sixtieth birthday on April 25. He is here seen on board his famous yacht, the "Elettra"

Sheep and Goats

Soon the congested state of the reception desk at the entrance hall of Broadcasting House will be a nightmare of the past. For it is proposed to separate us press goats and other non-broadcasters from the artist sheep.

Good, so far. Now all we want is an underground tunnel straight into the press section.

But we fear that the present necessity for throwing gravel at the windows to attract attention will have to continue instead.

PENTA-QUESTER BLUEPRINTS

Readers should note that all coupons for full-size Penta-quester blueprints (as offered in our issues of April 14 & 21) must be sent to us by April 28. No free blueprints will be supplied after that date (except in the case of overseas readers). After April 28 blueprints of the Penta-quester will be available at 1s. each, post paid

For Cricketers

Eye-witness accounts of the Tests will be broadcast by Howard Marshall during the lunch and tea intervals, as well as at the close of each day's play.

Running commentaries are too boring, decides the B.B.C. But it will experiment with "flashes" of commentary when anything really exciting happens.

On the Elstree Sets

From broadcasting studio to film studio is the interesting route you might care to follow on May 5, when the B.B.C. is going over to Elstree.

It will give us shots of the film, *Private Life of Don Juan*, featuring Doug. Fairbanks, junior.

Scottish Pirates, Beware!

With its usual solicitous care, the Post Office issues due warning to licence pirates north of the Tweed that its van will descend upon them at the end of April.

Glasgow, Edinburgh, and Paisley districts will be combed from that date until June 2.

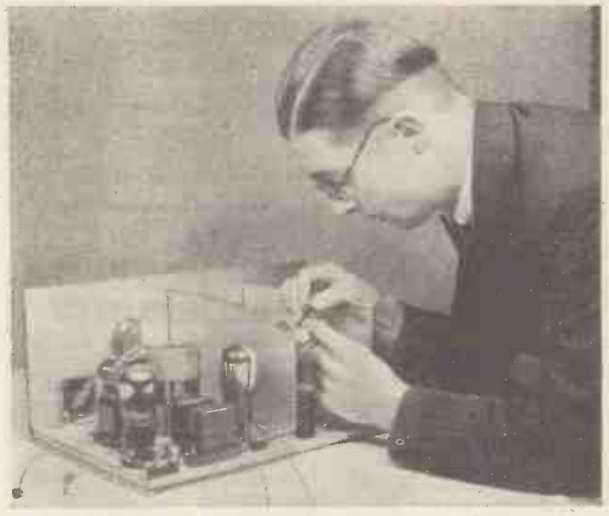
Introducing the Lucerne Major

"The Experimenters" Produce a Set for Experimenters!

IN a moment of excessive exuberance we threw out a hint that a Lucerne Major was coming—a set using our Lucerne coils with two screen-grid high-frequency stages.

More than one reader has written in, tweaking us about this promise—and almost suggesting that the idea, lovely enough in theory, had proved too much for us in practice.

Well, as we always let you know exactly what goes on behind our shifting scenes,



Not one of "The Experimenters," please note! An examination of the Lucerne Major by a member of the "A.W." Technical Staff

we don't in the least mind explaining to you our difficulties.

Don't think for a moment that we had any difficulty in making a two high-frequency stage set work. In fact it worked right away in the hook-up form.

What we were up against was the tuning arrangement. As you will remember, in the Lucerne Ranger, a set with one screen-grid stage, two separate tuning condensers were used. Add on a further screen-grid stage and what are you to do about the extra tuning condenser?

It means, on the face of it, three separate tuning condensers—unless cheapness and all that are thrown overboard, and a three-gang condenser is used.

We sounded a number of our readers, and, to our intense surprise, we found that separate tuning condensers were in high favour.

About Gang Condensers

For some reason, gang-condenser tuning is still held in dark suspicion—quite wrongly, in our opinion. But there it is. Some people do think that separate tuning of each circuit gives better results. Up to a point this is true—but what of the fiddling? There, again, we find that many of you simply revel in this sort of business—actually *like* fiddling with the knobs.

So we have little compunction in presenting to you now the Lucerne Major with three separate tuning condensers. We believe that this is the only set that has appeared in the radio press for years with such an array of tuning control knobs.

There are many advantages in the arrangement, not least of which is that owners of the existing Ranger can convert to the more powerful set with very small expense and alteration.

You need another coil, a tuning condenser, a valve holder, a high-frequency choke, a fixed condenser, and a four-point switch. That's all.

When we were evolving the final Major, we realised that we must cater for two classes of builder. For those, in the first place, who built the Ranger some weeks ago, and would now like to graduate to a more powerful four-valver. And, secondly, for those who did not build the Ranger, but who will want to build the Major from scratch.

Bearing in mind these needs, we evolved a set that is entirely new, and yet at the same time includes simply everything in the Ranger—by everything we mean even the nuts and bolts for fixing the components. The only parts that ought to be scrapped are the panel and the baseboard—though you could economise by simply adding on the fourth valve.

Reverting for a moment to the tuning arrangement, note that there are three condensers with slow motion drives, working three separate .0005-microfarad condensers. Then there is a .0005-microfarad reaction condenser, a three-point switch to cut off all the batteries, a four-point switch that changes the wavebands of all three coils at once, and finally a volume control reducing the amplification of the first screen-grid valve.

As you probably know, the advantage of this control is that the input to the first screen-grid stage can be reduced for strong signals, and thus prevent overloading and ensuing distortion.

Now for a rather curious—and perhaps to some people reprehensible—aspect of the Major's design. We have one variable-mu screen-grid valve and one straight screen-grid.

For one thing, those of you with Lucerne Rangers already have one straight screen-grid. You would not like to have to scrap that just for the sake of the Major, now would you? Of course not—see how we think of your pocket!

Getting Amplification Control

Then, again, we know perfectly well that we can get all the amplification control we need with one variable-mu stage. In other words there seemed no valid reason for scrapping one perfectly good straight screen-grid.

The order of the valves is variable-mu screen-grid followed by straight screen-grid—so that the Ranger with its straight screen-grid forms in the simplest possible way the basis of the Major.

We do not propose to go into the details of the new set this week, but to concentrate all that in our next week's article. But we should like to emphasise again that sets using Lucerne coils are sets with variable selectivity.

Very few people seem to be taking advantage of this flexibility, in spite of the fact that the ability to tap the aerial coil is one of the main features of the Lucerne coil.

Imploring Letters

We are still getting letters either imploring us to show how selectivity can be increased to cut out powerful locals, or asking how to flatten tuning in districts where there is no local swamping. It is all so simple—take off a turn or two for increased selectivity, add on this amount if you want more punch.

Remember that you alter the turns on the *coupling* winding, which is the winding terminating at the aerial terminal. A few misguided amateurs seem to have altered the turns on the grid winding—the main tuning coil. Naturally this did not have any effect on the selectivity, just altered the tuning range very slightly.

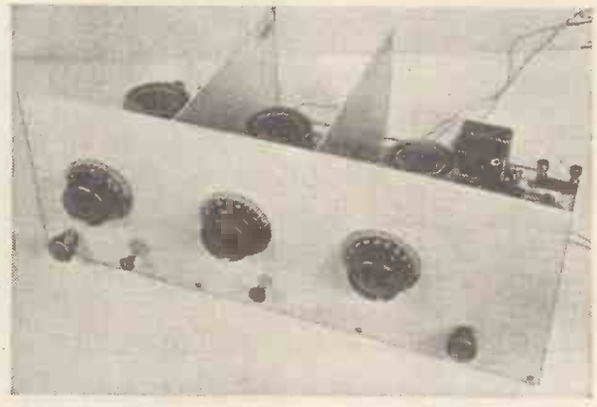
On the new set there will be a series aerial condenser, which has been put in for the benefit of the cautious ones who won't alter their tuning coils. With this condenser you can adjust the selectivity for any requirement—and then do your volume controlling on the variable-mu pot control.

There will still be only two high-tension positive tappings for the battery supply, but there will be two negative grid-bias tappings instead of one. The original 9-volt grid-bias battery is retained.

At every point we have tried to keep down the cost—and yet we venture to think that the Major is a spanking good four-valver that many amateurs will revel in.

Well, so much for this week's Fan-Fare. We hope the new Lucerne model will amuse you as much as it has us during tests. It was really quite exciting to twiddle around three tuning controls—quite like old times. And, believe us, they were easy enough to handle!

Look out for full constructional details of the Lucerne Major in next week's "A.W." There will be available a full-size blueprint—an invaluable aid to constructors. Don't miss a very characteristic article by "The Experimenters" next week!



Meet the Major! Note the three tuning controls in a row, with the three Lucerne coils screened from one another with simple vertical screens

PENTA-QUESTING in Sussex

"A.W." photo

Tested in the heart of Sussex, the Penta-quester again gave a good account of itself. Are you building the set?

In previous issues we have published reports on the Penta-quester from Surrey, Essex, Yorkshire and Cornwall. Now this week ALAN HUNTER reports on Sussex reception with this latest "A.W." three-valver.

Thousands of readers have taken advantage of our free blueprint offer, but we must remind you that (unless you are an overseas reader) you cannot get a free blueprint with the coupons in the April 14 or 21 issues after April 28. So please hurry!

"A.W." photo

Many housewives would appreciate their own radio set in the kitchen—there are many interesting programmes in the daytime

IN a moment or so I shall switch off this Penta-quester set, but only because I loath background listening. All the same, I am tempted to leave the typing of this report a little, for Henry Hall is coming through London National with a rendering of "Oh, Play to Me, Gypsy," that pleases me immensely.

Down here in Sussex the London National is not usually a good signal—not after dark, anyway. Just now, though, the sun is shining and there is no meddlesome Heaviside Layer to play the fool with London's upward rays.

I suppose this spot is about 55 miles from Brookman's Park, yet the dance music fills the room. Indeed, if I were so disposed I could "turn up the wick" so that the music might be heard at the bottom of my garden.

Where's that Toggle?

But I had better turn off the set and get down to this report. Where's that toggle switch—ah, there she goes. Off!

When the Editor suggested that I might bring down the Penta-quester to this country cottage I wondered why—until he explained that the set had already been tried out in Yorkshire, Essex, Surrey and Cornwall.

That the set had, in fact, been up hill and down dale in its varied career—and that another little test would not do it any harm—more especially as the applications for free blueprints were simply rolling in and thousands of intending constructors would be greatly interested in yet another report on the set's performance.

So I had the set sent up from Cornwall post haste—and the Editor himself brought it down here to the heart of Sussex in his natty new sports car. The Penta-quester arrived with no more damage than a bent minute hand on the clock-face dial. Which I thought at once was a tribute to the railway company and to the Editor's careful driving.

With the set, so that there might be no deception, came a spanking new 120-volt high-tension, 9-volt grid-bias battery and a fully charged 2-volt accumulator—in other words the sort of power supply that is specified.

Thanks to the clearly marked leads, I soon had these batteries hooked up. Within five minutes of the set arriving it was working—bringing in Fécamp at roaring strength.

Oh, I forgot to say—not that it is important, really—that the pentode Q.P.P. output valve had got a little bent on its long journey from Cornwall. The valve pins, I mean. But apart from a slight tendency to become microphonic the gallant little chap worked perfectly well.

Perhaps a word on the aerial-and-earth system might interest you. It is a nice, simple aerial, a single wire running from a bough on the old oak tree in the front garden to the eaves of the cottage—in all about 70 ft., if you include the downlead.

As for the earth, it is a buried plate right outside the little window in which the set table stands, and almost right under the aerial.

No Interference!

The only objection that even the most expert of you might raise against this aerial is that the electric power cable runs parallel half-way along its horizontal length. And yet, curiously enough, I suffer no interference. I know I ought to, but I just don't.

Well, so much for the aerial. The locality is probably quite well known to many of my Southern readers, being about 14 miles behind Brighton, that is about 6 miles from the foot of the South Downs.

Not, believe me, an ideal spot for wireless reception. You see, we are quite a long way from Brookman's Park, and all too close to the ships that pass in the night—if you know what I mean. *Did, did, did, da*—and all that!

Down here we are seemingly in the service area of Fécamp, the exuberant little French station that broadcasts so many I.B.C. programmes. We also get Nice-Cannes at inordinate strength. And as for Radio Paris, it very nearly blows your head off—being a good deal stronger than Daventry.

Editor's Eagle Eye

So you see now something of the environment in which the Penta-quester was tested. Under the eagle eye of the Editor himself I switched on, and, as I before remarked, in came Fécamp. It was so very loudly heard that I risked all and brought into action the "local" aerial, those chromium metal bars on each side of the cabinet.

Just a slight increase in the setting of the volume control and Fécamp *was as loud as before*. Which certainly impressed the Editor, no less than myself. For after all, the Penta-quester is only a three-valver—and to get a foreigner in broad daylight on a few

"A.W." photo

With the Penta-quester you are assured of many pleasurable listening hours—why not make it up and prove its merits for yourself—as this Sussex man is doing?

inches of metal for an aerial is certainly going —er—plenty.

But, of course, this chromium-plated miracle does only apply to a *local* station. You cannot, by any stretch of either the controls or the imagination, bring in more distant stations at loud-speaker strength.

For example, though the Londons were loud enough at half-throttle volume control with the outdoor aerial, they were but faint squeaks on the chromium. Which is what I should have expected, anyway.

Inside the area of big field strength this little aerial will bring in the signals at loud-speaker volume. Outside that area, as most of us are for all but the immediate local station, you must use *some* sort of orthodox aerial.

"A.W." photo

Part of our Sussex test of the Penta-quester. Everybody who hears the set is greatly impressed by its performance

That settles a point I am sure must have intrigued many readers. The chromium aerial is more than a brave ornament—it is a technical feature of the Penta-quester that justifies itself.

Don't imagine that this is going to be a formal sort of report. Rather it is a record of impressions gained over a week-end with the set.

I did not sit down at any time to see just how many stations I could log. Because, speaking personally, that is not the function of a set in *my* home. I want a set that responds neatly to control, that brings in its bag of entertainment alternatives to the home programmes, that gives sweet tone, and that does not run down the batteries in a night.

Primary Requirements

So long as the set conforms to these primary requirements I forgive it willingly when it fails to bring in say Hong Kong clear of, well, the Battersea power station.

But as I idly twiddled the controls of the Penta-quester—to the seething but inarticulate chagrin of my week-end companions—I learned a great deal about the set's little ways. I like the set—genuinely. Not just because I am the Assistant Editor of the journal that is putting it over. No, without bias I *like* the Penta-quester. Like it because it does what it claims to do without fuss or false alarms.

For instance, that volume control behaves admirably. It is more than a volume control, as you have been told already. It affects muchly the selectivity. Naturally it does, because it is a variable condenser in series with the aerial and the first tuning circuit.

As the capacity is reduced, so also is the signal input. For that reason the volume at the output goes down. But this reduction of series capacity reduces also the aerial damping imposed on the tuning circuit—and so up goes the selectivity.

Then the reaction comes into play. For, as many of you know, reaction has the very useful effect of increasing the in-tune signal's amplitude *without affecting the amplitude of adjacent out-of-tune signals.*

In other words, reaction lifts up the wanted signal from its background of adjacent foreigners. It increases the *ratio* of wanted signal to unwanted ones. Which is, of course, why you are always told to increase reaction when you want to sharpen up the tuning, and at the same time to throttle down on the input control.

What happens is that you reduce to inaudibility the out-of-tune signals on the volume control, and then bring up to good strength the wanted signal, which was also reduced in the process but which is alone increased again by the reaction.

Bearing this highly important aspect of reaction always in mind, you simply cannot go wrong with this Penta-quester. I separated with ease some quite tricky adjacent pairs.

I noted that if for any reason I had the volume-control knob just a little too high there *was* side-band chatter. But so soon as I turned that down a little and made up on the reaction, the station was cleared quite magically.

Need I say that at night the clock-face dial was alive with stations? One for nearly every minute of the hour. The new German giants, calling themselves Reichssender this and Reichssender that, came through with wonderful volume. Leipzig especially gave me many hours delightful "late music."

I found, as expected, that the London National faded during the evening. So up I went to the long waves, where Daventry, doing the same programme, came through with more than enough volume. While I was up on that band I snooped round the clock, finding plenty of good signals—notably Luxembourg and Radio Paris.

Do I have to say that I like the tone control? No, for this is an unbiassed report. It works well, but personally I like a little wider tonal range. And, while on the moan, I should have preferred the toggle switch for the batteries on the front—but I quite see that the chassis had to be kept simple, which it most certainly is.

Yes, Quality Is Good!

Quality, now. Yes—it is good. Very good, in fact. Nice, crisp sort of tone, with as much bass as can be produced in a table cabinet short of obnoxious thumping. Enough top to make speech a pleasure to listen to—with the tone control cutting the upper frequencies when there is a heterodyne whistle to be got rid of.

With this quality a round volume of sound that proves to me how good a valve is the QP21 class-B, especially when teamed to the W.B. moving-coil. Quite remarkable that a valve with a no-signal current of only 2 or 3 milliamperes should pass on to the loud-speaker so great an undistorted volume of sound. I should say the designer's estimate—or measurement, was it?—of ½ watt output is just about right.

Well, I don't seem to have told you much about the Penta-quester and yet I have filled my allotted space. I think that proves something, but precisely what eludes me for the moment. Anyway, it's a darned good set, chaps. The sort of set every true fan will revel in. The sort of set to show off to your pals—and be justifiably proud of having built for yourself. By the way, I hope that you will sign on the dotted line for that free blueprint—amazing generosity, I call it.

I am hoping now that the Editor will forget that the set is still in Sussex. Because if he does I can keep the Penta-quester in the lounge to impress Garge and t' other rustics who have a habit of dropping in to keep the pewter in use week-ends.

But I'm afraid he has his eye on it himself. You see, he really was impressed with the way I got Fécamp on the chromium bars!

COMPONENTS YOU NEED FOR THE PENTA-QUESTER

CHASSIS
1—Peto Scott Metaplex, 12 in. by 8 in. by 3¾ in.

CHOKE, HIGH-FREQUENCY
1—Graham Farish screened, type LMS (or Bulgin, Telsen).

COILS
2—Telsen dual-range screened, type W349

CONDENSERS, FIXED
2—T.M.C. Hydra, tubular type, values: .0002-, .004-microfarad (Dubilier, T.C.C.)
1—Dubilier .1-microfarad, tubular type (T.M.C., T.C.C.)

CONDENSERS, VARIABLE
1—British Radiophone two-gang .0005-microfarad with slow-motion drive, type PQ
1—Graham Farish .0005-microfarad, reaction type (or Lissen, Telsen).
1—Telsen .0003-microfarad, differential reaction type (or Graham-Farish).

HOLDERS, VALVE
3—Clix seven-pin, chassis-mounting type.

PLUGS, TERMINALS, ETC.
6—Belling-Lee wander plugs, marked: H.T.+1, H.T.+2, H.T.—, G.B.—1, G.B.—2, G.B.+ (or Clix, Eelex).
2—Belling-Lee spade terminals, marked: L.T.—, L.T.+ (Clix, Eelex).
5—Belling-Lee terminals, type R, marked: A, E, L.S. (two).
1—Telsen terminal block.

RESISTANCES, FIXED
3—Graham-Farish 1½-watt type, values: 600-ohm, ¼ and 1-megohm, (or Ferranti, Lissen).

SUNDRIES
4—yds. thin flex. Connecting wire and sleeving.
2—British Radiogram 1½ in. metal mounting bracket.
1—Bulgin knob, type K14.
1—Strip of wood 4½ in. by ¾ in.
1—Bulgin tone control, type CT2.

SWITCHES
2—Bulgin on-off toggle, type S80B, complete with 6 in. by 5/32 in. rod.
1—Bulgin on-off toggle, type S80T.

TRANSFORMER, LOW-FREQUENCY
1—Wearite, type PPA.

ACCESSORIES

BATTERIES
1—Drydex 120-volt high-tension, type H1012 (or Lissen, Ever Ready).
1—Exide 2-volt accumulator (or Lissen, Fuller).
1—Drydex 9-volt grid bias (or Lissen, Ever Ready).

CABINET
1—Peto Scott, type PQ, with clock-face dial and chain drive.

LOUD-SPEAKER
1—W.B., type PM4A (or Amplion, Blue Spot).

VALVES
High-frequency amplifier, Mullard VP2.
Detector, Mullard SP2.
Output, Marconi or Osram QP21.

SUITABLE MAINS UNIT
1—Atlas CA25 (or Ekco) for A.C. mains, or
1—Atlas DC 15/25B (or Ekco) for D.C. mains.

Real-quality Series.—7

Coupling the Detector to the Amplifier

By NOEL BONAVIA-HUNT, M.A.

G.P.A. photo

Explaining the finer points of design of a battery radio gramophone to an enthusiast

PROFESSOR : Let me see, how far did we get with our receiver design last week?

AMATEUR : We got as far as the detector and the coupling to the first low-frequency valve. I presume we can now discuss the coupling to the second low-frequency valve.

PROFESSOR : I am afraid you are hurrying on too fast. There is more to be said about the coupling of the detector to the first low-frequency valve. If I remember aright, I suggested a method of switching over from diode to leaky-grid rectification, with reaction.

In order to make the switching clear to you I gave you a mere skeleton circuit of the coupling to the first low-frequency valve, without including any frills to confuse your

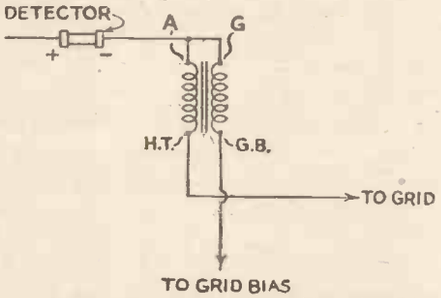


Fig. 1.—Auto-transformer connections for low-frequency transformer

mind. Anyway, the first stage-coupling is not complete yet.

AMATEUR : The coupling consists at the moment of a 100,000-ohm variable resistance—in other words, a grid leak. What's wrong with this?

PROFESSOR : Nothing, as far as it goes. But pure resistance coupling won't give us our ideal curve. I have definitely proved that a pure resistance connected between the output of the detector and earth (or grid-bias negative, as you please) creates what is called "frequency distortion."

The trouble lies in the fact that it is not apparently possible to choose a definite value of resistance that will do equal justice to either end of the frequency spectrum.

Value of Correcting Circuit

AMATEUR : Then all that is necessary is some form of correcting circuit, such as a friend of mine once showed me, consisting of a series of resistances with various sections shunted by condensers.

PROFESSOR : Not only is that not necessary, it must not be done.

AMATEUR : Why not?

PROFESSOR : It is fatal to introduce any sort of tone correction in this stage of the amplifier. I can tell you here and now that it is a waste of valuable time to experiment on these lines. If you knew what hours and hours I have spent trying out all kinds of correcting circuits, you would sympathise with me. My work, however, was fruitful in that I have learnt how not to do it.

AMATEUR : I am quite prepared to accept your word for it. Just what *is* required in the way of coupling here?

PROFESSOR : We want straight-line amplification of each and every note rectified. We must avoid tone correction like the pest. You can have it later on, but not at this particular stage. Have I made myself perfectly clear?

AMATEUR : Quite. You say we must get straight-line amplification of the rectified signals. I suppose that can be proved by the use of a frequency-response record or a valve voltmeter.

PROFESSOR : If you feel particularly anxious to prove that each separate note is being passed through and amplified at a uniform volume level, you can doubtless amuse yourself with a valve voltmeter. But we want to know a great deal more than this.

What we have to ascertain and make sure of is whether, if all the notes of the musical scale are sounded simultaneously, the strength of each one is the same all along the line. *That* is the test you ought to apply. And it is some test, too. Nobody, to my knowledge, has ever done it.

Of course, it can be done; but I really cannot show you how, because it would take too long. I can, however, tell you this : that if you were to see what happens when a pure resistance coupling is used as before mentioned, you would quite probably throw it away into the dust-bin. Which would be a mistake, since we are quite justified in retaining this pure resistance as a volume control.

AMATEUR : How do you get your straight-line amplification?

PROFESSOR : By seeing to it that the modulation frequencies are not attenuated by unequal matching of output impedances. This latter condition must always occur when resistance coupling is used. The only way to match the D.C. and A.C. output impedances

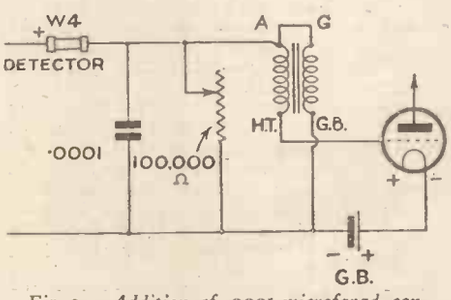


Fig. 2.—Addition of .0001-microfarad condenser in parallel with 100,000-ohm variable resistance

is to bias both the tuned circuit and the coupling circuit at the same time, and to adopt a fairly high-impedance low-frequency choke winding between the grid of the amplifying valve and grid bias.

Since, however, a high-impedance winding possesses a high inductance, and also a high self-capacity (neither of which characteristics belong to pure resistances), it is most desirable that some degree of step up should be introduced to counteract the latter characteristic.

Auto-transformer Connections

This can be achieved by connecting up a low-frequency transformer as an auto-transformer (see Fig. 1). Here we have a transformer with its four terminals connected as follows: (1) terminal A (sometimes marked "Plate") is joined to terminal G (or "Grid"), and this strapped connection is taken to the output of the detector (namely, metal-rectifier negative). (2) Terminal H.T. is taken to the grid of the first low-frequency valve, and (3) terminal G.B. to the grid-bias battery. The negative bias will be from 1½ to 3 volts according to the valve employed for the low-frequency stage and the amount of high-tension applied to its plate.

AMATEUR : What happens to the 100,000-ohm variable resistance?

PROFESSOR : This is retained (See Fig. 2) with the .0001-microfarad fixed condenser in parallel with it.

Complete Circuit

AMATEUR : Will you now show me the complete circuit of the detector and first low-frequency valve, with optional switching for leaky grid detection?

PROFESSOR : Here you are (See Fig. 3).

AMATEUR : What type of low-frequency transformer do you advocate here?

PROFESSOR : Oh, there are several that will occupy the position quite satisfactorily. The D.C. resistance of the secondary winding should not exceed 15,000 ohms, and not be less than 6,000 ohms. The Ferranti AF8 has a D.C. resistance of 13,500 ohms and is very suitable.

AMATEUR : What type of valve would you recommend for the first stage?

PROFESSOR : One of medium impedance and amplification, such as the L210 or the PM1HL. But it must be distinctly understood that the choice of valve in this stage of the amplifier

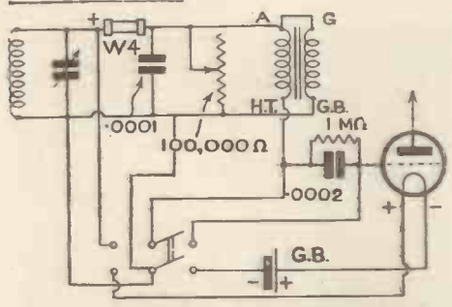


Fig. 3.—*Complete circuit with optional switching for leaky-grid detection*

depends entirely on (*a*) the form of coupling adopted between the first and second low-frequency valves, and (*b*) the question whether two or three stages of low-frequency amplification are going to be employed.

Obviously, if only two stages are decided upon, the first valve will have to be one capable of giving a fairly high amplification, such as the H210. If, however, three stages are employed, the first valve would of necessity be one giving less amplification.

AMATEUR: That is clear enough. What beats me is how anyone can decide the question of the number of low-frequency stages required. It seems to me that it is a matter of tossing a penny, and if heads means two, tails three, well—we just accept the ruling of the penny and choose our valves to suit the number of stages accordingly.

Not To Be Cajoled

PROFESSOR: Really, sir, I am surprised at you. What are our brains given to us for? Radio science is not to be cajoled by such childish expedients as tossing coins. Be a man, and use your brains. If we decide upon two stages, it is solely because there is a solid reason for that decision.

AMATEUR: But why should we have two rather than three? And why can't we make two stages produce the results of three? Isn't it only a question of valves? Some valves have twice the amplification factor of others, if not three times. With a pentode output valve, for instance, you don't need more than two low-frequency stages at most.

PROFESSOR: There you are, talking, like so many people love to do, about amplification: nothing but *amplification* seems to occur to you. The sole object of a low-frequency valve appears to so many folks to be that of amplifying signals. It isn't. You can get plenty of noise out of a two-valve set designed for that purpose.

But, of course, I must not misjudge you. I am only carrying coals to Newcastle when I tell you that quality comes before volume.

AMATEUR: Of course it does. But is it not just as possible to obtain good quality from two as from three stages?

PROFESSOR: Very good results can be obtained from two stages; but the very best result can only, so far as I have been able to accomplish it, be obtained from three.

AMATEUR: But why?

PROFESSOR: You must remember that you have tied me mercilessly down to a strictly limited high-tension voltage, and that the problem you have set me to solve is to get real quality under this limiting condition. We must have three stages.

AMATEUR: Again I ask why?

PROFESSOR: Because we simply must have a stage of low-frequency in which an opportunity is given to us of clearing up the mess.

AMATEUR: What do you mean? What mess?

PROFESSOR: The mess that comes out of our loud-speaker and is started by the high-frequency amplifier. The modulation frequencies are to some extent vitiated and fouled by the carrier wave, by the self-capacity of the valves, by stray capacities in the wiring of the set, by the coupling condensers, by a host of other things. The more we amplify, the more we increase the mess.

By the time we have reached the second low-frequency valve the mischief has grown to quite recognisable proportions, and our beautiful quality has departed. It is absolutely necessary at this stage to have a spring-clean.

Of course, we have done what we could to minimise parasitic oscillations in our design of the high-frequency amplifier and detector stage.

But there is still left over a definite trace of hybrid frequencies which spoil all our results if they are not swept away. So we must have a spring-cleaning stage or clarifier, and the best place for this is after the first low-frequency valve.

AMATEUR: I have never heard of such a thing before!

PROFESSOR: Perhaps not.

AMATEUR: Do you refer to a tone-correcting stage? I've heard of that.

PROFESSOR: Not strictly tone-correcting, but rather diversion of energy from one end of the spectrum to the other.

AMATEUR: What on earth do you mean?

Good Law of Nature

PROFESSOR: I must explain that there is a good law of nature that ordains that the greatest amount of work should be done by those who are the strongest. Much greater energy, for instance, is required to produce the deep bass notes of the drum or the double bass or the pedal pipes of an organ than the high-pitched notes of the piccolo. Much greater masses of air are displaced by the drum than by the fife.

If, therefore, too much energy is employed in the production of the higher frequencies, we are breaking nature's law: and, conversely, it is wrong to apply too little energy to the production of the lower notes.

Now in all amplifiers the tendency is to build up a disproportionate amount of electrical energy in the high-frequency portion of the spectrum, and to rob the lower frequencies of their due. If, then, we can in some way divert the energy from the high to the low, and do it sufficiently without starving the high notes, we shall find that a marked improvement has been effected, and that we are in measurable distance of our goal, namely real quality.

This Amazing Thing!

AMATEUR: You propose to do this amazing thing in the next stage of our low-frequency amplifier?

PROFESSOR: Yes, I do; though I must join issue with you when you call it an amazing process. It is absurdly simple and straightforward.

AMATEUR: Well, we have got as far as our first low-frequency stage, and I suppose there is no time to start on the second stage to-night.

PROFESSOR: I am afraid there isn't. We will leave it to next time, and meanwhile you can go and dream happily of the good things in store for you at our next meeting.

What About Watt?

Asks E. H. ROBINSON

ANY schoolboy will tell you that James Watt invented the steam engine, and that he did so by playing about with his mother's tea kettle.

These two pieces of complete inaccuracy persist from generation to generation. James Watt did not invent the steam engine, and the romantic picture of the small boy gazing at a kettle or pot, and musing on the enormous power that lifted the lid, was told about a Frenchman who lived a hundred years before Watt.

The great engineer, after whom is named the unit of electrical power, was born very nearly two hundred years ago in Greenock, near Glasgow, the year being 1736. In 1754 he was apprenticed to a mathematical instrument maker in Glasgow. Later, after working for a while in London, he was appointed mathematical instrument maker to the University of Glasgow.

Supremely Good Mechanic

James Watt was a supremely good mechanic with an original and inventive mind. When the Glasgow University sent him a Newcomen engine with the request that he would make it work Watt quickly discovered the reasons for the great inefficiency of this type of machine, which was then largely used for pumping purposes. The fault lay in the tremendous loss of heat in the cylinder.

He decided that true economy would be obtained by keeping the cylinder as hot as possible, and, as the steam had to be condensed to form the necessary vacuum to enable the machine to work at all, he invented the separate condenser. For this reason James Watt is the "Father of the Steam Engine."

Every spring-driven gramophone, and quite a large proportion of electrical-driven gramophones, have a centrifugal governor to keep the speed steady. You know how it works. There are three half-balls of steel fixed to springs, one end of the springs being held rigidly and the other attached to a collar which surrounds the axle which is driven by a worm gear from the motor.

As the speed rises, centrifugal force drives the governor balls away from the centre, and this action bends the springs and presses a plate against a brake pad. In action a governor, properly adjusted, allows the motor to run at one speed only. This form of governor, the first to be invented, and still the most used on steam engines, was evolved from the brain of James Watt.

Though this amazing man was no musician he built an organ for the Glasgow Masonic Lodge. He made very many improvements in the method of operating the keys and, as he had no ear at all, tuned his pipes by the "beat" or interference method, a phenomenon with which every wireless amateur is conversant.

So much for the man; now for the unit: 746 watts equals one horsepower; but it is far easier to remember that 1 horsepower equals about .75 kilowatt and that every time you consume a kilowatt of electricity you have used up 1.3 horsepower.

The unit by which our electricity meters measure what we have to pay for is the "kilowatt-hour." This unit can, of course, be made up of any possible combination of time and power. One kilowatt-hour might be .25 kilowatt for four hours, or four kilowatts for a quarter of an hour. Look at the thing another way. A 100-watt lamp can be alight for ten hours before it has consumed one unit.

Common Fallacies

That every schoolboy knows the common fallacies about James Watt is wrong. Not long ago a London boy, in an examination, described the great inventor as "the man who invented the electric-light meter so that it won't take bent shillings and foreign coins."

Though Watt invented a great many things, and is commonly supposed to have discovered the composition of water, he certainly did not invent or discover the smallest thing connected with electricity.

It is because he was the greatest pioneer of engineering as we know it to-day that his name was chosen for the name of an electrical standard, to be honoured along with those of Volta, Ampère, and Ohm.

On Your Wavelength

By Thermion

Wireless from the Antarctic

THE B.B.C.'s relay from Admiral Byrd's Antarctic exploring party was extraordinarily successful. The expedition's headquarters at the Bay of Whales established communication with New York, whence the transmission was relayed across the Atlantic.

The total journey of the wireless waves—I haven't an atlas by me and I was never top of the class in geography—must have been the best part of 10,000 miles, but, despite that, we didn't miss a word spoken by members of the party or a single bark delivered for our benefit by the sleigh dogs.

The vocal efforts of the party were particularly fine. If they explore as well as they sing, they ought to find all sorts of things.

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France's Ether Clean-up

THE French Government has at last been able to pass a Bill making it illegal to use electrical appliances that can radiate interference. The provisions are of a very comprehensive kind, taking in as they do such prolific sources of unwanted noise as cinema projectors, flashing signs, hairdressers' appliances, vacuum cleaners, and so on.

The new law is delightfully simple and straightforward—so far as any law can be simple and straighforward! What it amounts to in a nutshell is that if you don't fit your noisy appliances with completely effective disturbance suppressors by a certain date, you will be for it. And that is that.

Britain's Noisy Noises

AND what is this queer but delightful country of ours going to do about it? A commission is, I believe, sitting. But the sitting of a commission on a question is apt to be like a hen on a china egg—a long business with small results!

One of our national peculiarities is that we have a way of letting nuisances continue and grow in severity until they become so gigantic that it is a matter of the utmost difficulty and of terrific expense to put an end to them.

Every day sees more and more electrical machinery installed in this country, and a very great part of it is of the strongly radiating kind. Something drastic will eventually have to be done. It is a pity that our legislators cannot live up to the "Do it now" mottoes that decorate their offices, instead of waiting for something to turn up.

Meantime, thousands of complaints about interference with wireless reception reach the G.P.O. every week and the G.P.O. has no power to do anything.

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No Wired Wireless

LAST week I told you something about the experiments that had been made in the distribution of broadcast programmes over the electric-lighting mains. I now hear that successful though the recent demonstration was, it has been decided not to permit relaying to be done in this way. There are a good many reasons why the use of electrical mains for the purpose is not desirable, and I am not surprised to hear that the House of Commons Standing Committee (why "Standing" when it has been appointed to sit?) takes this view.

In course of time, when almost everybody has electric light, we shall undoubtedly make large use of the mains not only for broadcasting, but also for other kinds of communications. But many watts will flow through our meters before that time arrives. Hasn't Professor Mugwump or somebody told us that electricity is still in its infancy or something?

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Disapproving of Television

IN spite of all the talk there is to-day about television—even in the daily Press—some people seem to have a curiously "foggy" notion of its limits. In fact one highly-estimable old lady of my acquaintance made it clear that she was definitely shocked at the bare idea of being able to "see things at a distance." Even after I had carefully explained that pictures were only being televised from a specially prepared studio, she remained vaguely unconvinced and still inclined to disapprove of the whole thing.

Strangely enough, when Rontgen first discovered his X-rays, he ran into much the same kind of prejudice. In fact one well-known London newspaper was so indignant at the prospect of possible intrusions upon one's privacy that it demanded the immediate passing of a law forbidding the use of X-rays. It all goes to show how easily the non-technical mind can be led astray.

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Watching S.A.V.C.

THE other evening I was able to give myself a very convincing demonstration of the effectiveness of self-adjusting volume control. I was using a superhet with a pentode as intermediate frequency valve and Westector S.A.V.C.

Between the plate of the pentode and high-tension positive I connected up a milliammeter for trimming purposes. Radio Normandie was tuned in and came through splendidly, the strength remaining absolutely steady.

After listening for a moment or two, I glanced at the milliammeter and I noticed that its needle was swinging rhythmically over the scale. For an instant I thought that the valve must have gone mad; then I realised that I was *seeing* S.A.V.C. doing its work.

As the signal waned the grid-biasing voltage on the pentode was automatically reduced so that the plate current went up. Then during a waxing period the automatic increase of the grid bias caused a fall in the milliammeter reading.

H.M.V. photo

In modern factories receiver chassis are assembled on moving bands to avoid handling as much as possible

Just to make sure how good the S.A.V.C. was, I switched off that set and tuned-in Fécamp with a set whose only volume control is of the manual type. The signal was fading rhythmically from a roar to a whisper. With the S.A.V.C. set it had full entertainment value; with the other, one could not listen to it with any genuine pleasure.

Trimming Tip

THAT last paragraph reminds me to give you a tip for trimming superhets with S.A.V.C., if you don't know it already. It is not the slightest good depending upon your ear if the set is a sensitive one with good S.A.V.C., for the sound level will be kept much the same, even if you made quite big alterations in the settings of the trimmers.

A home-constructed mains short-wave set in use at Accra, Gold Coast Colony

The best of all methods is to put a milliammeter, as suggested, into the plate circuit of the intermediate-frequency valve (or the second of these if there are two) and to work by its readings. The more nearly correct is the trimming, the lower will be the milliammeter's reading, for at exact resonance the grid-bias of the intermediate frequency valve or valves is at its highest and the plate current therefore, at its smallest. If you trim it in this way you can get the very best out of any S.A.V.C. superhet.

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Battery Staleness

IN last week's issue there was an interesting letter from a Wimbledon reader who suggests that one reason for the cheap battery's popularity is that it has a ready sale and is, therefore, seldom stale when purchased.

There is a good deal in that; but I don't quite agree with his remark that it is better to buy a cheap stale battery than an expensive stale one.

I have done a good many tests on what is called the "shelf life" of dry batteries. In these tests you don't put them under any load at all. You just store them in an even temperature and notice what effect time alone has on the E.M.F., and so on.

There is no question that on the shelf good batteries last very much better than cheap ones. Personally, I would rather have a good battery that has been stored for four months than a cheap one that had been on the shelf for the same number of weeks.

Max Kester, who has left the recording side of H.M.V. to join the Light Entertainment Department of the B.B.C.

One excellent point is made in this reader's letter. He suggests that the date of manufacture should be stamped on the battery case. This is a reform for which I have been pressing for some time, and some day we shall get it. Manufacturers of photographic films tell you that they must be used before a certain date; makers of good-quality batteries need have no fear about doing the same sort of thing.

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These Micro Waves

NOBODY is as yet quite sure how far it is possible to signal with the new micro waves. In theory, at all events, the curvature of the earth is supposed to set the limit, though Marconi has already shown that in certain cases it is possible to cover distances in excess of the so-called visible range.

However, transmission is now being made from aerials carried by balloons up to a height of 5,000 feet and over, which should give an optical range of at least 100 miles—provided there are no serious attenuation losses.

The same idea was, in fact, used in the very early days of wireless when both balloons and kites were employed to lift the aerial wire to the highest possible elevation—at a minimum of expense—until it was found that excessive height did not help matters much in the case of long waves.

High-point Radiation

ANOTHER idea for gaining height is to locate a micro-wave "beam" aerial quite close to the ground, and to direct the radiation from it straight upwards towards a second aerial system supported at the top of a high mast. The second aerial then acts as a "reflector," either to "scatter" the waves in all directions, for broadcast reception, or else to reflect them in a definite direction towards a distant station. The second arrangement can be used for long-distance "relay working."

The whole crux of the matter is that these waves *must* be radiated from a high point if they are to cover a greater distance than, say, 30 or 40 miles, and it is not always so easy in practice to do this.

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Sir Walford to Retire

SIR WALFORD DAVIES, whose recent appointment as Master of the King's Musick brought him such hearty congratulations from wireless listeners, has long been one of our most hard-working broadcasters.

I hear that he will bring much of his microphone work to what we hope is only a temporary close this summer. He will, though, continue to direct until the end of the year the choral series, "Melodies of Christendom."

A wonderful man, Sir Walford! He knows all about music and has the happy knack of giving you the feeling that *you* know a good deal more about it than you do.

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Radio Pests

THESE unauthorised transmitters who seem to think it bold or daring or smart, or something of the kind, to send out concerts of gramophone records on wavelengths which they have no right to use have become a perfect pest of late.

One of them, I see, has lately been interfering with Londoners' reception of broadcast programmes. I trust that the G.P.O. people will lose no opportunity of jumping on them with both feet.

These nuisances don't give their performances to further worth-while experiments; all such work can perfectly well be done on authorised wavelengths. Their sole object is to gain notoriety—and so long as they gain it in the police court with a nice fat fine attached I don't mind.

Honest-to-goodness wireless enthusiasts should show them no mercy. If you pick up one of these illicit transmissions, report the matter straight away to the G.P.O., giving the authorities any useful facts that you can.

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Battery Miracles!

THIS week's report of the five-bob batteries under test may seem almost incredible to some readers. They have actually gone *up* in voltage and on the last day of their sixth week the readings are higher than they were at the end of the fifth week.

Are the batteries about to justify the miraculous claims made on their behalf? Are they wonder batteries which really do give something for nothing?

No, dear reader, I am sorry to disappoint you. The answer is, I regret to say, merely that we are enjoying a heat-wave at the time of writing. One can keep the laboratory temperature *up* to a reasonable level in cold weather, but it is impossible to keep it down during hot spells.

Warmth generally has the effect of increasing the E.M.F. of dry batteries and it has particularly striking effects on those whose depolariser is not of the very best. I am afraid that there will be something of a flop if and when the laboratory temperature comes down again to its normal 62 degrees.

Five-bobbers' Bulletin

AT the end of the fifth week, Battery A showed a starting voltage of 80.4 under load and a voltage at the end of six hours of 68.8. The corresponding figures for Battery B were 84 and 72.

At the end of the sixth week, Battery A's starting voltage on the last day is 80, and the ending voltage 68.8. For Battery B, the readings are 85.6 and 73.6, respectively.

During this week, Battery A's ending voltage rose from 67.7 on the first day to 68.8 on the last. You will notice that Battery B shows a gain of 1.6 volts for the seven days.

The good-quality triple-capacity battery with its first-rate depolariser is much less affected by the rise in temperature. At the end of its eleventh week under test its readings were 106 and 100 for the starting and ending voltages under load. Now, after twelve weeks, it reads 106.5 starting and 100.4 ending.

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More Wails About "Duds"

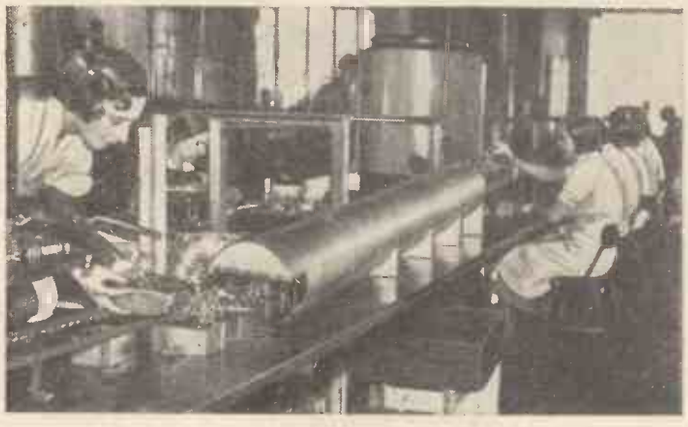
MY grouses about "dud" components have brought me piles of letters from readers, whose chief complaint about me (and about the component) is that I don't put it half strongly enough.

Dear fellow sufferers, please remember that AMATEUR WIRELESS is not printed on asbestos paper and that my typewriter is not guaranteed fireproof. If I wrote a paragraph saying what I really thought, the whole thing would have to be printed in asterisks and exclamation marks.

I have just put together what should be a really beautiful superhet. Actually, it is pretty good on the medium waves, though on the long waves it produces nothing but silence from the loud-speaker and just the reverse from me.

The reason is that the wave-change switch in the coil assembly is "slightly out of adjustment." It is a brand new coil and an expensive one. I cannot get at the switch without unmaking and, subsequently, remaking over a score of rather fiddling soldered joints.

The rest is just asterisks!



H.M.V. photo

Blocks of fixed condensers for radio sets being passed through a wind tunnel to set the pitch sealing

Telcen photo

Here is further evidence of improved conditions in the radio trade—a batch of radiograms ready for dispatch

Improving Your Pick-up Performance

By F. D. CAWLEY (G5FC)

Trying out a home-made table radio-gramophone—such an outfit can be assembled at home very cheaply

YOUNG FRANK is in trouble again. I met him in town the other afternoon and he seemed delighted to see me.

"I say, old man," he greeted me, in his own inimitable way, "do you know anything about pick-ups? I've bought one, and the reproduction is fiendish. What do you think is the matter?"

"Well, a lot of things might cause poor quality," I replied. "Perhaps the best thing would be to have a look at it. Shall we say Saturday, as usual?"

"By Jove, I wish you would!" said Frank, at once. "I don't seem to be able to do any good with it."

"Righto, then—Saturday."

Trouble from Minor Faults

The two days passed quickly enough, before I strolled in the direction of Frank's home. I wondered what could be the trouble, but did not anticipate anything very difficult. Pick-ups are tricky things, but it is generally quite a minor fault that prevents them from giving really good reproduction.

Frank put a record on for me at once, and the quality was certainly rather atrocious. It was a dance tune, and the lack of brilliance made it sound even more depressing than its natural mood. Moreover, each time there was a lively piece on the trumpet the loudspeaker wheezed and jarred in a horrible way. We put the record on Frank's ordinary acoustic gramophone and it sounded quite all right.

"That's the maddening part about it," remarked Frank. "The thing sounds fine on an ordinary gramophone and all the money I spent on the pick-up might just as well have been thrown away!"

"Now then!" I smiled. "Stop that nonsense! Let's have a look for the trouble."

The pick-up was a nice job and it seemed certain that nothing connected with it could be causing the poor quality. It was complete with arm and rest, and Frank had mounted it with meticulous care.

"What value is this?" I asked, examining the volume control.

"50,000 ohms," Frank replied.

"Is that all?" I said. "Then that explains some of the trouble—500,000 ohms would be more like it. Have you got another one?"

Frank had a rummage round, but all he could find was a 250,000-ohm wire-wound fixed resistance.

"That will do," I said, and we fixed the two up in series, making 300,000 ohms across the pick-up, the 50,000-ohm resistance still being variable, of course.

The reproduction was now greatly improved; the high notes were not so lacking as before and there was not so much jarring on the penetrating trumpet notes.

Then I noticed that there was quite a long distance between the gramophone and the radio receiver.

"That won't do," I remarked. "The leads from the pick-up to the amplifier must be as short as possible. There is only a very small amount of current induced in the pick-up windings, you know, and it soon disappears if too long leads are used. Could you not bring the gramophone any nearer?"

"Well, no," Frank hesitated, and during the pause that followed I guessed that his parents did not like the furniture moved about.

"Let's move it nearer for now, then," I suggested, and we did. The shortened leads effected still more improvement; apparently the flex wire Frank had been using previously had been acting like a condenser, by-passing some of the higher frequencies.

"When you fix it up again," I said, when we had both agreed that there was a further improvement, "instead of using this flex, get some lead-covered cab-tyre wire—it is a heavier gauge and will carry the current without losses."

"Oh, by the way," I added, as an afterthought, "you should not use your ordinary receiver volume control while the pick-up is working—it only introduces distortion and cuts out the bass notes. Have it at full volume all the time."

We did this and after an adjustment of the control across the pick-up the result sounded absolutely fine. Frank was delighted, but I still had another card up my sleeve.

"About needles," I said. "What kind are you using?"

"Half-tone," replied Frank.

Choice of Best Needles

"Well, always remember that if you want the very best reproduction you should use the loudest tone needles you can get hold of. Loud needles are the thickest and consequently the full range of frequencies in the groove is transmitted to the pick-up windings. When thin needles are used, some of the frequencies are lost through the needle bending in opposition to the strain of responding to the variations in the groove."

At this Frank looked so dismayed that I had to laugh.

"Like everything else connected with wireless," I assured him, "it is not half so complicated as it sounds."

"Good!" he remarked, rather dubiously.

"To put it simply," I explained, "the variations in the groove which the needle conveys to the pick-up magnets are extremely minute, and consequently the greatest care must be taken to avoid any stray disturbances. Thin needles being not so sturdy as thick ones, on loud passages self-vibration is set up, which increases surface noise and diminishes the reproduction of the upper register."

Just then Frank's mother and father walked in from their stroll, and they were so delighted with the reproduction that they sat down and insisted on having a gramophone concert there and then, so I imagine Frank will not need to get the cab-tyre wire after all!

H.M.V. photo

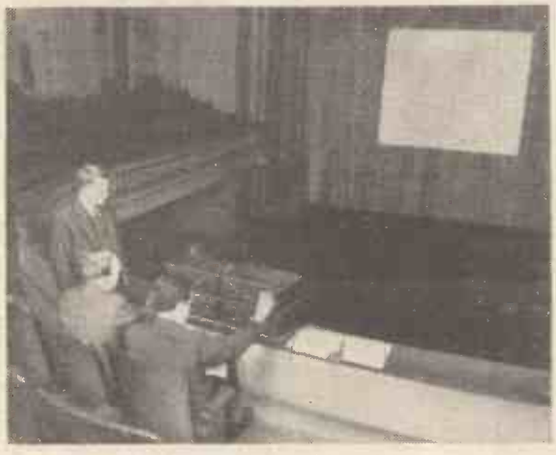
Robert Tredinnick, well known to listeners for his gramophone recitals from Midland Regional, trying over some new records

Typical radio-gramophone motorboard layout with rest for pick-up, needle cups and gramo-radio switch

Auditory Perspective for Realism!

BY ALAN HUNTER

Sixteen horns all lead from one throat in the loud-speaker —here an engineer is soldering them together



Adjusting the specially constructed amplifiers, which have a frequency range from 40 to 15,000 cycles

NOW, what does all this mean, I can hear you asking. *Auditory perspective*, indeed. Well, you know what perspective means as applied to vision—the ability to define relative locations in space.

Just the same in sound, perspective plays a part. When you hear a real-life orchestra you hear a composite effect made up of sounds coming from many different directions—but is this so with a loud-speaker reproducing that same orchestra? It is not, as you well realise.

You lose a part of realism over a loud-speaker —you lose auditory perspective. Because the Bell Laboratories of America realised that, they have been concentrating a squad of brainy research men on the task of putting reproduced sound into its proper perspective. They seem to have succeeded in a remarkable way.

They started off by assuming that when you listen directly to an orchestra the sounds you hear must travel across the opening between the stage and the auditorium. By placing an array of loud-speakers in this space, and connecting them by a line to a bank of loud-speakers placed similarly before the audience at a distant point, they would hear—*always assuming perfect transmission*—exactly the sounds that would have been heard if they were sitting in the auditorium.

So many microphones and loud-speakers would obviously be impracticable, but what of a much smaller number? Tests have proved that the localisation effect can be produced with only three channels.

Bell men have proved that the enhanced aesthetic appeal of auditory perspective does not depend so much on accurate localisation of the source of the sounds as on the fullness that seems to come from the effect of *spacing out* the sounds.

Before this acoustic truth could be demonstrated to an audience, it was necessary to develop a studio of the correct reverberation period, amplifiers capable of a very wide frequency response and wide volume range, loud-speakers giving an equally wide frequency response—with low noise level for the soft passages—and, of course, high-quality connecting lines.

Such difficulties would appal many small organisations, but the Bell Laboratory is exceedingly rich and vast—and, as I found once through a personal visit, is imbued with the true research spirit.

They actually produced loud-speakers for this job covering a frequency range from 40 to 15,000 cycles, designed to radiate the enormous power of 450 *watts*—not milliwatts, note. Two units were constructed, one handling the low and the other the high frequencies.

The amplifier and loud-speaker system is capable of delivering three or four times the power of a large orchestra between the frequency limits of 40 and 400 cycles.

Having developed the right type of loud-speakers to work with the high-power amplifier, the job of testing the effect of auditory perspective still waited upon the right type of land-line connection between the strategically placed microphones and the distant loud-speakers. They eventually used carrier-frequency transmission over toll lines between Philadelphia and Washington.

The system has no immediate application to listening in the home, but for audiences in large halls it offers a very great advance. The reproduced music is claimed to sound practically identical with the orchestra itself; if this is so it is a wonderful achievement.

It emphasises that given unlimited resources —such as the Bell Laboratories of America undoubtedly have at their command—reproduction well-nigh indistinguishable from the real thing is perfectly practicable.

Whether such wonderful quality can ever come into everyday use is a question I would hesitate to answer. I must ask the Bell people!

Field coils of the exponential horns for the special loud-speakers were wound with copper ribbon, as seen above

Flowing a melted compound round the edge to seal the joints of the low-frequency horn — some loud-speaker!

The orchestra was two floors above the auditorium, with three microphones spaced across the room in line with the conductor

Open-air Radio!

Summer-time Listening Is Often the Best

Fox photo

When the Army goes on manoeuvres these days it always takes radio along. Royal Corps of Signals enjoy a field day!

H.M.V. photo

Just before she takes her first dip of the season, this fair listener tunes-in—what? Perhaps the weather forecast!

JUST because summer time is now officially here—whatever the Clerk of the Weather may have arranged—you need not imagine that the radio season is over. For every summer it is becoming more obvious that radio is an all-the-year-round pastime.

Indeed, as this interesting galaxy of pictures clearly proves, the summer months are the signal for a very widespread use of radio.

Whether it is for music on the beach at the seaside, or for radio en route to the South of France, or for Army manoeuvres, or just simply for radio in the garden—the wireless set is called upon to work a great deal of overtime during the long days ahead.

It used to be thought that the only type of set for open-air use was the battery-operated portable, but all that is now changed. Car-radio equipment, with powerful super-hets run from the car's batteries, give full-bodied reproduction—either by the wayside or while the car is in motion.

For open-air fêtes and such-like gatherings there is a wide range of public-address apparatus, enabling hundreds or even thousands to hear announcements and dance to gramophone records.

Quite apart from expensive car-radio and radio-gramophone equipments, there are now on the market portables giving a quality of performance that would have been thought quite impossible a few years ago.

Class-B Portables

There are portables that work with class-B amplification and moving-coil loud-speakers, and have self-adjusting volume control to counteract fading. Such sets, tuned to the modern high-power broadcasting stations of Europe, provide an unending source of entertainment in the open air.

Even if you have a car there is no absolute necessity to take a car-radio equipment in order to enjoy the delights of open-air programmes. Any good modern portable can serve.

This type of set will prove especially useful when you are travelling abroad, as you can take it down to the *plages* or beaches of Continental resorts—and while you are at the various foreign cities you can keep in touch with England through one of the Regionals—or certainly through Daventry.

During the summer months, too, there is great activity among live wireless clubs, who organise field days in which amateurs can display their skill at such things as direction-finding. Here again, there is no very great expense involved, while a lot of fun that could not possibly be arranged in winter months can be enjoyed.

Then, too, it is in the summer, when certain stations tend to fade, that the amateur can test the efficiency of his apparatus in keeping up the strength of the waning stations.

Many a holiday can be much enlivened if you remember to pack the wireless set. It is amazing how many ardent listeners go away regretfully leaving behind their favourite sets—when, if they realised it, they might just as well take the sets along.

Every sign points to another hot, dry summer, so get ready for a season of open-air radio. Just a final word of advice, though. Do please remember that, if you take your set into the garden, or fix up a loud-speaker extension, neighbours will be sorely tried *unless you moderate the volume.*

Last summer we received dozens of complaints about this nuisance. We should be the last to suggest that garden radio ought to be prohibited—for the simple reason that enough volume can be arranged to give enjoyment to those around the loud-speaker without disturbing the people over the garden wall.

Biagini photo

Very attentive, isn't she? A fair listener "somewhere in Italy" determined not to miss what her loud-speaker is saying

H.M.V. photo

When you plan your summer tour abroad, don't forget to take a wireless set with you. Working a portable under the shadow of Eiffel Tower, Paris

Kitching & Clayton photo

Players in one of Shakespeare's masterpieces enjoy an interlude of dancing between the acts—a good way of whiling away an odd minute

Modernising That C

Useful and Practical Hints for Impro

Wide World photo

The largest and smallest loud-speakers shown at the 1930 Radio Exhibition. How far have we progressed since then?

DESPITE the now almost universal adoption of the moving-coil unit as the standard reproducer in radio sets, there must be an enormous number of the older moving-iron models still in use or, at least, in good working order and available for use. These latter would undoubtedly come into use for that "other room" could they but be persuaded to provide modern quality and, in the former case, it is obvious that the listener entirely dependent upon this type will appreciate an improved rendering.

It is my intention in the following notes to provide a number of suggestions that may be used either piecemeal or en bloc to give varying degrees of improved tone, up to a complete scheme for obtaining reproduction which the writer may truthfully say is first class.

The various hints may each be depended upon to eliminate some undesirable feature

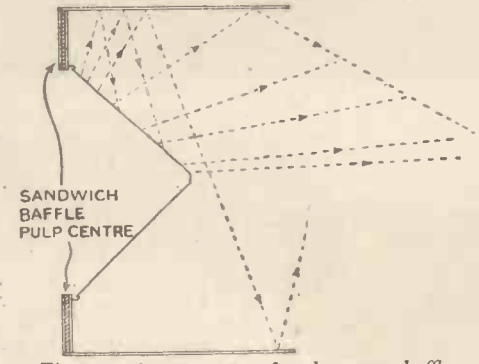


Fig. 1.—Arrangement of a box-type baffle made from pulp-or sugar-cane board

and may be selected for use as the wishes of the worker and practicability indicate. Taken en masse they work together in perfect harmony with a result that closely approximates the real thing.

THE BAFFLE

Since the main disadvantage of the moving-iron is its lack of bass it is scarcely necessary to emphasise that a good sized—in fact, if possible, a really large—baffle is essential. In the case of the ordinary flat type, something like 30 in. square can be really helpful. Two other factors are not, however, so well realised.

The first is that it is hopeless to expect good bass from a baffle that can itself vibrate and all precautions against this trouble should be taken. An ideal material is some form of pulp or sugar-cane board about ⅝ in. to ¾ in. thick sandwiched between two layers of ordinary threeply (Fig. 1).

The sandwich should be made up by gluing (fairly thick glue) and pinning with veneer or gimp pins along all edges, round the centre opening, and at frequent points over the face.

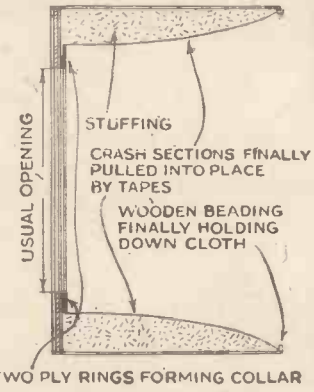


Fig. 2.—A cheap and simple box baffle that can be used with great success

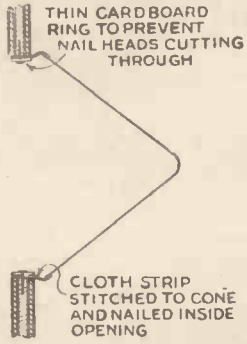


Fig. 4.—Method of fixing cone diaphragm to baffle board

A good substitute for the pulp board is several thicknesses of heavy strawboard or, to avoid trouble, such a triple-board is manufactured by some ply works. If the unit is to be chassis mounted it is preferable to bolt it on rather than to use wood screws.

The second factor is that box resonance provides far more trouble with the high-pitched moving-iron than with the bass-accentuating moving-coil unit. For obvious reasons few people use very large unenclosed baffles and incidentally, if they do, they usually hang or stand them in a corner in such a way as to more or less enclose them in effect.

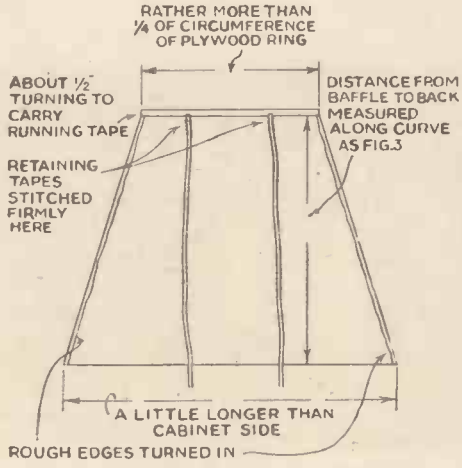


Fig. 3.—Tapes for holding box-baffle packing in position

We therefore come back almost every time to some form of cabinet with its concomitant resonance. That this effect is definitely harmful is easily shown.

Sound waves obey the same laws of reflection as those of light and, taking the old simile of the squarely-struck billiard ball, it follows that many of the waves leaving the cone have a good chance of returning whence they came by running round the cushes—playing into baulk as it were—and that the high frequencies generated at the edge of the diaphragm, being both nearer to the side and farther from the back of the cabinet, have an even better chance than the lower notes originating nearer the apex.

Hence arises the apparent predilection of moving-irons for box resonance: in short a ramification of the tendency to shrillness. Fig. 1 demonstrates the point.

I make no apology for labouring this issue for the remedy, now to follow, is of the greatest value. He who would doubt that these reflected waves are harmful needs but to shout under the next railway arch he meets and see how far he regards the returned version of his voice as complimentary.

Another small point may be interpolated here. If so much trouble can arise from these "echoes" it follows that a back to the cabinet will add yet another reflecting surface and, consequently, even more falsity. Therefore, if possible, avoid a back: if not, provide generous openings—gauze covered if so desired.

Now for the remedy generally known as "box baffling" and one, by the way, much used by the B.B.C. Briefly this consists of filling the interior of the cabinet with non-resonating material generally arranged in the shape of a form of exponential horn—the cone being at the smaller end and the cabinet back at the larger.

A number of schemes of achieving this end have been published and commercial fitments are purchaseable, but the method described below has the merits of cheapness, ease of working, and real success.

A ring of threeply (don't use wood likely to split) with an outer diameter about ½-in. greater than that of the cone or chassis, as the case may be, and with an inner that of the usual opening, together with a similar ring about ½-in. to 1 in. less outside should be firmly fixed to the inside of the baffle board as shown (Fig. 2) and thus forming a flanged collar.

The good wife should now be persuaded to machine up four pieces of crash, or some tough, rough-surfaced (and not too easily stretched) material, to Fig. 3.

A length of tape is run through the turnovers, taking care to see that the returning tapes already attached will come on the outsides, and by means of it the small ends of the four sections are tightly tied round the ply collar. With the baffle board in place inside the cabinet these sections are padded up with any suitable upholstering material until the interior of the loud-speaker takes on the shape of an exponential horn. Fig. 2 shows this shape in section.

In practice well screwed up newspaper, old magazines etc., provide the cheapest stuffing, but obviously shredded wood or paper and similar substances are all suitable. Avoid

Old Moving-iron Loud-speaker

oved Performance from Old Reproducers :: By F. COOPER

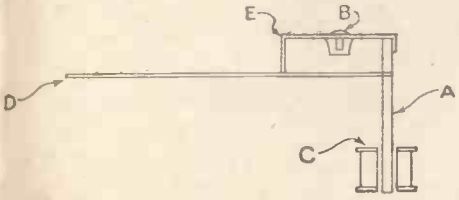


Fig. 5.—Principle of balanced-armature (moving-iron) unit

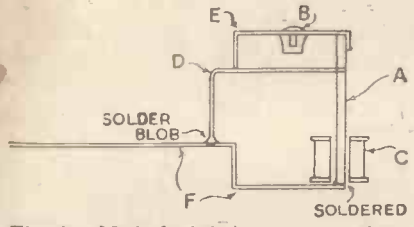


Fig. 6.—Method of fitting a new reed to a moving-iron movement

stiff paper that would have a marked rustle. Slag-wool when available is ideal owing to its high-sound insulating properties.

When carrying out the filling, arrange the pieces of crash to correspond to the four sides of the cabinet and, beginning with the bottom one, stuff until it is more or less the correct shape and then fix down with drawing pins the outer edge at the centre. Work in from the sides of the piece until the padding is really tight and then pin down nearly to the corners.

Turn the cabinet on to its side and proceed similarly with the next piece, paying, this time, particular attention to the adjoining corner. Proceed thus until the whole trumpet is firmly padded into shape, level off unevennesses by pulling tight and pinning down the retaining tapes, and, finally, to finish off nicely, bead down the trumpet mouth with narrow strips of wood and trim off any waste material.

Typical of the old days. The units of such loud-speakers can often be adapted to drive a cone diaphragm

If the sections have been carefully made they will be found to overlap sufficiently to prevent the stuffing from escaping. Experienced upholsterers can probably improve on this, but the method works well in the novice's hands.

So much for quality via the baffle, but before leaving the subject a few sizes will be helpful to a reader (building) up specially. The depth of the cabinet or box should be about two-thirds of one side and 18 in. by 18 in. by 12 in. and 22½ in by 22½ in. by 15 in. are useful versions.

Quite obviously "the larger the better" is still true, but the lady of the house is likely to put in a word here and, in any case, there is such a property as weight.

My own version is a thick carboard box (back-less) built on a strong wooden frame (22½ in. by 22½ in. by 15 in.) padded as described, the whole ensemble slipping into the bottom of a radiogram cabinet. In this case it was necessary to refrain from fitting set components in the vicinity of the loud-speaker unit. There is no reason, however, why the baffle should not be built directly into an existing cabinet. Similarly it is equally as applicable to small as to large models.

It may be remarked that owners of moving-coil units will find that a box baffle is capable of immenseley improving their instrument's performance.

Where the reader is preparing a special baffle on these lines and also intends to make use of the floating cone to be described next; it will be necessary to adjust the sizes of the

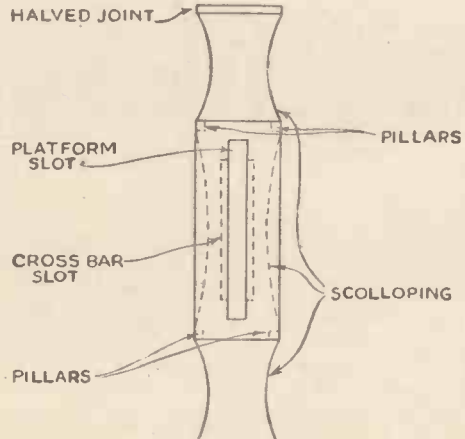


Fig. 7a.—Top view of adjustable chassis, looking at platform

ply rings to allow for the larger opening. The outer ring should then be 2 in. and the inner 1 in. greater in diameter than the cone.

If a sandwich is being made up it will obviously simplify matters to fix the necessary ply discs to one side and to cut the opening through the whole assembly as a final operation.

THE CONE

It is not proposed to discuss here the making of cones. Enough has been written on that score to stuff scores of baffles. I prefer the commercially pressed buckram type, but the one normally used with the unit is all that is

Many readers must have moving-iron units of this type, which can be modernised as explained in this article

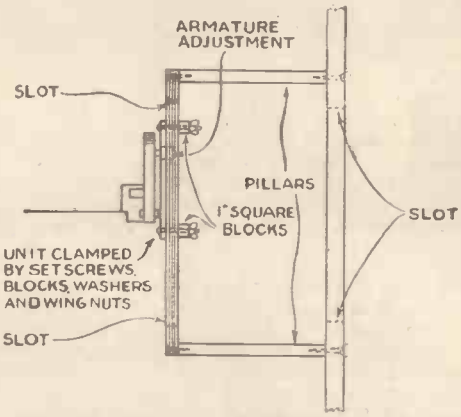


Fig. 7b.—Side view of adjustable chassis, showing how unit is fixed in position

needed. What is important is the mode of attachment to the baffle, and where the usual chassis is not in use or its design permits, the following gives a free and really floating action.

The function of the baffle being to provide a long path for the current of air that equalises the pressures before and behind, it is customary for the cone to be more or less firmly pressed against it with consequent damping of the reed.

A better alternative is to stitch a 1-in. strip of fairly thin but tightly woven cloth to the outside of the cone at the extreme outer edge, cut the baffle opening to the same size as the cone (not smaller as usual), and nail the cloth to the *inner edge* of the hole itself using, in addition, a narrow strip of thin cardboard to prevent the nail heads from cutting through. The nailing should be at frequent intervals.

This device is particularly easy to carry out with the sandwich type of board and forms a sort of short bellows which allows the diaphragm to move concertina fashion (Fig. 4).

ADAPTING THE UNIT

Up to now we have discussed improvements on the basis of taking the unit as it stands and, it is true to say, wonders may be thus achieved. Nevertheless much more remains to be done for the moving-iron effect with its

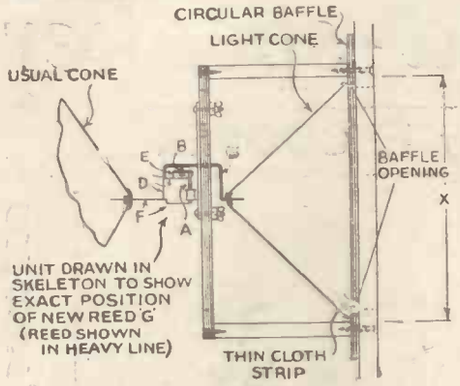


Fig. 8a.—Addition of secondary cone and baffle to single driving unit

high-note emphasis and low-note loss continues. The next task, then, is to deal with the bass department inside the unit itself.

The principle of the balanced armature (the popular form of moving-iron) is roughly as in Fig. 5. If the reader will examine his own, he will find the main idea is that an iron armature A pivoted at a point B is caused to vibrate between the magnet poles and coil C and passes its impulses on to the reed D which, being also held by a brass strip E acting as a spring, transmits a more or less push-pull action to the cone.

Now those missing bass notes are of low frequency and, consequently, of relatively long wavelength. It is therefore not unreasonable to assume that they will be more easily formed at the base of the armature where it is more free to move, that is further from the fulcrum and spring; and yet, if the reed were connected there the spring would exert less influence and the movement would tend to become radial rather than "push-pull." It therefore appears desirable, if at all possible, to employ both effects.

Solder or rivet a new reed F (Fig. 6) to the extreme lower end of the armature A, making sure that it does not touch the magnets and, after it has passed clear of the polepieces, bend it up slightly, straighten up again, and continue horizontally to the cone.

Disconnect the old drive D from the cone, bend it down at right angles at a point just past E, cut off where it meets F and solder firmly at the junction.

Effectively the drive is now taken from both top and bottom of A at a point somewhere between them, according to the length of the bend in F. The exact locus of this point governs to some extent the effect obtained: the F end gives maximum bass but generally dull tone; the D end gives the reverse. It is necessary to try two or three positions to obtain the best result, but when that is found it will be hard to believe that a mere moving-iron can produce notes so deep.

The foregoing has been written on the assumption that many will wish to use an existing chassis or other methods of mounting the unit. It is, however, probable that centreing difficulties will already have arisen and, in any event, the last "tip" of all will only be available for use with a specially designed structure. The next task, therefore, is to provide a more versatile means of support.

ADJUSTABLE CHASSIS

The design given here will be chiefly applicable to large cabinets or boxes, but possessors of smaller instruments will find that some adaptation, such as using the front platform only and converting it into an open work back, very useful.

The unit is carried on a five- or seven-ply platform, about 2 in. wider than, and about two and a half times as long as itself, in which is cut a slot twice the length of the unit and comfortably wide enough to carry the armature-adjustment screw. The unit is fixed by 5/16-in. set-screws passed through the usual facing lugs and the slot, and held behind the platform by 1-in. square ply blocks five- or seven-ply with washers and wing-nuts.

It is thus capable of considerable adjustment in a vertical direction and a small amount (according to the width of the slot) laterally.

The platform is rigidly screwed at each corner to ¾-in. or 1-in. square pillars, which in turn

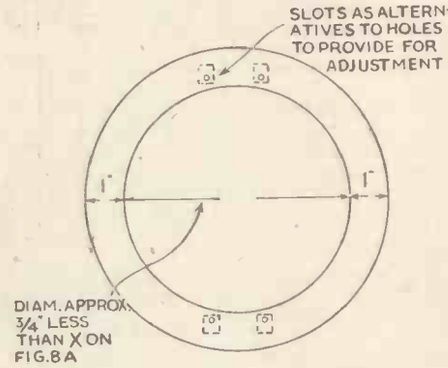


Fig. 8b.—Arrangement of circular baffle

connect to a 1-in. thick bar, of equal width to the platform, traversing the back of the cabinet. This cross bar should be firmly screwed in place (halved jointed if practicable) and slotted at the centre to provide access to the unit adjustment.

A useful refinement is to scollop the edges to minimise impedance to sound waves and, incidentally, to help with the working of the suggestion following this. The length of the pillars is, of course, determined by the distance available between the apex of the cone and the cabinet back. (See Figs. 7*a* and *b*).

SECONDARY LOUD-SPEAKER

Now to the last and a somewhat revolutionary suggestion. The bass has had practically all our attention, but what about those exceedingly delicate extremely high notes, such as light cymbal touches, the drum brush, etc.? Large heavy cones, damped armatures and so forth don't help these by any means.

Let us then pick up these delicate vibrations at the top of the armature (that is, the old reed position), where we found them to be generated, and give them a special cone and baffle to suit their particular requirements.

Using the chassis just described this can be accomplished by fitting a small circular baffle (Fig. 8*b*—stiffish ply will be suitable here), about 2 in. all round greater, and with an opening slightly smaller, than the vertical separation of the pillars, (x, Fig. 8*a*) to the inside of the cross bar. This baffle therefore fits between those pillars and the cross bar and should be held in place by the same screws.

A cone is fitted to it on the floating principle and arranged to occupy the space behind the platform, the main issue being to give this cone as sharp an angle as is consistent with convenience.

The drive for this secondary loud-speaker is obtained by soldering yet another reed (G in. Fig. 8*a*) to the original D (Figs. 5 and 6) at the point where D now bends down to meet F, taking the new reed G up above B, then backwards through an appropriately drilled hole in the back plate of the unit (ensure adequate clearance), bent downwards to level with the working position of F and, finally, outwards horizontally to enter the new cone.

This new cone should be of light but stiff Kraft paper, have a minimum of overlap and be lightly glued; the adapter should be as small as practicable and the cloth strip employed to float the cone should also be of very light material.

If it be considered that the presence of this extra cone impairs the adjustable nature of the chassis the screw holes in the circular baffle may be cut as short slots, when it will be possible to make any small correction of position to line up with reed G. It may be well to add here that so long a slot in the platform of the chassis is provided in order that a maximum of experimental unit positions might be available.

This secondary loud-speaker is likely to be of little value unless it is used in conjunction with the double-reed, but nevertheless it has a definite place in a complete scheme for "modernising the moving-iron." When operated alone it develops little power, but under full working conditions its effect is very definite.

It would thus seem that the main action is to pick up "backlash" from the large cone and the relative diaphragm sizes provided by such an arrangement as that described give very good balance.

As this article is intended to be taken either as a series of hints or a complete scheme for modernisation of moving-irons in general specific designs, dimensioned drawings, references to particular makes etc., have been avoided The idea throughout has been to give basic outlines and methods such that none can say, "Oh! you can't do that with mine—it won't fit" or make some similar comment; and thereby to help all experimentally minded moving-iron owners rather than a limited few.

For the same reason theoretical requirements have often been stressed in preference to dogmatic instructions so that the reader may adapt the various suggestions to suit his particular requirements and possibilities. Lastly, costs throughout are very small and, in many cases, as good as negligible.

A postscript hint for the sceptics—try before you decry.

On the Long Waves

By Jay Coote

ALTHOUGH some changes have already been carried out in the wavelengths of stations working on channels above 1,000 metres, personally, for the time being, I listen very rarely to any broadcasts on that band. With the exception of Daventry, Zeesen, Moscow, Luxembourg, Kalundborg, and sometimes Radio Paris, interference is very unpleasant.

Warsaw, Motala, and Eiffel Tower are a "wash out" on most nights, as they mar one another's programmes. The Dane is fairly clear of Luxembourg, but the latter's spread is disconcerting.

Undoubtedly between Radio Paris and Moscow there is a bare separation of 8 kilocycles, and the former is still worried by Reykjavik. Fortunately, in most instances, it is possible to receive the long-wave programmes from medium-wave stations, but this does not apply to France or Poland.

◆ ◆ ◆

On May 17 the new 10-kilowatt station at Vadsö (Norway) will be formally opened; it will work on 845 metres (355 kilocycles), or the last channel in the medium waveband—in effect, a wavelength borrowed from other services. This is the Finmark transmitter mentioned in the Lucerne Plan. It will relay the Oslo programmes by landline in the near future, but in the meantime receives them *via ether* from the Jeloy short-wave transmitter, which is heard nightly on 42.92 metres. Vadsö holds the record as being the most northerly point of the broadcasting system.

Continued on page 460

We Have Fun!

says ERNEST H. HILL, a public-address engineer

WHEN installing and operating public-address apparatus at outdoor functions throughout the country I have been impressed on many occasions by the vast amount of interest shown in this work by radio enthusiasts of all ages.

I am sure that the general opinion is that the life of a public-address operator consists of one long holiday spent in the most desirable parts of the country with the most interesting apparatus with which to amuse himself in his spare time.

Interesting? Yes, but certainly not a restful life. In fact, during the summer months the operator becomes a species of travelling showman constantly putting up and taking down his apparatus in the intervals between often hectic drives from one town to the next.

Working Throughout the Year

I am speaking, of course, of the life of an engineer who is constantly engaged on this work throughout the year and who is therefore in a somewhat different position from a local trader who will probably install his apparatus once or twice a week.

Referring to his job, a colleague of mine used to say, "It's a great game if you don't want to eat or sleep," but it is in all of us to grumble about our jobs until we look back over the past few years and find that the humorous incidents easily outnumber the less pleasant memories—and in this public-address work is no exception.

I think my first bad moment was at a large carnival in Essex, at which we had been

[Photopress photo]

A car fitted with public-address gear for political work. Note that the index letters are "P.A."

troubled during the evening by an occasional high-tension "splash" or spark in the 500-watt amplifier. Such a thing is not uncommon in high-voltage apparatus (we were using 4,000 volts) and, as the trouble can be very difficult to trace, we were carrying on and hoping for the best.

As darkness fell I was gazing absent-mindedly at the amplifier, and my thoughts were probably some little distance from the job in hand, when the comparative quiet of the evening gave place to the most enormous report and flash of light I have ever experienced.

I was certain, of course, that the amplifier was no longer with us, but with returning consciousness I noticed, to my amazement, that the valves were still glowing quite happily and that I could still hear music coming from the loud-speakers.

No, it was not a magnified version of our high-tension "splash," but the organisers had decided that it was dark enough for the firework display and had opened the programme by firing a particularly large rocket from within ten feet of the van in which I was standing.

That such an absurd incident can produce severe "wind-up" in the case of a seasoned operator will probably amuse some readers, but my fellow "P.A." and broadcasting engineers will bear me out when I say that the ever-present dread of "letting the show down" produces its own special brand of "nerves."

On another occasion a breakdown caused considerably more amusement when it was all over than it did at the time. Apparatus had been installed and tested in good time for a carnival (again in Essex) and we decided that, in view of the hot weather, we would "dress the part" and don white flannels for the afternoon.

The show opened in a blaze of sunlight (and white flannels), and all went well until, without warning, the loud-speakers made a noise like the father of all atmospherics, the noise being accompanied by a firework display inside the 500-watt amplifier.

When "P.A." gear breaks down on a show it just has to be put right in the shortest possible space of time; so out came the side panel of the amplifier, the high-tension transformer (weighing more than such things should on a hot day), and the smoothing condensers.

The trouble was quite obvious—a break in the smoothing choke

Something like public address! Part of the gear used for making announcements at the R.A.F. Pageant at Hendon

[Philips photo

Announcing election results through a large public-address equipment. Public-address engineers have to be ready for every emergency

—and we were running again in fifteen minutes, but I have never seen white flannel trousers quite so dirty before or since. We were not able to take as active a part in carnival day as we had intended.

When testing the apparatus to be used in connection with a military tattoo I was asked by the officer in charge to call some men working on the far side of the arena.

An Unforgivable Sin

I thought I had worded the announcement quite well when I said "Hello, fatigue party, Royal Corps of Signals! Will you please report to the grandstand?" But, alas, I was guilty of an unforgivable sin: I had said "PLEASE" in the Army.

Before giving you my next story I must admit that I would not have believed it had I not been present.

We were announcing results of races, etc., at an aquatic sports meeting near Cambridge and were using large box-type loud-speakers some 4 ft. square. During the afternoon an elderly lady asked me: "How does the man in the box get to know the results so quickly?" I cannot remember my reply, but I doubt if I explained as clearly as I might have done.

It must be admitted that luck plays a very large part in work of this description, and never more so in my own case than on a very wet day at an agricultural show in Huntingdonshire.

Having been completely soaked while installing the apparatus during the morning, we were listening to (and broadcasting) what should have been the opening speech when we discovered that the "speech" consisted of an announcement to the effect that the show was being cancelled in view of the bad weather conditions.

No more than two seconds later we were startled by violent sparking from our 2-kilowatt generator, which rapidly grew worse—we had a "dis" between slip-ring and armature winding.

Now, this could not be repaired without dismantling the generator, which would take several hours, and it could not be done on the show-ground; so that the cancellation order indeed saved our reputation.

Incidentally, we finished the repair at 2 a.m. next day, which, as my colleague said, would have been all right if we had not wanted to eat and sleep!

Many of the components in a modern receiver are provided with their own screens. Note that there is good clearance between the coil and its can

A Chat on Screening

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

SCREENING, by which we mean the placing of sheets of metal or conducting surfaces in a receiver in such positions that they prevent interaction between adjacent parts, is a subject worthy of careful attention by every home constructor. The extent to which it is required, or even desirable, depends on the particular receiver and the amount of gain, while in the whole art of radio design complete screening is one of the most difficult things to achieve.

If, by some strange gift of nature, we could *see* magnetic and electrostatic fields in a receiver, the work of a designer would be infinitely easier. As it is, even the most experienced men must adopt, to some extent, a "hit-and-miss" method, particularly when, for commercial reasons of cost, it is desired to use the minimum of screening.

No Secret of the Difficulties

I am acquainted with many skilled designers, both in this country and the United States, and they make no secret of the difficulties they encounter along this line.

Screening is adopted for more than one purpose. First of all it is used to avoid unwanted interaction between parts, this interaction taking the form of both electromagnetic and electrostatic induction.

Electromagnetic induction is the effect produced when a coil of wire, or even a straight wire, produces an electromagnetic field which interlinks with an adjacent wire or conductor in such a way as to induce in this second wire or conductor a voltage. Single wires have relatively small fields and, provided care is taken not to bring one wire too close to, and parallel with, another, comparatively little trouble is usually experienced in simple sets.

Strong Fields from Coiled Wires

Coiled wires, however, may have very strong fields, and act on other coils or other wires over considerable distances, particularly when the gain in a receiver is high. The *shape* of this magnetic field, too, may be quite different from what is anticipated, due to the positioning of adjacent conductors. Setting one coil at right angles to another may *not* necessarily give a minimum of coupling between them.

Electrostatic induction can generally be referred to as a condenser effect. Two parallel wires close to one another form two plates of a small condenser, the air between them being the dielectric, and interaction from this cause is fairly frequent in wireless sets.

A large coil containing a considerable amount of wire presents a big surface, and two coils near to one another may be electrostatically coupled so as to produce oscillation, although the electromagnetic coupling is such as to *oppose* reaction effects.

If you have ever experimented with different windings in a reaction coil you may have obtained a reaction effect with a fairly large coil, although later you may find that the direction of winding has been such as to *oppose* electromagnetic reaction.

This is due to the fact that there has been sufficient capacity coupling between the reaction coil and the main coil to give oscillation, although it generally happens that you get no reaction up to a certain point and then suddenly the whole set goes into violent oscillation, with no intermediate stage of usable build-up without oscillation.

An early use of screening (although by no means the first) was in the screened coils which were popularised by the Technical Editor of this journal some years ago. Previous to the introduction of screened coils, the actual position of adjacent coils in a set with one or two high-frequency stages had to be carefully arranged, so that the electromagnetic field did not interact harmfully.

An alternative method was to box each individual stage. As, however, the bulk of interaction came from coils, it was found that if these were carefully screened (which was easily done in cylindrical cans) the other parts could be arranged in any convenient fashion with very little likelihood of interaction.

It must be remembered that at this time we did not have screen-grid valves and the high-frequency gain was by no means as great as to-day. With increase of efficiency the screening of other parts was found to be necessary, so that a modern high-gain receiver looks like an iron-clad with even the valves themselves screened and practically no leads showing.

Several different metals can be used for screening with varying degrees of efficiency. If a set were being built regardless of expense, it is probable that silver would be chosen as the screening material, as this has a very high conductivity without any magnetic effect. The higher the conductivity the better the screening for a given thickness of metal.

Copper comes next and aluminium not much farther behind. For commercial reasons (cheapness and ease of working) iron is frequently used in these days, although it is a bad material of which to make screening boxes for coils or other objects where electromagnetic screening occurs.

For this reason it is frequently found that while the main part of a chassis may be of iron (either sprayed or plated with some less corrodable metal), the coil cans are of aluminium or copper.

While high-frequency screening naturally takes our attention first of all, it must not be forgotten that low-frequency screening may be extremely important. Electrostatic effects rarely trouble us in the low-frequency end, but electromagnetic effect due to large coils may set up all kinds of difficulties.

An audio-frequency amplifier, in order to have uniform amplification over the whole range of frequencies desired, must be not only very carefully designed, so far as the layout of parts is concerned, and the proportioning of them, but the electromagnetic screening must be most carefully attended to.

Heavy Iron Screening

The heavy losses which may be set up in the radio-frequency end of the circuit by using iron for screening the coils are largely dependent upon the frequencies used, but in the audio-frequency end of the set, where the frequencies are low, heavy iron screening has to be used.

A copper box, which will provide very effective electromagnetic screening for a radio-frequency coil, will probably be as transparent as glass in the low-frequency field of a modern audio-frequency transformer.

When very high gain and very thorough screening is required, every little aperture in the screening box has to be sealed, and one of the problems is to get the leads *out* without getting unwanted fields *in*!

So far I have not referred to one very important aspect of screening—the losses introduced by it. These may be very considerable. For example, let us take a radio-frequency coil and place it inside a screening box with very little space between the coil and the box itself.

As the whole of the box is a conductor, it acts, so to speak, as a single short-circuited turn of a step-down transformer, and for this reason very heavy currents may be set up in the surrounding metal, the effect of the interacting field being considerably to reduce the inductance of the coil in question.

For the same inductance a coil must have more turns if it is screened, and as the resistance of a coil depends on the amount of wire, among other things, the efficiency goes down accordingly. If the screening material is poor and of not too high a conductivity, then the losses set up in it may still further detract from the efficiency.

Simple one- and two-valve sets do not need any elaborate screening—even when used in strange locations

Running a Disc Receiver from the Mains

By KENNETH JOWERS

ALTHOUGH it is better to use a 6-volt motor driven by an accumulator, if you are not using synchronising gear, the bother of obtaining fully-charged 6-volt accumulators tends to make the low-voltage motor rather unpopular.

There are, of course, many users without any mains available, so they have no alternative to the low-voltage motor but, on the other hand, a big percentage of users have some sort of mains supply. There is no doubt that these fortunate readers will prefer to run their disc receiver entirely from the mains, so as to be independent of fluctuating accumulators and dry batteries.

Quite a number of reliable motors are available, suitable for either A.C. or D.C. mains which, with the addition of a variable and a tapped resistance, will revolve at 750 revolutions per minute for quite long periods. Two good examples of this type of motor are the universal models supplied by Peto Scott or Mervyn for 30s.

These motors can be mounted in the same way as suggested for the low-voltage motor or, on the other hand, when buying the motor you can also obtain a metal chassis designed to go with it.

The alterations to the original disc receiver are very few. For controlling the voltage applied to the 6-volt motor, I used a 2-ohm Igranic resistance. This has to be replaced by a 150-ohm variable resistance, which can be connected and fitted in exactly the same way as the 2-ohm type. As this variable resistance is only intended as a vernier control, a tapped fixed resistance must be connected in series with one side of it and the supply mains.

This resistance should be adjusted until the disc revolves somewhere near 750 revolutions a minute, and final adjustments made by means of the variable resistance.

Keeping the motor speed steady is rather a strain, particularly after the novelty of seeing the pictures has worn off. In the early stages the bother of constantly adjusting the motor speed is tolerated, but after a while most readers will look for some gadget that will keep the motor synchronised for a reasonable length of time.

This is not such a difficult or expensive matter as you may at first imagine. The synchronising equipment consisting of magnetising coils and a 30-tooth phonic wheel, etc., which can be obtained from Peto-Scott and fitted without the slightest trouble, providing you have purchased a double-ended motor. The universal motors I previously mentioned are supplied with a spindle at either end.

The disc is fitted to one end and the synchronising gear to the other. The synchronising gear can be fitted very simply, and as there are only two connections—you can see these from the theoretical diagram—it is only a moment's job to alter your disc receiver to include this very important refinement.

Every user of a disc receiver will be well advised to fit this gear as it greatly adds to the entertainment value of the receiver. It is suitable for every type of disc receiver that uses a double-ended motor.

After you have fitted the mains motor you are half way to having an all-mains disc receiver. The other half is obtaining the D.C. voltage for exciting the neon lamp. If your mains set will give 180 to 200 volts at 30 milliamperes or so the job is done for you, but as it is not always possible to tap this voltage, the problem is not quite so simple as it appears on the surface.

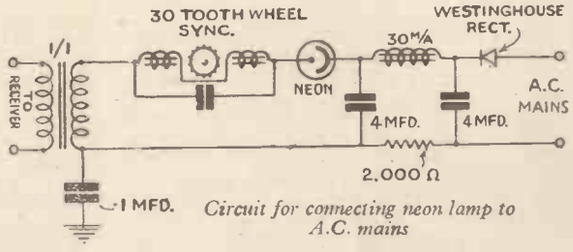
The majority of commercial mains sets use between 200 and 250 volts high tension, and it is quite a simple matter to include the neon lamp in the anode circuit of the power output valve by means of a Bulgin split anode adaptor.

On the other hand, certain readers will not be prepared to tamper in any way with a commercially-built set, while in certain types of receiver it will not be convenient to use a split anode adaptor. If you are lucky enough to be on D.C. mains, the job is practically done for you, but of that more anon.

It is, as you can see from the theoretical sketch, quite a simple matter to obtain the neon voltage, even if you are on A.C. mains. The loud-speaker terminals of the sound receiver should be connected to the primary of a 1-to-1 ratio output transformer. One side of the secondary of this transformer goes to one side of the neon lamp, either directly or through the synchronising gear should you be using it. The other side of the neon lamp is then connected to one side of a Westinghouse metal rectifier through a 30-milliampere smoothing choke.

Wide World photo

A television novelty shown in Italy. Speaking on the phone and watching your correspondent at the other end of the wire!



Circuit for connecting neon lamp to A.C. mains

Mains Unit Without Transformer

This choke is by-passed to earth at both ends by means of the usual high-capacity fixed condensers and, in fact, the completed circuit is a simple mains unit, but without a mains transformer. The A.C. supply is fed directly to a rectifier.

Don't forget to include a 2,000-ohm fixed resistance in the negative lead, otherwise the neon lamp will have a bright life, but a short one.

If you are on D.C. mains, there is no need for a rectifier. Just connect the full voltage across the first smoothing condenser, but still include the fixed resistance.

Some readers will have to be content with exciting the lamp by means of dry batteries, but the same circuit as regards the synchronising gear can be used, although there will not be any need for the smoothing condensers, choke or rectifier. Simply connect the voltage across one side of the neon and one end of the 1-to-1 transformer. If you are prepared to adjust the voltage by hand, there will be no need for the fixed resistance, although it is always advisable to include this as a precautionary measure.

The few commercial sets that do not use sufficient D.C. voltage have to be coupled by means of the circuit given on this page.

Peto-Scott mains-driven motor, synchronising gear, fixed resistance and variable resistance for television reception

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

Our Tests of New Apparatus

Ferranti electrolytic condenser

FERRANTI DRY ELECTROLTYIC CONDENSERS

THE new Ferranti CE type electrolytic condensers are constructed in the usual way, the condenser units themselves being wax-impregnated and the whole assembly housed in a cardboard container with flexible leads for the connections.

The sample submitted for test was an 8+8 microfarad condenser type CE 100 and measured 2⅛ in. by 1⅝ in. by 4 in. long. The connections to the two condensers are brought out entirely separately so that they may be used in two different parts of the circuit.

Test Results.—The capacities of the two sections were found to be 7.6 and 7 microfarads respectively. The leakage current was slightly above .5 milliampere per section after the condenser had been in circuit for some 30 minutes.

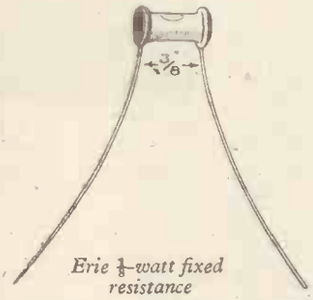
The condensers were tested to 550 volts D.C. without any signs of breakdown, so that the rating of 500 volts peak appears conservative. A test on the insulation resistance between the two sections gave an infinity reading.

Makers: Ferranti, Ltd.
Price: 7s. 9d.

ERIE RESISTANCES

VERY small resistors rated to carry ½-watt have recently been introduced by Erie.

These resistors measure only ⅜ in. long by ⅛ in. in diameter and are suitable for grid leaks, grid stoppers and similar locations where they have to carry practically no current.



Erie ½-watt fixed resistance

The resistors are supplied with the usual wire ends and are colour coded for resistance value in the usual way.

Test Results.—We found the resistances eminently satisfactory for their purpose. They dissipated their rated wattage without any overheating, and will contribute considerably to the neatness of any set.

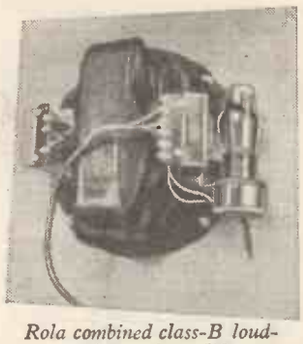
Makers: Erie Resistor, Ltd.
Price: 1s.

ROLA CLASS-B LOUD-SPEAKER AND AMPLIFIER

THIS unit consists of a driver transformer feeding the class-B valve which, in turn, feeds the loud-speaker through a matched output transformer.

The input to the whole unit is supplied through a pair of flex leads, terminating in an adaptor which is plugged into the last valve holder of the receiver. The valve which has just been removed is then replaced in the socket on top of the adaptor and two further leads are connected, one going to low-tension negative and the other to high-tension positive.

The connections are thus very simple and the whole unit is mounted on a compressed fibre baffle 12 in. square and only occupies 4¼ in. depth. The compactness and ease of connection will appeal to many.



Rola combined class-B loud-speaker and amplifier

Test Results.—Tone was found on test to be very pleasant and quite free from the shrillness which is often associated with class B due to incorrect matching. Tone correction is incorporated in the unit, but this has obviously been nicely graded since the upper register is well maintained and there is no loss of life or brilliance.

A real punch was obtained from the unit using a 120-volt high tension battery, showing that a large percentage of the watts developed by the valve were actually reaching the loud-speaker instead of being lost on the way.

Sensitivity was of a high order.

Makers: British Rola Company.
Price: £2 17s. (without valve).

The 20-metre Band is Best

Says KENNETH JOWERS

DURING the course of the week I have had several reports from various parts of the country, including Lanarkshire, Cornwall, Hampshire, all commenting on the exceptionally fine transmissions of G5AR on the 80-metre band. I decided to check these reports up and listen to the station myself.

The quality and volume were distinctly better than usual and, in fact, the reproduction from a moving-coil loud-speaker was very B.B.C. On looking up 5AR, I find it belongs to Mr. Ostermeyer, who, as most of you probably know, was one of the founders of the R.S.G.B. and is now the honorary treasurer.

◆ ◆ ◆

Now that the clock has been put on, the 80-metre band will have to be given second place as regards DX reception. The 20-metre band will, in future, be the most interesting channel for long-distance reception, right up until last thing at night. Of course, for the past few weeks the conditions on this channel have been exceptionally good right up until 22.00, and at the moment I can still hear some of the West Coast Americans up until midnight.

Of course if you care to get up in the morning fairly early, the 80-metre channel is still worth searching, for the American amateur stations come in extraordinarily well until about 06.00.

◆ ◆ ◆

G2YL, whom I mentioned quite frequently a little while ago, has been doing very well recently. With a power of 50 watts, G2YL has worked PK4AZ and PK4BO of Sumatra and PK1BO of Java, which is pretty good going for the time of the year. This station is worth logging on the 20-metre band and many male operators can pick up a point or two from Miss Corry, who operates G5YL.

◆ ◆ ◆

There has been quite a lot of interest lately in radio in armoured cars and tanks.

[*Photopress photo*

Adjusting the short-wave transmitter used for a scientific expedition to Northern Norway

During the last week-end the Essex hams were doing quite a lot with an armoured car at Southend. G6KV of Laindon put out some signals which were received very well up to quite long distances. G6KV's station was chosen, as this transmitter's 80-metre signal is recognised as being exceptionally steady.

◆ ◆ ◆

I have had a very lengthy letter from Mr. Clemenson, of West Hampstead, who has been logging some very interesting stations just recently. He has received K4SA at R8 on 40 metres, and, what is more, he was able to hear this station at 06.50. One particular *morning* he heard W5ATF at R8, W5LY at R8, and W5AQI at R6.

As well as these stations he heard six Australians and five New Zealanders, all within a space of thirty-five minutes. It was certainly good going to hear W5 stations at 07.00. In that area the American stations start coming in at 01.00 and continue on until 08.00 on the 80-metre band.

It looks as if the 20-metre band will be worth having until midnight, and after that switching over to 80 metres, as very few readers send me reports on either the 31- or 50-metre bands. Mr. Clemenson tells me that during the afternoon he hears as many American stations as he does Australians on 20 metres.

All these stations are heard on a detector and low-frequency receiver.

Criticisms by WHITAKER-WILSON

My Broadcasting Diary

[Collins photo
John Henry

Monday

ASHLEY STERNE'S *Table D'Hote* one of the best radio shows ever. Really funny. Music nice, too. So were the lyrics by A. A. Thomson. Those two ought to be retained permanently by the B.B.C. and made to write revues. I'll write reviews of their revues any time.

Loved the argument when the dessert came on. A girl offered a man an apple, but he said he remembered what came of Eve's offering one to Adam. Another man said that was Adam's fault. You couldn't expect much of a man who married his own rib.

Thoroughly agreed with the definition of caviare. It tastes like new football boots *smell*. It does. Well, here's to their next. Most enjoyable.

◆ ◆ ◆

Sweeney Todd sent me all goosey. Todd an odd Tod in some ways, but I liked him. So that's melodrama? Good broadcasting stuff, too. Direct; no bunkum about it.

Tuesday

THINK there must be a strike on at the B.B.C. Can't get a sound out of my set . . Perhaps not. Wonder if that wire ought to hang loose like that? Never noticed it before. Well, that's that, and I shan't hear anything to-night. Annoying. Wanted to hear the Tudor Singers.

Wednesday

ALL serene again. I was right about that wire.

Fancy them doing old Purcell's Coronation Anthem at the Symphony Concert! Years since I heard it.

Albert Sammons in the Delius concerto satisfied me completely. The concerto wanders about a bit, but I read a book and found it mingled itself with what I was reading. Bad habit, though. Still, there *is* music in the world which lets one do that sort of thing.

Put the book down for Holst's *Choral Symphony*. Very beautiful, but thought it wanted another rehearsal or two. Miriam Licette sang instead of Dorothy Silk. Not so well as I have heard her, but she may have had it sprung on her at the last moment.

["A.W." photo
Claude Hulbert

Thursday

POSTMAN'S KNOCK definitely a good show. Real comedy lines. Ben Welden as the Editor remarkable. Claude Hulbert and Reginald Purdell as the two reporters absolutely brilliant. So characteristic of both writers that I thought I knew which lines were written by Hulbert and what by Watt.

"This is a one-way street." "I know. I only want to go one way." If Claude didn't write that—then I'll be bound it was John.

One fault only. Taken too quickly all through. That's why they ended up with nine minutes to spare. In the words of the theme-song: "Please don't mention it . . . it's been no trouble at all to listen to it."

Oh, John; oh, Claude! Get together again.

Friday

THE Oxford University Dramatic Society in *Dr. Faustus* amazingly good. Say what you like, cultured voices like their's appeal to me. And the English! I can listen to a classic of this kind at any time.

Congratulations to Barbara Burnham on a first-rate adaptation. Not an easy matter to cut Marlowe successfully. A thorough Gielgud production.

Saturday

THE FIRST TWELVE YEARS pleased me enormously. But, then, look whom they had in it!

["R.P." photo
Norman Long

Norman Long made a good beginning by singing the first song he ever broadcast—as far back as 1922. Liked his piano-playing. A real pianistic touch. Helena Millais so good with her Old Lizzie character that I was sorry she wasted time in preaching sermons in rhyme. Can't bear being preached at, personally.

The Roosters merry enough. Not quite so characteristic as usual perhaps. Still, they only had four minutes. Not too easy to establish their style in that space of time.

John Henry better than ever I heard him. Now that he has come back to the microphone, can't he be asked regularly? He was very funny. Nearly every line got a roar from the audience.

Sorry Mabel Constanduros could not be there. Liked Leonard Henry's clever telegram. Also Claude Hulbert's. He said Enid thought it was to-morrow night and he thought they'd done it. Just like him. John Watt imitated his voice very well.

Tommy Handley never better, I think. He nearly made me blush once, but I managed to laugh it off.

Clapham and Dwyer excellent. So Cissie has been to a nudist camp in Germany? That, of course, explains her long absence.

Ashley Sterne

I thought Elsie and Doris Waters wouldn't get from New Cross to St. George's in eighteen minutes, Elsie told me in the morning they were going to try it with a fast-driving brother. However, they were excellent when they did come. Doris did the "hiccup" Elsie promised me. Glad they are to be in the Command Performance. They deserve to be.

The Carlyle Cousins sang unaccompanied for a few bars. I want them to do a whole number in three-part harmony *without the piano*.

Postscript

THE best week of broadcasting since I listened. *Table D'Hote, Sweeney Todd, Symphony Concert, Postman's Knock, Dr. Faustus*, and the Saturday vaudeville. You can't expect more than that in a week. 'Tisn't reasonable.

Listeners' Letters

EASTERN COUNTIES RECEPTION

To the Editor, "AMATEUR WIRELESS."

I READ with interest J. G. D.'s letter (1050). I agree with him as to the need for a local relay for the Eastern Counties, but cannot admit that listening with a simple set on the medium waves is impossible.

Fading is the bugbear, especially with the Regionals, but on the whole reception is tolerable.

For the listener who wants no trouble at all a super-het with self-adjusting volume control is the only solution here. I myself use a four-valve screen-grid set with two transformer-coupled low-frequency stages.

H. F. LUSCOMBE.

Lowestoft. [1063

IRISH BELL BROADCASTS

I HAVE just read the article by W. Oliver on "Broadcast Bells and Chimes" in AMATEUR WIRELESS for April 14. The Madrid chimes mentioned are broadcast from the clock tower of the Department of the Interior.

Several interesting bell broadcasts have been transmitted at various times from the Irish stations. When, for instance, the Cork station was opened the famous bells of Shandon Church were broadcast as a background to a choir singing the well-known verses which begin: "The bells of Shandon, that sound so grand on the pleasant waters of the River Lee."

Another Irish broadcast was of the carillon at St. Colman's Cathedral, Queenstown, which brought Dr. Gebruers, the carilloneur, letters from all over Europe as far as Vienna.

J. C. WILSON.

East Sheen, S.W.14. [1064

A REPLY TO "OLD HAND"

MIGHT I suggest that "Old Hand" re-reads Thermion's story of dud components on page 261? According to Thermion, it is a *true* story in which the constructor *suspects* the coils and on return from the makers, tests them in his set. At least, he certainly did try them in his set for it "still refused to function."

The "Old Hand" who wrote letter 1,048 is perhaps not the "Old Hand" referred to by Thermion. If he is, then one of the stories is not true.

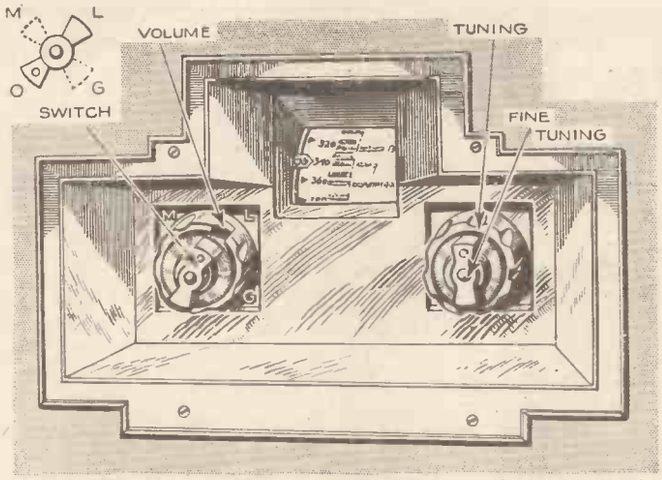
"NEW READER."

Harrow, Middlesex. [1065

Sets of the Season Tested

Marconiphone 269 Portable

A Set that will give you maximum enjoyment from radio in the open air



In this drawing our artist shows clearly how the combination controls are arranged on the Marconiphone 269 portable

UNTIL this season, many readers were under the impression that a portable receiver was one which was a compromise between good quality and economy in high-tension current. Far too often we have heard the expression, "It sounds like a portable."

Such prejudice against portable receivers is hard to overcome, but if we were to have more receivers of the Marconiphone 269 type, we have no doubt whatsoever that they would completely supersede the standard type of battery-operated superhet that needs an external aerial.

It Can Be Carried Around !

The only point about the Marconiphone 269 that is reminiscent of the older type of portable is the fact that it can be carried around. Station-getting, quality and selectivity are in every way equal or even better than with the average battery super-het using an external aerial.

We were very impressed with the exceptionally fine cabinet work, even though it is always a good feature with Marconiphone sets. It is of figured and inlaid walnut of very simple but impressive design. At first sight it seems far too heavy for a portable receiver, but actually this is not so. A clever design of escutcheon enables the controls to be grouped together so that their operation is unusually simple.

In fact we were so interested in the escutcheon that we have had it drawn and reproduced in these pages. There are two knobs, the left-hand control is firstly for volume and in the centre of it is the on-off medium-wave, long-wave and gramophone switch. On the right-hand side is the tuner and concentric with it the trimmer. That's all the controls there are.

The tuning dial is calibrated in wavelengths and station names, and covers between 200 and 500 metres and 1,000 and 2,000 metres.

The high-tension battery is of 175 volts, including 9 volts for grid bias. This is fitted in the bottom of the cabinet, side by side with the accumulator. The high-tension plugs can be pushed in the proper sockets without any fiddling and, what is more, when they are pushed in they stop in.

The anode current of the entire receiver is very low. When not tuned to a station the standing current is 6.5 milliamperes. This is with the full high-tension voltage. At average volume the current is round about 10 milliamperes.

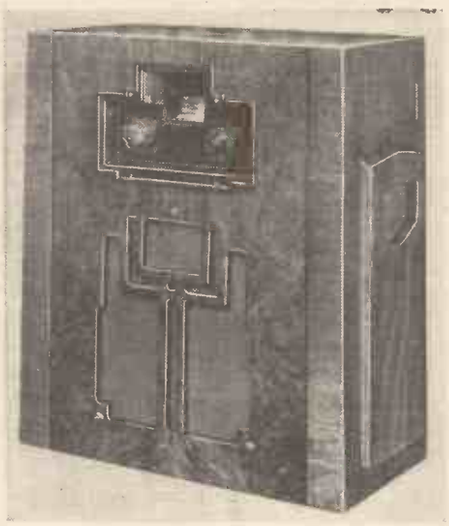
As the battery is designed to give almost double this output, it stands to reason that the receiver will run for a very long while without requiring a replacement.

We have already mentioned that the quality is amazingly good. This is due to push-pull pentode output, specially matched to the moving-coil loud-speaker. A very good idea is embodied in the push-pull circuit. The push-pull valves are marked v and s, and there are two tappings on the high-tension battery marked v and s. You plug in the two corresponding high-tension tappings into these two sockets. This makes certain that the anode currents of the two valves are approximately the same.

Provision has been made for an external aerial and earth and a gramophone pick-up, so that the receiver could actually be used in place of the standard set, if you do not wish to erect an unsightly aerial.

After dark, stations can be picked up at almost every point of the dial; in fact one gathers the impression that the receiver is connected to an external aerial. It is only during the daytime that long-distance stations cannot be received, but you must not think from this that you are limited to the local station in daylight—far from it. We found that during the morning and the afternoon we could always rely on eleven or twelve Continental stations of good strength.

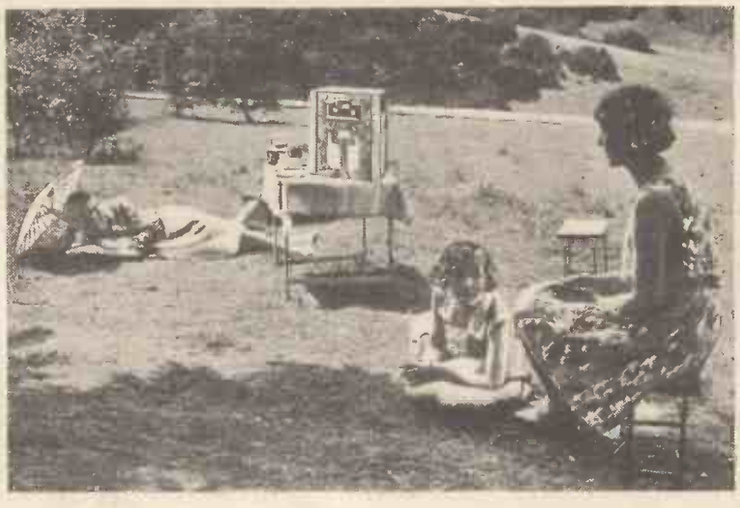
Selectivity is of a very high order and, in fact, if advantage was taken of the directional properties of the frame aerial, stations separated by only a very few kilocycles could be received.



Note the neat arrangement of combination controls on this Marconiphone portable

IN A NUTSHELL

Makers : Marconiphone, Ltd.
Model : 269.
Price : £15 15s.
Valve Combination : High-frequency amplifier (Marconi S21), first detector and oscillator (Marconi S21), single intermediate-frequency stage (Marconi VS2), second detector (Marconi HL2), push-pull output (two Marconi PT2's).
Power Supply : Internal combined high-tension grid-bias battery and low-tension accumulator.
Type : A super-het portable receiver with automatic volume control.



This pleasant picture shows you to what good use radio can be put in the Summer time. The set is a Marconiphone model 269

Automatic volume control is a standard feature, and not only is this very useful when listening to long-distance stations, but should you wish to use the portable in the car, the variations in volume caused by bridges and buildings and so on are almost nullified. For those who do not wish to go to the expense of buying a special car radio set, this is an ideal alternative.

Provided the ignition system was fitted with noise-suppressors this set would work very well while the car was in motion.

We cannot too highly stress the fact that this receiver should not be considered in the light of a portable. It combines the advantages of a fixed receiver and external aerial with none of the disadvantages of the average portable. At fifteen guineas it is exceptionally good value for money.

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LUCERNE RANGER

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KIT "C"

As for Kit "A," but with Valves and Peto-Scott type PQ Cabinet. Cash or C.O.D. Carriage Paid, £8/16/0.

Or 12 monthly payments of 16/-.

RECOMMENDED PETO-SCOTT PERMANENT MAGNET MOVING-COIL SPEAKER. Cash or C.O.D. Carriage Paid, 19/6, or add 1/9 to deposit and each monthly payment.

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1	Peto-Scott Metaplex Chassis, as specified ...	3	6
1	Graham Farish Screened H.F. Choke ...	4	6
2	Telsen Dual-range Screened Coils, Type W349	17	0
1	British Radiophone 2-gang Condenser, .0005 mfd. with S.M. dial Type P.Q.	18	0
1	Wearite Transformer Type P.P.A.	13	6
1	set of 3 Specified Valves	2 13	6
1	Peto-Scott Penta-quester Cabinet	1 15	0

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Designed at the special request of "Amateur Wireless." In handsome hand-french polished Walnut. With unique 360-degree Tuning Scale and 2-1 reduction sprockets, driving chain, scale and speaker baffle.

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Balance in 11 m'thly payments of 3/6. DOWN

KIT "B"

As for Kit "A," but with Valves only. Cash or C.O.D. Carriage Paid, £3/10/3.

Balance in 11 monthly payments of 6/6. Send only **6/6**

KIT "C"

As for Kit "A," but with Valves and Peto-Scott Lucerne Cabinet. Complete with B.A. Cone Speaker. Cash or C.O.D. Carriage Paid, £4/12/6. Balance in 11 monthly payments of 8/6. Send only **8/6**

ASSEMBLED LUCERNE PARTS

★ If Ready-assembled Lucerne Coils, H.F. Choke, and L.F. Transformer required with Kit in place of parts for same add 5/- to Cash or C.O.D. prices or 6d. to each monthly payment.

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Complete kit comprising 2 ready-drilled Formers, 2 Reels of enamelled Wire, 6 B.A. Terminals, Nuts and Screws. Exact to specification for Aerial or Grid Coil. Postage 6d. extra. **2/6**

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Ready assembled and tested by Peto-Scott. 2/6, postage 6d. extra.

L.F. TRANSFORMER PETO-SCOTT KIT, comprising moulded bakelite case, ready-drilled and completed with ready-wound bobbin, 25 pairs of laminations and terminals, to "Amateur Wireless" specification. Postage 6d. extra. **3/6**

Ready assembled and tested by Peto-Scott, 5/-, postage 6d. extra.

MAINS L.F. CHOKE Complete Kit of Parts, exact to "A.W." specification, comprising ready-wound bobbin, laminations, clamping strips and bolts. Postage 6d. extra **6/9**

Ready assembled, tested and guaranteed by Peto-Scott. Postage 6d. extra. **8/9**

A.C. MAINS TRANSFORMER Complete Kit of Parts, exact to "A.W." specification, comprising ready-wound bobbin, with coloured leads, set of laminations, clamping strips, fixing screws. Postage free. **13/6**

Ready assembled, tested and guaranteed by Peto-Scott. Postage free **16/6**

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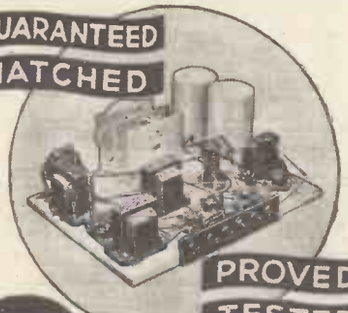

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YOURS FOR **5/-**

Another **PETO-SCOTT** triumph — this latest Class B Battery 4 Kit at a popular price. Seven times the volume of an ordinary battery set, with outstanding performance equal to "mains" receiver. Kits supplied with detailed "Simple to build" instructions and assembly blueprint. Matched and tested components. Guaranteed for 12 months by Peto-Scott. **KIT "A,"** less Valves and Cabinet. Cash or C.O.D. Carriage Paid, £3/10/0, or 5/- deposit, balance in 12 monthly payments of 6/-.

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Recommended PETO-SCOTT SPEAKER, if required, add 22/6 to Cash Prices or 2/- to each monthly payment.

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Medium-wave Broadcasters

This week we give details of all the important European medium-wave stations.
Next week we shall publish a list of short- and long-wave transmitters.

Metres	Kilo-cycles	Station and Call Sign	Country	Power (Kw.)
201.1	1,492	Bordeaux-Sud-Ouest	France	.3
203.5	1,474	Plymouth	Great Britain	.3
203.5	1,474	Bournemouth	Great Britain	1
204.2	1,469	Pecs	Hungary	1.25
206	1,456	Fecamp	France	20 0
208.6	1,438	Miskolez	Hungary	1.25
209.5	1,432	Beziers	France	1.5
209.9	1,429	Newcastle	Great Britain	1
211.3	1,420	Tampere	Finland	1.2
214	1,402	Sofia	Bulgaria	5.0
215	1,395.4	Radio Lyon	France	.7
218.2	1,375	Basle, Berne	Switzerland	.5
221.1	1,357	Turin (2)	Italy	.2
222	1,351	Dublin (2)	Irish Free State	1.2
222.6	1,348	Koenigsberg	Germany	.5
222.6	1,348	Milan Vigentino (2)	Italy	7
224	1,339	Montpellier	France	.8
224.1	1,338.8	Lodz	Poland	1.7
225.6	1,330	Hanover and other Hamburg relays	Germany	1.5
227.1	1321	Magyarovar	Hungary	1.25
230.2	1,303	Danzig	Germany	.5
231.8	1,294	Linz and other Vienna relays	Austria	.5
233.5	1,285	Aberdeen	Great Britain	1
235.1	1,276	Stavanger	Norway	0.5
236.8	1,267	Nurnberg	Germany	2
238.5	1,258	San Sebastian (EAJ8)	Spain	.6
238.5	1,258	Rome (III)	Italy	1.0
240.2	1,249	Juan-les-Pins	France	2.0
241.9	1,240	Cork	Irish Free State	1
243.7	1,231	Gleiwitz	Germany	5
245.5	1,222	Trieste	Italy	10
247.3	1,213	Lille PTT	France	1.4
249.2	1,204	Prague Strasnice (2)	Czechoslovakia	3
251	1,195	Frankfurt-am-Main and relays	Germany	17
253.2	1,185	Kharkov (2)	U.S.S.R.	35
255.1	1,176	Copenhagen	Denmark	10.0
257.1	1,167	Monte Ceneri	Switzerland	15
259.1	1,158	Moravska-Ostrava	Czechoslovakia	11
261.1	1,149	London National	Great Britain	50
261.1	1,149	West National	Great Britain	50
263.2	1,140	Turin (1)	Italy	7
265.3	1,131	Hoerby	Sweden	10
267.4	1,122	Belfast	N. Ireland	1
267.4	1,122	Nyiregyhaza	Hungary	6.25
268.5	1,117	Vitus (Paris)	France	1.0
269.5	1,113	Kosice	Czechoslovakia	2.5
271.7	1,104	Naples	Italy	1.5
271.7	1,104	Madona	Latvia	15.0
274	1,095	Madrid EAJ7	Spain	3.0
276.2	1,086	Falun	Sweden	.5
276.2	1,086	Magyarovar	Hungary	1.25
277.2	1,082	Zagreb	Yugoslavia	.75
278	1,079	Bordeaux PTT	France	13
280.9	1,068	Tiraspol	U.S.S.R.	10
283.3	1,059	Bari	Italy	20
285.7	1,050	Scottish National	Great Britain	50
288.5	1,040	Leningrad (2)	U.S.S.R.	100
288.5	1,040	Rennes PTT	France	1.3
291	1,031	Heilsberg	Germany	60
291	1,031	Parede	Portugal	5.0
293.5	1,022	Barcelona (EAJ15)	Spain	2.0
296.2	1,013	North National	Great Britain	50
298.8	1,004	Bratislava	Czechoslovakia	14
301.5	995	Huizen (Hilv. prog.)	Holland	20
304.3	986	Genoa	Italy	10
304.3	986	Cracow	Poland	1.7
307.1	977	West Regional	Great Britain	50
309.9	968	Grenoble PTT	France	3.0
312.8	959	Poste Parisien, Paris	France	60
315.8	950	Breslau	Germany	60
318.8	941	Algiers	North Africa	13
318.8	941	Goeteborg	Sweden	10
321.9	932	Brussels (2)	Belgium	15
325.4	922	Brno	Czechoslovakia	35
328.6	913	Limoges PTT	France	.7
331.9	904	Hamburg	Germany	100
335.2	895	Radio Toulouse	France	8
335.2	895	Helsinki	Finland	10
338.6	886	Graz	Austria	7
342.1	877	London Regional	Great Britain	50
345.6	868	Poznan	Poland	17.0
349.2	859	Strasbourg	France	15
350	857	Bergen	Norway	1.0
352.9	850	Valencia	Spain	3.0
356.7	841	Berlin	Germany	100
360.6	832	Moscow (4)	U.S.S.R.	100
362.8	827	Radio LL, Paris	France	1.2
364.5	823	Bucharest	Roumania	12
368.6	814	Milan	Italy	50
373.1	804	Scottish Regional	Great Britain	50
377.4	795	Lwow	Poland	21.5
379.7	790	Barcelona (EAJ1)	Spain	8
382.2	785	Leipzig	Germany	120
386.6	776	Toulous PTT	France	.7
391.1	767	Midland Regional	Great Britain	25
395.8	758	Katowice	Poland	16
400.5	749	Marseilles PTT	France	2.5
405.4	740	Munich	Germany	100
410.4	731	Seville	Spain	1.5
410.4	731	Tallinn	Estonia	11
410.4	731	Madrid (Espana)	Spain	1.0
415.5	722	Kiev	U.S.S.R.	36
420.8	713	Rome	Italy	50
426.1	704	Stockholm	Sweden	55
431.7	695	Paris PTT	France	7
434.8	690	Fredriksstad	Norway	0.7
439.8	682	Belgrade	Yugoslavia	2.8
443.1	677	Sottens	Switzerland	25
449.1	668	North Regional	Great Britain	50
455.9	658	Langenberg	Germany	60
463	648	Lyons PTT	France	15
470.2	638	Prague (1)	Czechoslovakia	120
476.9	629	Trondheim	Norway	1.2
476.9	629	Lisbon (tests)	Portugal	20.0
483.9	620	Brussels (1)	Belgium	15
491.8	610	Florence	Italy	20
499.2	601	Sundsvall	Sweden	10
499.2	601	Rabat	Morocco	6
506.8	592	Vienna	Austria	100
514.6	583.2	Riga	Latvia	15
514.6	583	Agen	France	0.5
522.6	574	Muhlacker	Germany	100
531	565	Athlone	Irish Free State	60
539.6	556	Beromunster	Switzerland	60
549.5	546	Budapest	Hungary	120
559.7	536	Wilno	Poland	16
569.3	527	Vilpuri	Finland	13.0
569.3	527	Ljubljana	Yugoslavia	7
578	519	Innsbrueck	Austria	0.5
696	431	Oulu	Finland	1.2
726	413.5	Boden	Sweden	.6
748	401	Geneva	Switzerland	1.5
749	401	Moscow	U.S.S.R.	20.0
765	392	Ostersund	Sweden	.6
824	364	Smolensk	U.S.S.R.	10 0
840	357	Budapest (II)	Hungary	3.0
845	355	Vadso	Norway	10.0

NOTE:—The following wavelengths are common to several transmitters: 206 m. (1,456 kcs.); 207.3 m. (1,447 kcs.); 208.6 m. (1,438 kcs.); 211.3 m. (1,420 kcs.); 218.2 m. (1,375 kcs.); 221.1 m. (1,357 kcs.); 225.6m.214 m. (1,330 kcs.); 228 7 m. (1,312 kcs.); 235.1 m. (1,276 kcs.); 236.8 m. (1,267 kcs.); 251 m. (1,195 kcs.).

Metal-sprayed Baseboards

CONSTRUCTORS in some parts of the country have experienced difficulty in obtaining from their local dealers supplies of Metaplex for baseboards and chassis. In some cases they have been told by their local dealers that Peto-Scott do not supply through the trade.

Arrangements were made many months ago, however, for Metaplex to be supplied to the trade through the British Radio Gramophone Co., Ltd., and dealers can obtain supplies through this source without delay.

Attention is drawn to this point because the successful working of many recent AMATEUR WIRELESS designs depends in no small degree on the use of a metallised baseboard or chassis. Those who do not wish to get their Metaplex direct from Peto-Scott should insist on their dealers getting it for them through the wholesale distributors.

Penta-quester Blueprints

A FEW of the thousands of free Penta-quester blueprints that have been sent to AMATEUR WIRELESS readers during the past week have a minor error. The connection from terminal No. 6 on the high-frequency coil (mounted on the under side of the chassis) going to the anode of the high-frequency valve (on the top of the chassis) is numbered 57 on the underside and 51 on the top side of the chassis.

This is actually one connection, of course, and the number on the underside of the chassis should be altered to 51.

Wire No. 57 is the low-tension negative flex to the accumulator.

We would also take this opportunity of again reminding readers that the coupons for free Penta-quester blueprints published in our issues of April 14 and 21 must be sent to us by April 28 at the very latest.

The Human Ford

The Ford shown at a New York exhibition which was made "human" by radio gear

WHAT is it that talks and listens, sees and moves, and yet has no brain? The answer is the new Ford roadster recently demonstrated in the 1934 Ford exposition in New York. The three big features in the inventive world—the automobile, radio and television—were all combined here. And we have yet one more sign of the march of progress.

In Detroit, without a human being aboard, this car has been driven in the streets and stopped and started at traffic signals.

The demonstration at the exhibition proved an absolute magnet to the public, especially to the women. "Good morning, folks, I am glad to see you," says Ford and proceeds to look around and describe various onlookers, much to the amusement of the crowd.

At request he will blow his horn, light his lamps and answer questions. If a watch is held close to his lamps he will tell the time, and if a dollar bill is pressed close to the glass he will tell the exact number. Several dollar bills and watches were eagerly handed up to the handsome demonstrator.

One young lady from a visiting New York school was described by Ford and invited to come up on the stand and have a friendly chat. Amidst roars of amusement she was asked to put her face close to the radiator and was loudly kissed by the Human Ford.

As he was feeling hot, the attendant kindly opened the ventilators and doors and amidst much amusement the interesting demonstration finished. LIONEL MERDLER.

Notes and Jottings

RADIO-RELAY companies in many parts of the country have been very generous to the Wireless for the Blind Fund. The companies are giving free service to blind persons when the Fund has paid for the original cost of loud-speaker and installation.

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Writing of wireless for the blind reminds us that Burne-Jones & Co., Ltd., have received further orders for sets with the special Braille tuning system. This brings the number of sets supplied to the surprising figure of 24,000.

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Visual tuning in a well-developed state has been incorporated in the latest product of the Hayes radio factory—the H.M.V. Super-het Portable Fluid-light Six. Or, for short, model 463.

It is a six-valver for A.C. mains, and the price is £16 16s. A handsome transportable in a fine-looking walnut cabinet.

Controls are grouped on a single escutcheon, two combination knobs doing the work of four controls.

The fluid-light effect is obtained by the projection of two arrows of light on to the scale. The maximum length of arrow denotes maximum accuracy of tuning-in. As each station comes in the arrows give a visual indication of signal strength and tuning accuracy—a very great asset in a set with such highly selective tuning.

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Some long-distance medium-wave working is reported by Capt. G. P. Olley. The apparatus used was a Marconi AD601 fitted in a Dragon Moth plane of the Olley Air Service, Ltd. Capt. Olley was in touch with Croydon while on a flight to the North of Scotland (a distance of 450 miles) by telegraphy, and 250 miles by telephony.

INFORMATION BUREAU

Will every querist please observe the following revised rules?

Please write concisely, giving essential particulars.

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

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

The designing of apparatus or receivers cannot be undertaken.

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

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

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

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

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

Postcard Radio Literature

Here "Observer" reviews the latest booklets and folders issued by well-known manufacturers. If you want copies of any or all of them FREE OF CHARGE, just send a postcard giving the index numbers of the catalogues required (shown at the end of each paragraph) to "Postcard Radio Literature," AMATEUR WIRELESS, 58/61 Fetter Lane, E.C.4. "Observer" will see that you get all the literature you desire. Please write your name and address in block letters.

Claude Lyons Resistances

THE new Claude Lyons catalogue, "A Helping Hand to Constructors," will help you to choose the correct resistance for any particular job. In addition to details of resistances, hum adjustors, switches, mains condensers and transformers, sparking-plug suppressors, valve holders, microphones and pick-ups are also dealt with. **158**

Mains Equipment

CONSTRUCTORS of A.C. mains receivers will be interested in the Bryan Savage range of mains equipment. The transformers are designed to withstand a test voltage of 300 per cent. over the rated voltage.

The primary tappings are so arranged that the transformers can be used on all voltages from 200 to 250. The bobbin which carries the windings is of bakelite. The core is of ferro silicon, and good size cores they are! Every choke and transformer carries a twelve months' guarantee.

The latest folder, which gives details of ratings and prices of the standard lines, will be a great help when choosing new mains gear. **159**

Variable Resistances

THE new Kabi variable resistances have several interesting features. The resistance wire is embedded in bakelite, the contact being made through a sprung sliding arm and a hair-spring connection to the external soldering lug. They are rated at 3 watts dissipation, and can be obtained combined with mains switches. **160**

Car Radio

READERS who are interested in car radio should send for the Motorola catalogue, which gives details of several notable models. One of the models is exceptionally small, being only 7¼ in. by 8 in. by 8½ in. A five-valve receiver, loud-speaker, and power supply are all contained in the metal case. The loud-speaker is of the energised type; automatic volume control is another feature. **161**

On the Long Waves

Continued from page 450

More powerful plant is to be given also to Aalesund, as in that port the station is not only entrusted with radio programmes, but in addition with the more important duty of keeping the Norwegian fishing fleet in Arctic waters in touch with home affairs.

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I cannot believe there are many listeners in the British Isles able to tune in a Zagreb broadcast, as the power of the station is comparatively low. However, you may succeed without much difficulty if you choose the night following the first day in each month, as from midnight on these occasions the studio gives a special transmission.

Zagreb, by the way, works on 276.2 metres.

Oberammergau Relay

A week or so ago I mentioned the possibility of a relay of the Oberammergau Passion Play. I am pleased to say that from Continental sources I learn that the matter has been settled with the German stations, and through Reichssender Munich as the channel for all other stations, for the first time in history, an excerpt of this performance will be broadcast on Sunday, May 13.

We shall only be getting a sample of this famous production—the actual play itself lasts eight hours—but if you tune in to one of the more powerful European stations, as I understand that several will taking the transmission, you will also hear the principal actor, Anton Lang, give a short explanatory address in English.

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FULL-SIZE BLUEPRINTS

When ordering, please send postal order, NOT STAMPS. Quote the blueprint number shown.

CRYSTAL SETS (6d. each)

1931 Crystal Set	AW308
Four Station Crystal Set	AW427

ONE-VALVE SETS (1s. each)

Easy to Build One	AW304
Portable Short-wave One	AW354
B.B.C. One-valver	AW387
S.W. One-valver for America	AW429

TWO-VALVE SETS (1s. each)

Home Station A.C.2 (D, Pen)	AW374
B.B.C. National Two (D, Trans)	AW377
Melody Ranger Two (D, Trans)	AW388
"A.W." Iron-core Two (D, Trans)	AW395
"A.W." Iron-core Two with Q.P.P.	AW396
Big Power Melody Two, with Lucerne Coils (SG Trans)	AW338A
B.B.C. National Two, with Lucerne Coils (D, Trans)	AW377A
Consolectric Two (D, Pen) A.C.	AW403
Lucerne Minor (Det, Pen)	AW426
Screen-grid Two (SG Det, Trans)	WM289
A Two for 7 Metres (D, Trans)	WM295
New-style Radiogram (D, Trans)	WM299
A.C. Quality Gem (D, Trans)	WM312

THREE-VALVE SETS (1s. each)

James Push-push Three (SG, D, Q.P.P.) (1/6)	AW378
Everybody's Home Radiogram (SG, D, Trans)	AW381
Our Up-to-the-Minute Three (SG, Westector, LF, Trans)	AW384
Class B Three (D, Trans, Class B)	AW386
"Up-to-the-minute Three" with Class B, 1/6	AW384B
A.C. Triodyne (SG, D, Pen)	AW399
Home-built Coil Three (SG, D, Trans)	AW404
Fan and Family Three (D, 2LF)	AW410
£5. 5s. SG. 3 (SG, D, Trans)	AW412
A.C.-D.C. Universal Three (SG. Det, Pen)	AW414
1934 Ether Searcher (SG, Det, Pen) Baseboard	AW417
1934 Ether Searcher (SG, Det, Pen) Chassis	AW419
Lucerne Ranger (SG, Det, Trans)	AW422
P.W.H. Mascot (Det, R.C, Trans)	AW337A
Cossor Melody Maker with Lucerne coils	AW423
Mullard Master Three with Lucerne coils	AW424
Schoolboy's Three (Det, 2. RC)	AW428
Penta-quester (HF, Pen, Det, Pen)	AW431

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

"A.C. Melody Ranger" (SG, D, RC, Trans)	AW380
Home-lover's New All-electric 3 for A.C. mains (SG, D, Trans)	AW383
Melody Ranger (SG, D, RC, Trans) with copy of "A.W." 4d. postage	AW375
Signpost Four (SG, D, LF, Class B)	AW398
"A.W." Ideal Four (2SG, D, Pen)	AW402
2 H.F. Four (2SG, Det, Pen)	AW421

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

The Etherdyne (Super-het)	AW406
Super-quality Five (2 HF, D, RC, Trans)	WM320
Ideal Home Super (Super-het)	WM280
Easytune 60 (Super-het)	WM284
New Class-B Five (SG, D, LF, Class-B)	WM340
Class-B Quadradyne (2 SG, D, LF, Class-B)	WM344

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

1934 Century Super (Battery super-het)	AW413
1934 A.C. Century Super (Super-het)	AW425

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

Super Senior (Super-het)	WM256
Seventy-seven Super (A.C. Super-het)	WM305

PORTABLES (1s. 6d. each)

General-purpose Portable (SG, D, RC, Trans)	AW351
Midget Class-B Portable (SG, D, LF, Class-B)	AW389
Holiday Portable (SG, D, LF, Class B)	AW393
Town and Country Four (SG, D, RC, Trans)	WM282
Everybody's Portable (five-valve Super-het)	WM291
Spectrum Portable (SG, Det, QP21)	WM357

AMPLIFIERS (1s. each)

Universal Push-pull Amplifier	AW300
"A.W." Record Player (LF, Push-pull)	AW319
Battery-operated Amplifier	AW362
"A.W.'s" Push-push Amplifier	AW376
Class-B Gramophone Amplifier	AW391
Universal A.C. Amplifier (3-valve)	AW411
Five Q.P.P. Output Circuits	WM315

MISCELLANEOUS (1s. each)

"A.W." Trickle Charger	AW352
Add-on Band-pass Unit	AW359
Plug-in Short-wave Adaptor	AW382
Experimenters' D.C. Mains Unit	AW430
Experimenters' A.C. Mains Unit	AW432

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

AMATEUR WIRELESS BLUEPRINTS DEPT., 56-61 Fetter Lane - London, E.C.4

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by John Trent

★

AT THE MIKE WITH the BOSWELL SISTERS

These are just some of the splendid contents of Friday's issue of Radio Pictorial. Don't forget to get your copy—the folks at home will enjoy it, too.

2D

EVERY FRIDAY

RADIO PICTORIAL