

**BUILD OUR "CHALLENGE THREE" KIT SET**

**HIGH QUALITY WITH LOW H.T. SEE PAGE 695**

# Amateur Wireless

Every  
Thursday 3<sup>d</sup>

and  
Radiovision

Vol. XVII. No. 439

Saturday, November 8, 1930

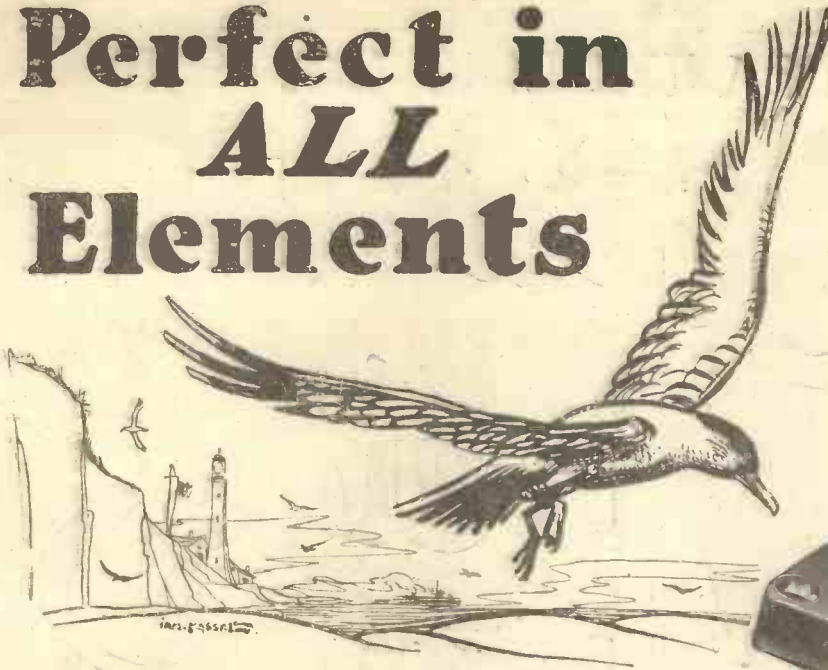
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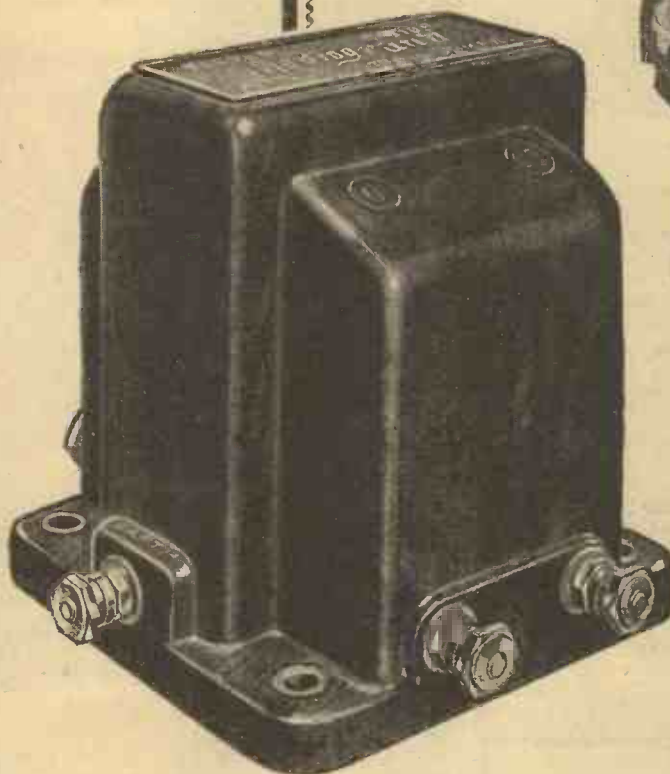
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# Amateur Wireless

and  
Radiovision



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THE LEADING RADIO WEEKLY FOR THE  
CONSTRUCTOR, LISTENER & EXPERIMENTER.

## NEWS & GOSSIP OF THE WEEK

### THE ELEVENTH

AS in former years, the B.B.C. will take an active part in the Armistice Day ceremonies on Tuesday next, November 11. The ceremony at the Cenotaph will be broadcast in the ordinary way, with the Post Office line link *via* the B.B.C. O.B. van in Richmond Mews—a little turning opposite the Cenotaph. This line link has been used for the past two years and has been so satisfactory that the technical arrangements will remain practically the same.

### THE MENIN GATE BROADCAST

ANOTHER feature of the broadcast arrangements for Armistice Day is the relay from the Menin Gate. The "Last Post" and "Reveille" will be relayed by ordinary telephone wire to the Lapanne cable station, and then by cross-channel cable to England and the ordinary Post Office land lines. The Belgian broadcast engineers have been co-operating with the B.B.C. engineers for some weeks past on this relay and elaborate precautions have been taken against a breakdown.

### ANTI-"RED" STATIONS!

RUSSIA is experiencing another epidemic of anti-Soviet broadcasting, and the Government officials are having a great deal of trouble in putting direction finders to work on a station—or, perhaps, a chain of stations—which is causing a great deal of harm by broadcasting propaganda to the peasants. Most of the small Russian villages have been provided with receivers by the Kremlin, and now the anti-Soviet broadcasters are using these receivers for "talk"—and a lot of it—against the Government. The strength appears to be constant over a large area of Russia, and so it seems probable that there is more than one station at work.

### THE KING TO BROADCAST

HIS MAJESTY THE KING has approved the broadcasting of his speech in opening the Indian Round Table Conference. This will be transmitted by all B.B.C. stations (including 5SW), beginning at 12 noon on Wednesday next, November 12. Subsequent speeches, including that of the Prime Minister, also will be broadcast.

### MORE CENTRALISATION?

THE B.B.C.'s centralisation policy seems to be develop-

### PRINCIPAL CONTENTS

	Page
News and Gossip ...	683
An Ideal Gramophone Amplifier...	685
Berlin's New Broadcasting House	686
Making the Most of a Transportable	687
For the Newcomer ...	688
On Your Wavelength ...	693
High Quality with Low H.T. ...	695
In My Wireless Den ...	696
The Making of a Radio Play ...	699
What is an Induction Motor? ...	700
The "1931 Mullard Orgola" ...	701
Broadcast Artistes in Picture ...	702
Without Fear or Favour ...	703
The "A.W." Challenge Klt Three" ...	704
Adding a Pick-up to the "Challenge Four" ...	708
How Your Batteries Work ...	710
"A.W." Tests of Apparatus ...	714

ing along personal lines. It comes as a surprise to Northerners to learn that Mr. Joseph Lewis, who was music director at the Birmingham station for seven years, has been transferred to Savoy Hill, where he will act as one of the conductors of the B.B.C. Orchestra and will be concerned in programme-building on the musical side. Both before and since he joined the B.B.C. he has been connected with musical activities in the Midlands. He was for some time assistant conductor of the City of Birmingham Orchestra, under Dr. Adrian Boult. Listeners in the Midlands are not to be deprived of Mr. Lewis's services in consequence of his transfer to London. Many of the performances which he will conduct will be broadcast nationally, and others will be given regionally.

### CANADA LEARNS FROM US

MR. E. A. WEIR, Director of Radio for the Canadian National Railways, has been visiting England in the belief that this country can furnish the Dominion with good ideas. He says: "I have studied broadcasting in England, and I am convinced that you can teach us much in the technique of programme presentation. Particularly is this so in the production of wireless plays in which branch of broadcasting Great Britain is far in advance of us on the other side of the Atlantic. I have come to England to learn what I can of the methods employed by the B.B.C. in the



A new glimpse of the rapidly-growing Slatthwaite. All three masts are now "up," and the heavy Diesel engines are being fitted. First transmissions are promised by the end of the year

NEXT WEEK: FOR GRAMOPHONE USERS—A SIMPLE TWO-VALVE AMPLIFIER



# NEWS & GOSSIP OF THE WEEK —Continued

presentation of this type of radio entertainment."

## PRAISING THE B.B.C.

ASKED what he really thought of the B.B.C., Mr. Weir said: "Undoubtedly a system of state monopoly in broadcasting has many advantages, not the least of which is more systematised and orderly programmes. It also makes possible programmes of a more diversified character appealing to every class of listener. I do not mean by this that a system identical

NEXT WEEK.

## FULL DETAILS OF A TWO-VALVE GRAMOPHONE AMPLIFIER

to that of the B.B.C. would suit the needs of Canada, but I do feel that much could be adapted from British practice which would be of the greatest advantage to the Canadian listener." So somebody thinks the B.B.C. system is right!

## BE "CLUBBY"

HAVE you ever thought of joining a Radio Club? You know, there are plenty of advantages in "getting together" in wireless, and you are almost sure to find a Club somewhere in your locality. There's a good one in Golders Green, for instance. The Golders Green and Hendon Radio and Scientific Society have just changed their headquarters and have moved to Woodstock School, Golders Green Road, a few minutes from Golders Green tube station, where meetings will be held on the second and fourth Thursday of each month at 8.15 p.m. The object of the move is to be in the centre of local activities. An interesting programme has been arranged, which will include visits to Brookmans

Park, the National Physical Laboratories, Teddington, and the Air Port at Croydon.

## CINEMA ORGAN BROADCASTS

MOST listeners appear to like the broadcasting of cinema organ music. Reginald Foort's organ broadcasts from Bournemouth enhanced the reputation which he made among listeners when he presided over the organ at the New Gallery Cinema a year or two ago. Now Mr. Foort moves on to the new Victoria Cinema, from which his first broadcast takes place this week. He designed the organ himself, and he describes it as the instrument of his dreams. It conveys the sounds of motor horns, saxophones, cathedral chimes, carillons, gongs, cycle bells, human voices, or the rushing of express trains. Three manuals can be brought into use by means of what Mr. Foort describes as "second touch." It might not be a bad idea to get Mr. Foort to design a cinema organ specially for broadcasting.

## SPONSORED PROGRAMMES LIKED

AT the time of writing, Irish listeners are experiencing their second week of the sponsored-programme experiment. Dublin and Cork broadcasting stations give one hour per evening to chocolate makers, suitcase makers, billposters, and jam and pickle merchants. In return a sponsored programme is arranged for the mutual benefit of the advertiser and the listener in search of entertainment. Except for one Catholic paper, the Irish press has commented very favourably upon the experiment, which is to continue until November 20. We learn that the 120-kilowatt high-power transmitter will probably be erected in a central position.

From this it would seem that the promoters have an eye on a much bigger audience than is contained in the Free State.

## AMERICA WANTS OUR TALKS

THE B.B.C. has been asked by the Columbia broadcasting system of America for permission to relay two of the talks in the "Science and Religion" series. Sir Arthur Eddington on November 23 and Dean Inge on December 7 are particularly wanted. It may not be generally known that talks have been arranged by Columbia



Mr. Joseph Lewis, who is leaving the Midland Regional area to take an active part in musical direction at Savoy Hill

representatives in London for relay to America through the transatlantic telephone.

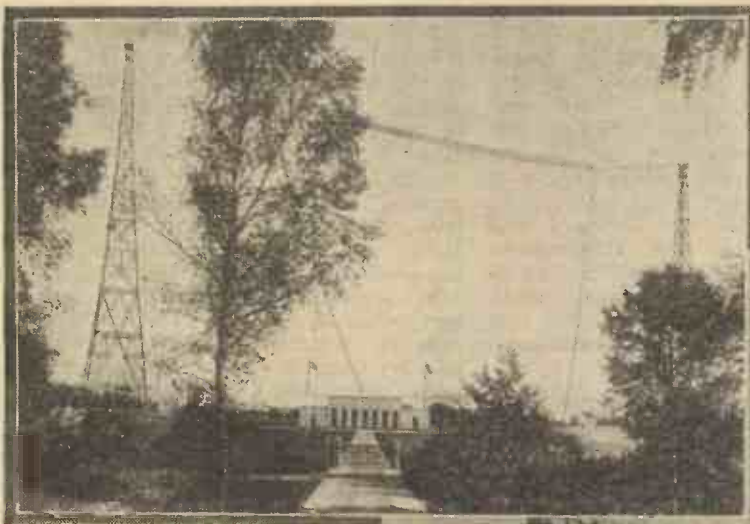
## NATIONAL AND REGIONAL

ACCORDING to B.B.C. engineers, no dislocation has been caused by the modification in the Brookmans Park wavelengths, whereby the 356-metre channel is used for National broadcasting at times when only one transmitter is in use. It is pointed out that every listener can get the

356-metre transmitter, since it is on the old 2LO wavelength. And those who have altered their sets to bring in the 261-metre transmitter lose nothing by the re-arrangement.

## TWIN-STATION CRYSTAL SETS

WE hear so little of crystal sets these days that we are apt to overlook the fact that the Regional Scheme of broadcasting was first conceived for listeners with these simple sets. We are interested to hear that, in connection with the National Institute for the Blind scheme of crystal-set installation, both Regional and National programmes can be clearly received. At Oxford good reception is reported of both stations, which can be separated quite easily.



Two views of a well-known long-waver—Motala. You can hear this station any evening on 1,348 metres, and it comes through well, having a power of 40 kilowatts. The aerials, station building and control room are seen here





# AN IDEAL GRAMOPHONE AMPLIFIER



The amplifier and case—the complete instrument is shown in the rear

THERE are many readers who want to get really great volume from a wireless set or a gramophone pick-up for some special purpose, such as radio dancing at home or for broadcast music in a small public-hall.

Provided the amplifier is made up properly it is entirely reliable, and, working from A.C. mains, does not need any careful adjustment of battery values and so on.

An accompanying panel shows the makes and types of the most important components used in the various parts

of the circuit; small parts, such as terminals and valve holders, are not mentioned.

Starting at the input side of the circuit, the microphone transformer is optional and is needed only if the amplifier is to be used for public-address work. The "mike" transformer should be purchased complete

with the microphone. It will usually have a ratio of 40 or 50 to 1, but this will depend entirely on the microphone used. The scratch filter used for gramophone work is a special Wearite component.

Note the way in which the first low frequency stage is decoupled with a stabil-

## COMPONENTS FOR THE AMPLIFIER

Mains transformer (Parmeko), with secondaries for 450-0-450, 7.5, 5.5 and 4 volts

Push-pull input and output transformers (Varley DP6 and DP7, Ferranti)

Smoother choke (Ferranti B2, Varley, Parmeko, R.I.)

Scratch filter (Wearite)

Grid bias resistances, first and second stage, 1,000-ohms (Claude Lyons)

Grid bias rheostat for push-pull stage (Clarostat power, low-range 50-250 ohms, 40-watt: Regentstat)

Microphone and microphone transformer (Ediswan, Rothermel, Igranite)

Anode resistances, wire-wound, (Varley power type, Ferranti, R.I.)

Volume control resistance (Rotor Electric, Regentstat, Igranite)

One 30-ohm Humdinger (Claude Lyons)

One .01-mfd. mica-dielectric condenser (T.C.C.)

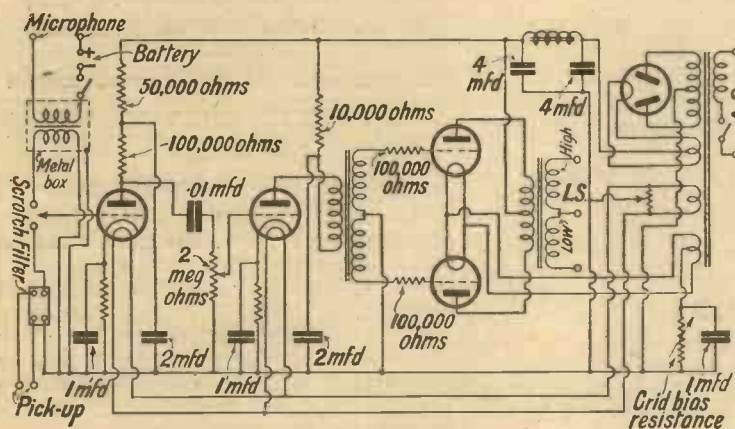
Two 4-mfd. paper-dielectric condensers, 1,000-volt test (T.C.C.)

Two 2-mfd. and three 1-mfd. paper-dielectric condensers, 400-volt test (T.C.C.)

Two 5-pin and three 4-pin valve-holders (Lotus, W.B.)

Two 100,000-ohm grid-leaks for push-pull stage (Lissen, Ediswan, Graham-Farish)

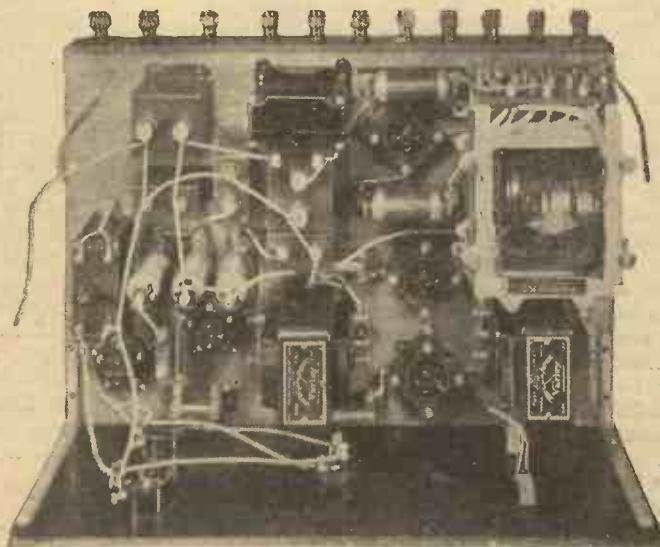
Valves, (first stage, MHL4; second stage, ML4: push-pull, 2 LS5A's: rectifier, U8)



The circuit of the amplifier

An amplifier entirely suitable for this work is that which has been made up for use in the AMATEUR WIRELESS laboratory for test purposes. A brief reference to this was made in "A.W." No. 430, in an article "The Art of Using a Pick-up," which explained how to adapt a set for gramophone working. As many readers have asked for further details, these are given below.

The circuit of this amplifier is shown herewith, and experienced amateurs should have no difficulty in making up the amplifier from this diagram. It must be understood that no wiring plan is available because, obviously, the construction of the amplifier would be beyond those who are not capable of obtaining the particulars from the circuit and details given here.



The layout will be apparent from this plan view

ing resistance of 50,000 ohms, the anode resistance having a value of 100,000 ohms. Wire-wound components should be used.

The push-pull coupling is on quite straightforward lines, the stage preceding the push-pull coupling being decoupled with a 10,000-ohm resistance and a 2-mfd. condenser. There are stabilising resistances in the grid circuit of the push-pull valves; these are of 100,000 ohms. Varley DP6 and DP7 push-pull transformers are used, and both high- and low-impedance outputs are available.

Grid bias is obtained automatically by means of dropping resistances, the values of these for the first and second stages being 1,000 ohms. The grid-bias resistance for the push-pull stage is a low-range 40-watt Clarostat (power type).

A single mains transformer is used which delivers 450-0-450-volts, 7.5, 5.5 and 4 volts. This is a Parmeko component.

So far as valves are concerned, an Osram MHL4 is used in the first stage, an Osram ML4 in the (Continued in 3rd col. of next page)



# BERLIN'S NEW "BROADCASTING HOUSE"

BERLIN has beaten London by a short head in the race to get a new broadcasting headquarters complete on time. The new Berlin "Funkhaus," representing

the central portion of the two sides can also be used for broadcasting.

The building covers an area of 24,500 sq. ft., and by reason of its size is one of the new landmarks of Berlin. It is conveniently situated near the artistic centre of the city—an important thing to be considered, as the designers of our Broadcasting House had to bear in mind when they chose Portland Place as a site.

The whole business of broadcasting is carried on at this new "Funkhaus," and apart from the studios and office buildings, there is a museum devoted chiefly to radio technical apparatus and a large laboratory where much research work for the R.R.G. is carried out.

In the district which the R.R.G. has chosen for the new building there is room for de-

velopment should this be necessary in later years, whereas with our broadcasting House there is little space to spare in the Portland Place district of the West End of London.

## Studio Arrangements

Comparison between the internal arrangements of this building with those of the B.B.C.'s building is interesting, particularly as the B.B.C. places a deal of importance on its central control tower. The studios are arranged in the centre portion of the building, with sound-proof linings, and although there is no control tower equivalent to that designed for our Broadcasting House, there is a deep well running through the centre of the main studios (as in many American studios), and through the glass-lined windows of these the activities in each of the studios can be seen from a gallery above.

The larger studios have ante-rooms attached, similar to the B.B.C.'s silence cabinets. It is understood that some of these will be used later for housing television apparatus, which can thus be connected easily with the adjacent studios for use when the R.R.G. undertakes television broadcasts on a more organised basis than at present.

Berlin's Broadcasting House is now complete and is in operation, and the staff is being transferred from the other buildings in the various parts of the capital. It would appear that another twelve months must elapse before the B.B.C.'s new headquarters are complete.



A bird's-eye view of the new building taken from the top of the aerial mast adjacent. The futuristic architectural design is striking

the combined efforts of the Reichs-Rundfunk-Gesellschaft and of the Funk-Stunde, is situated in Charlottenburg, away from the centre of Berlin and adjoining the well-known grounds of the Berlin Exhibition.

## A Huge Building

In size the Berlin building is superior to the B.B.C.'s Broadcasting House now in course of erection. It is very much larger, having a frontage of about 500 ft., and, with five stories, is roughly 66 ft. in height. The entire building is of iron and stone construction and in the side portions, where some of the studios are situated, special arrangements have been made to render these completely sound proof.

As seen in plan, and as you can see from the accompanying bird's-eye view, the building is roughly triangular in shape with a central portion running from the apex of the triangle through to the base. The design is rather futuristic.

## An Open-air Studio

The centre building contains the main studios and their accompanying ante-rooms and control rooms. The top of the central portion is a flat roof and here it is intended to give open-air concerts. Many items, military bands, for example, sound better in the open air, where acoustic problems of studios have not to be considered.

Part of the studio accommodation in this new building is for the Deutsche Welle, and one main and two smaller studios are set aside for the transmissions of this organisation. Covered courtyards situated between



There is a "well" running down between the main studios, as in many American stations

## "AN IDEAL GRAMOPHONE AMPLIFIER"

(Continued from preceding page)

second, and two battery valves, LS5A's, in the push-pull stage. The rectifier is a U8 valve. The smoothing choke is a Ferranti type B2, and this has 4-mfd. condensers placed on each side.

When making up the amplifier allow plenty of baseboard space, for it is easy to get L.F. interaction if the parts are crowded together. A good plan is to use an elevated baseboard so that the major parts may be placed on top of the decoupling resistances and condensers for each stage underneath. This is the layout which has been adopted in the AMATEUR WIRELESS amplifier. The small controls, such as the mains on-off switch and the volume control, are on the panel.

Wiring should be carried out with bare wire in lengths of insulated sleeving and the baseboard layout should follow as nearly as possible the arrangement of the theoretical circuit diagram. No attempt should be made to crowd the first two stages close to the push-pull stages or the rectifier arrangements.

An amplifier made up exactly on these lines, and using the valves and power transformer specified, will deliver sufficient undistorted power to work several moving-coil speakers, such as the Ediswan R.K. Senior, etc.

John Masefield's great tragedy, *Pompey the Great*, will be revived through the National transmitters on November 7.



# MAKING THE MOST OF A TRANSPORTABLE

If you are not satisfied with the reception from your transportable, or if the running costs are high, then you will be interested in this practical article by KENNETH ULLYETT, in which some useful ideas are given.



"IT'S all very well for you to say that wireless doesn't cost anything," said a friend to me the other day. "You people who work your sets from the mains can reckon that reception costs only the solitary ten shillings a year for the licence; but with me, it is different. I have a transportable, you know, and I find that I have to buy at least four high-tension batteries every year."

"But you have the mains," I said.

"Yes: but, as I say, my set is a transportable—which rather cuts out the possibility of using mains, doesn't it?"

This seemed to open up so many possibilities of improvement that we fell a-talking about getting better reception from transportables. The set under discussion was a five-valver, and the makers of it optimistically claimed that the high-tension consumption was only 10-milli-amperes. A quick test with a milliammeter in the negative high-tension lead showed that the amount of current being taken from a very much overworked standard capacity battery was 16 milliamperes.

The causes were two, namely, the slight softening of the power valve with age and the consequent increase in the high-tension current it consumed; and also the deterioration of the 9-volt bias battery, the maximum of which had dropped to a practically immeasurable value on my pocket meter.

cently been fitted, I knew that it was doomed to an early death.

Two suggestions I made were to fit a new and larger grid-bias battery (there was room for a 16-volt battery, and about 12 volts of this could have been used with advantage) and to fit a very much larger high-tension battery as soon as the existing one ran out.

"But, you see," said the set owner, "there is not room for a larger battery. The man at our local wireless shop told me some time ago that I should fit a double-capacity battery, but as you see, there isn't room in the set for one."

## The Question of Current Supply

At considerable length I explained that a double- or even triple-capacity battery could be hidden away underneath the table upon which the set stood, and that lengths of flex could connect up to this from the high-tension terminals of the set. It is surprising how many people seem to think that an external high-tension battery cannot be fitted.

"Anyway," I said, "why go to the trouble of persevering with dry high-tension batteries when you have the mains supply 'on tap.' For the amount which you would expend on high tension over a couple of years you could buy one of the new portable-set type mains eliminators. This would fit in the battery compartment, and then your high-tension costs would be reduced practically to nothing, for the mains current consumption is so small."

This suggestion met with a deal of surprise and further explanation was needed to show how one of the many portable high-tension units could be fitted in the battery compartment.

"Furthermore," I said, "you can buy a trickle-charging model and keep the accumulator up to tip-top condition without having to run it to the

charging station every fortnight or so."

"There is just one point, as I cannot be here to see you install it yourself: you may find that when it is placed in one position in the battery compartment a certain amount of hum may be introduced in the set, due to the stray magnetic field set up by the transformer and choke in the eliminator. If you place the eliminator on its side you may find that this cuts out



The tapping to the frame aerial—seen in the centre—enables an external aerial to be used without impairing selectivity

much of the hum. Another way of curing the hum is to use an earth connection, but perhaps you have an earth already."

"Oh no," was the reply, "the set has a frame aerial."

Then explanation was needed of the way in which an earth connection can be added to practically every portable or



A large high-tension battery can be accommodated outside the set, and will give economical working

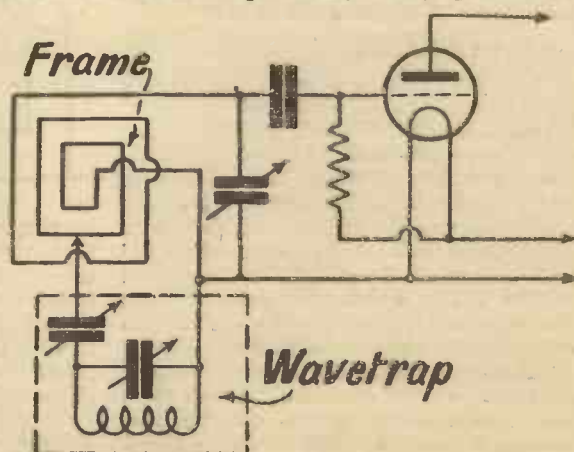


Fig. 1.—The connections for a simple wavetraps which can be added to most transportable sets. It is described in the accompanying article



# For the Newcomer to Wireless: GRID BIAS

WILL you please tell me why grid bias is used in wireless sets?

We will think, first of all, of a low-frequency amplifier, such as the output valve of the set. Just what has this valve to do?

I suppose that it receives fairly powerful impulses on its grid and reproduces these in magnified form in its plate circuit.

You have put it in a nutshell. The great thing to remember is that the impulses reaching the grid of a low-frequency valve are pretty big. Now supposing that we didn't use any grid bias, the grid would be at zero potential, wouldn't it? In other words, it would be at the same potential as the negative end of the filament.

Yes, I follow that.

Very well, then. In comes an audio-frequency impulse, which we may regard as consisting of a positive crest and a negative trough. If the grid was at zero before the impulse arrived you will agree that the crest of the wave must make it positive.

Yes, that's clear.

Now think what happens. The filament of the valve is throwing off elec-

trons which are strongly attracted by anything within the bulb that is at a positive potential.

I see. Then they are attracted by both the grid and the plate?

That's just it and the result is that instead of the whole stream going to the plate, as it should, part of it is diverted by the grid, returning to earth by the filament circuit. If you think it out you will see that it means that whenever the grid goes positive there is a reduction in the proportion of the electrons that go to the plate and this means that the plate-circuit fluctuations are not quite a faithful copy of those in the grid circuit.

That, of course, would introduce distortion, wouldn't it?

It would; in fact, it often does in sets that are not properly biased.

Then just what does grid biasing mean?

By means of a grid-bias battery you set the grid at a strongish negative potential. What happens now is that a negative half wave reaching the grid makes it still more negative, whilst a positive half wave, if the bias is properly arranged and the valve is up to its job, can never make the grid actually posi-

tive.

Then there is no starvation of the plate, and no distortion?

You have hit it exactly. The main purpose of grid bias is to prevent distortion by preventing the grid from ever becoming positive. It has, too, a secondary and very useful purpose.

And that is?

By making the grid negative we cut down the high-tension current and, therefore, save the high-tension battery.

What about H.F. valves?

Here the impulses reaching the grid are usually very tiny, but it is just as well to use grid bias if we can to prevent any flow of grid current.

What effect does grid current have on H.F. valves?

It introduces damping and is, therefore, fatal to selectivity. We used to hold down H.F. amplifiers by making their grids positive and deliberately damping the circuits. Modern circuits incorporate either the neutralising principle or the screen-grid valve and damping is not necessary. Therefore H.F. valves can always be given a negative bias, which improves the selectivity and again saves the high-tension battery.

## "MAKING THE MOST OF A TRANSPORTABLE"

(Continued from preceding page)

transportable set by taking the lead to the negative low-tension or high-tension terminal.

"And while you are fitting an earth," I said, "it might be worth while trying an external aerial."

A length of flex was obtained, untwisted into its separate lengths of rubber-covered wire and hidden along the top of the picture rail of the room in which the set was installed.

The far end of the wire was left free, of course, and the down lead was taken to a point on the frame aerial which I chose at random, and to which connection was made simply by baring one of the frame aerial wires for about half an inch and twisting the down lead end round it.

### An External Aerial

"Can you add an external aerial to every portable set?" asked my friend.

I pointed out that where separate tuning controls are provided for the frame aerial and high-frequency stages then it is safe to add an aerial, because although this makes a difference to the tuning, this difference can be corrected. With sets in which the H.F. and frame aerial circuits are ganged it is not always wise to add an aerial unless the ganging can be reset—not a job everyone may care to undertake.

"Tuning is rather broad, even without the aerial, isn't it?" he said. "I wish there were a good way of cutting out the local station. Even by turning the frame round I do not find that it makes much difference. Is it possible to fit a wavetrap?"

On a piece of paper I sketched out the circuit shown in the diagram, Fig. 1.

"The little coil and condenser," I explained, "make up the wavetrap. One side of the trap is connected to low-tension and high-tension negative, and the other side is taken through a variable condenser (which can be .0003 maximum pre-set condenser) to an intermediate point on the frame aerial, just as I have done when trying out an external aerial on your set.

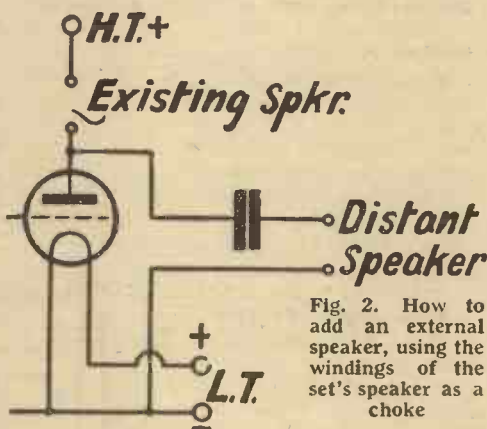


Fig. 2. How to add an external speaker, using the windings of the set's speaker as a choke

If you make up the wavetrap yourself then you can use a pre-set condenser for tuning the trap coil. By changing the value of the pre-set coupling condenser (not the condenser across the wavetrap coil) and by changing the tapping point on the frame aerial you can control the selectivity of the wavetrap.

"A difficulty that I foresee," said my friend, "if I fit a mains unit, is that the set ceases to be a portable and I shall have to work it only in this one room. The mains

points in the other rooms are already occupied with radiators."

"Then why not leave the set where it is," I suggested, "and make provision for an external speaker on an extended lead?"

### Using Two Speakers

"There are several ways of doing this. One, of course, is to disconnect the two wires going to the speaker in the set and take them to a couple of sockets at the side of the cabinet. The speaker in the set should have a length of flex connected to its terminals and a plug on the external speaker should be similarly fitted up and then at will you may plug in one or the other.

"A disadvantage of this is that both speakers have the high-tension current running through them, and with an extended speaker and with the set working from the mains, this may be dangerous, for the extended leads will be at a high voltage above earth. If you do not object to the set's speaker working at the same time as the external speaker, then you can get over this trouble by rigging up a simple choke output circuit, and using the windings of the set's speaker as the choke."

I sketched out the scheme of connections as shown by Fig. 2.

"The only additional piece of apparatus you will need," I said, "is a 2-microfarad fixed condenser, capable of standing up to the mains voltage. With this arrangement the extended leads are entirely insulated from the high-tension voltage and there will never be any danger of getting a shock from the speaker in the other room."

These ideas are worth putting into practice in many portables and transportables.



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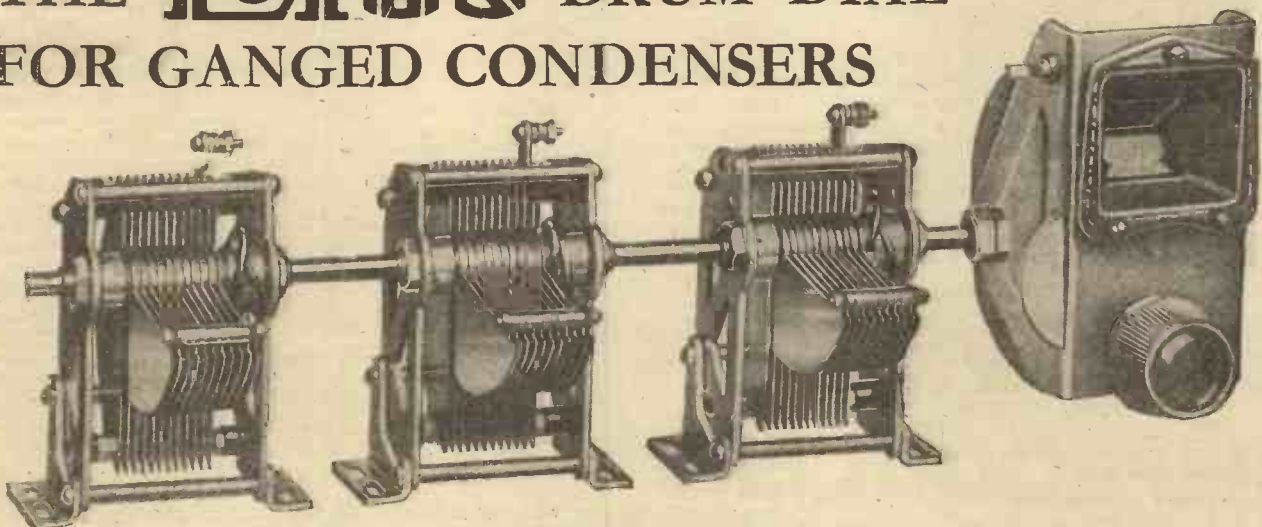
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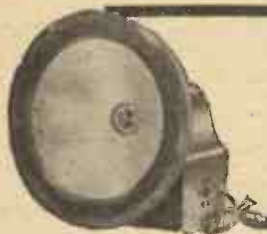
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# On Your Wavelength!

## A WONDERFUL RELAY

WE are rapidly drawing nearer and nearer to the time when it will be possible for one human being to be able to speak to the entire world. On October 27 the greatest relay ever attempted by wireless was made with great success. All over Europe, Asia, and America were relayed the speeches of the British Prime Minister, the American President, and the Prime Minister of Japan. Each of these spoke from his own capital—Mr. Ramsay MacDonald from London, Mr. Hoover from Washington and Mr. Hamaguchi from Tokio. It was an amazing piece of organisation. The Japanese Prime Minister's speech, for example, was broadcast from the Japanese stations and picked up in America by the Pacific short-wave link. Thence it was passed on to the U.S.A. broadcasting chains and to the transatlantic telephone service for transmission to this country. The same links, but running in the opposite direction, were used for Mr. Ramsay MacDonald and for President Hoover. Perhaps the most surprising part of the relay was the extraordinary good quality which was obtained from Tokio.

## THE FUTURE

THIS great relay has shown what wireless can do in the matter of spanning distance and even of time—there was a time difference of about 15 hours over the three continents which participated. It will not, I think, be long before some great singer or instrumentalist gives a world broadcast. It could be done quite easily, and it would be an epoch-making event. Suppose, for example, that Galli-Curci was billed to sing to the world from the Albert Hall. The B.B.C.'s normal outside broadcast arrangements would, of course, provide reception in this country. A further transmission would be made to Rugby, whence it would be relayed by means of the existing wireless links to Australia, India, Canada, South Africa, and the United States. By short-wave transmission or by land line and cable, P.C.J. would be connected up to relay to Bandoeng, whence the transmission could be passed on to the whole of the Far East. At the same time the European land lines would convey it to big broadcasting centres in every country of the Old World for relaying. In this way the great singer's voice would be heard in every civilised country in the world, and her audience would probably run to hundreds of millions.

## A BIT OF A PROBLEM

A MATTER that is seriously worrying the B.B.C. people just now is the disappointing service area of the Brookman's Park National transmitter. They pushed up the power to 68 kilowatts, but still it fails to provide a reliable service over anything like the radius that it should. In some localities signal strength is poor, and rather farther afield bad fading is the rule rather than the exception. The trouble is,

of course, the short wavelength, and short wavelengths do not seem to fit in with high power. It seems as if the station with its present wavelength might be something of a white elephant, for it is actually far more "regional" in its service than is the London Regional working on 356.3 metres.

## WHAT IS TO HAPPEN?

A NATIONAL transmitter giving an unreliable service to a comparatively small area is clearly absurd. An attempt has been made recently to overcome the difficulty to some extent by sending out parts of the National programmes from the London Regional transmitter, but this is clearly not very satisfactory. We who live in the wipe-out area of "Noisy Nat" might suffer in silence if we felt that hundreds of thousands of others benefited though we were swamped. As it is, we have rather the feeling that we are getting all the kicks whilst no one gets the halfpence. Other problems of a similar nature are likely to arise when further twin super-power stations come into operation, for several of the wavelengths available are on the short side. Those that are allotted to Great Britain include 301 metres, now used by Aberdeen; 288.5, used by most of the relays; 242 metres, used by Belfast; and 200 metres, used by Leeds. It seems, on the face of it, quite likely that most of these will be found not too suitable for high-power broadcasting.

## WHAT ABOUT IT?

IF five out of the ten wavelengths assigned to this country don't fit in with high-power broadcasting it rather seems that the Regional Scheme might find its style, so to speak, a bit cramped. It is no use building enormously expensive transmitters and pushing their power up and up and up if you cannot make them deliver the goods. Myself, I think it would be best to make it a rule that for each twin station the longest wavelength available should be assigned to the National transmitter. In the natural order of things this wavelength will carry the best programme, and will therefore appeal to the widest circle of listeners. A shorter wavelength could be devoted to the Regional programme. I am wondering, though, whether there is not some little snag concerning broadcasting below about 300 metres that is baffling our people.

On the Continent it seems to be generally recognised that medium-powered stations do best on the shorter wavelengths. The only European super-power transmitter working anywhere near them is Bordeaux Lafayette on 304 metres with 35 kilowatts. Of other short-wave stations, Vibourg on 291 metres, with a rating of 15 kilowatts, has a very disappointing range, and the same is true of the 15-kilowatt Hörby and of Helsingfors with similar power. On the other hand, the 14-kilowatt Bratislava and the 11-kilowatt Moravska-Ostrava are both pretty well heard at times. Curiously enough, of the shorter wave stations those with the best range appear to be using

quite moderate power. Nürnberg and Cologne, for instance, generally come in amazingly well, though the power of the former is only 2.3 kilowatts and that of the latter 1.7 kilowatts. Turin, with his modest 8.5 kilowatts, is a marvellous transmission, whilst Gleiwitz with 5.6 kilowatts, Leipzig with 2.3 kilowatts, and even Kiel with .3 kilowatts, all have splendid ranges.

## FRAME MOUNTING

HEAPS of us use home-made frame aërials which are satisfactory in most respects but when we come to construct them we are apt to find ourselves up against a rather thorny problem in the matter of pivoting arrangements, and the connections between the frame itself and the terminals of the set. What many people do is to stick a couple of terminals (or three if a centre tapping is required) on a small piece of ebonite attached to the upright member of the cross piece. To these are attached flex leads which run to the terminals of the set. The drawback here is that as you turn the frame the leads wind themselves round the upright.

## A SOLUTION

I HAVE just made a frame with which I am very pleased. My solution of the pivoting problem kills two birds with one half-brick, and readers will find it useful. To the upright member of the cross piece I fixed a good quality plug by means of strips of ebonite. If you use a flat plug there is no difficulty about making it a tight and rigid fit. The "in" and "out" ends of the windings go respectively to the sleeve and tip of the plug. The stand of the frame consists of a box with an ebonite top on which are mounted a good strong jack and a couple of terminals. The jack is of the single open-circuit type, one contact being wired to each terminal. Simply stick the plug on the end of your frame into the jack on the box and you have a pivot which works well and automatically connects the windings to the terminals on the stand. Leads are taken from the latter to the terminals of the set, and you can turn the frame as much as you like without affecting them. Unless, though, you are very careful about the jack selected, you may find that the spring which makes contact with the point of the plug is too weak to ensure a good connection as the aerial is rotated. There are heavy-duty jacks specially made for the purpose, and these are excellent.

## STATIC POTENTIALS

A CORRESPONDENT sends me the following ingenious theory of what he regards as an unsuspected danger to airships of the size of the ill-fated R101. It is well known, he argues, that the electric potential of the atmosphere is by no means evenly distributed. In the first place there is a more or less definite potential-gradient as one moves vertically upwards from the earth's surface. This is often manifested by a steady hiss heard in



## On Your Wavelength! (continued)

the phones of a wireless receiver as the aerial wire discharges the potential difference across its ends. Sometimes, in thundery weather, the aerial discharge current becomes so heavy that a stream of sparks will pass between the plates of a series condenser, accompanied by a sharp crackling noise. In the second place, areas of unequal electrical pressure certainly exist in the higher regions of the atmosphere, particularly in the vicinity of clouds. When the concentrated charge exceeds a certain voltage it discharges itself in the form of lightning.

### A PERIL OF THE ETHER

WE have now, he continues, started to launch huge airships, built up around a metallic framework, into a region which is, in effect, full of uncharted electrical dangers. A metal structure of girders and stays, over 700 feet in length, and insulated from earth, must inevitably encounter large potential differences as it moves from point to point through the air. In these circumstances, changing currents will be induced which may well spark across an imperfect contact in the framework and so cause disaster in an atmosphere containing explosive gas.

This certainly seems rather alarming, but I fancy the designers of such craft must be well aware of the danger from atmospheric "static," and will have taken suitable precautions, for instance by carefully bonding all joints in the metalwork, to prevent "sparking."

### REPRODUCTION AND DISTANCE

I WAS at a trade show the other night of a new picture produced at Elstree, and for the first time in my life I saw a picture from the front row of the stalls of an ordinary theatre. From the visual point of view the effect was, perhaps, a little bewildering at first. Whenever the camera was "panoramed" around, the effect was somewhat similar to that experience when taking off in an aeroplane. The various objects and people moved by with dazzling rapidity. Farther back in the auditorium, of course, this effect is not noticed.

The point which impressed me particularly, however, was in connection with the sound reproduction, for, of course, the picture was a talkie. I was quite prepared to find the reproduction unpleasantly loud, but, to my surprise, I found it very much the reverse. In fact, it started off so softly, I thought for one moment that the apparatus was not functioning correctly; yet as the picture proceeded no difference was noticeable in the strength. But apparently there was no difficulty in hearing all over the theatre, which goes to show that filling a large theatre is not so much a matter of enormous volume as purity of reproduction and correct attention to the acoustics of the hall. One of the tests I always put on loud-speakers myself is to see how intelligible the speech is a considerable distance away. If there is any distortion present there is a muffling of the sound reproduced, and no increase in the volume will render it any more easily understood.

### STEERING BY WIRELESS

SPEAKING recently at Leeds, Rear-Admiral Blount referred to the small radio-controlled launches used during the war by the Germans off the Belgian coast. These craft were loaded up with a cargo of gun-cotton and then steered by wireless from the shore, with the idea of ramming their victim amidships. Of course, they carried no crew. The steering gear was normally set to give a straight course, but was swung to port or starboard by means of two tuned relays energised by radiation from the shore transmitter. A wavelength of say, 500 metres closed the port relay. During "no signal" intervals, the steering reverted to normal, whilst a wavelength of 1,000 metres brought the starboard relay into operation. This kind of thing, which looks simple enough on paper, is apt to prove quite another matter in practice, and I don't think these "engines of destruction" ever did much real damage or proved to be worth their salt. For one thing, effective control is limited to a comparative short range. Then, if the other side happens to be fitted with wireless, it is easy for them to "jam" the controls and so leave the craft an easy target for gun-fire. Given a sufficiently powerful wireless transmitter, one could even take charge of the steering gear and send the thing back to "hoist the enemy with his own petard."

### AT LONG LAST

OLD readers of AMATEUR WIRELESS will remember that many years ago I suggested that the time was ripe for the introduction by manufacturers of valves designed specially for the function of rectification. The detector, when you come to think of it, is a very curiously placed valve, for it has remarkably complex duties to perform. First of all, it has to convert high-frequency impulses into audio-frequencies; secondly, it has to magnify at high-frequency; thirdly, it has often to be worked much closer to the point of oscillation than any other valve in the set. It is simply no good telling me that a good medium-impedance valve suitable for H.F. amplification purposes is the ideal detector. Should you do so, reader dear, I will merely open the lid of your cabinet and flip your detector valve with my dainty finger-nail. And in nearly

every case your loud-speaker will respond with a mighty pong. Most of us have experienced microphonic troubles at one time or another.

### WHAT IS WANTED

SOMETIMES pongs occur only when the set receives knocks that really should not come its way; sometimes they happen when you walk across the room; in extreme cases the jolly little business known as singing round the ring takes place. This means that vibrations from the loud-speaker set the detector vibrating and that a howl builds up. Clearly, then, the detector should be as nearly non-microphonic as makes no matter if it is to be of real use. Next, it is important that, if it is to be used as an anode-bender, it should have a very pronounced curl at the lower end of its curve and that it should be capable of offering a decent straight-line portion to what we may call the positive halves of incoming waves. For grid-leak-and-condenser purposes its grid-current curve must be just so. Last, but by no means least, it must enable its user to obtain perfectly smooth reaction effects. And I have always maintained that none but a valve specially designed for the purpose could do all of these things as they really should be done.

### BUT LET ME HAVE ONE GROUSE

I HAVE one little grouse that I really cannot help ventilating, for I think that it is a matter which requires attention. Nothing is more annoying than to see an advertised component which is obviously good and has received excellent test reports and then to find, on ordering it, that it is unobtainable and that delivery cannot be promised within any definite time. This kind of thing does occur rather too often, and the sooner it comes to an end the better I, and countless others, will be pleased. I know, of course, how it comes about. Some manufacturer of a rather nervous disposition evolves a really good component. He has not the courage to put it into extensive production right away, but resolves to go gently until returns from advertisements begin to show whether it is likely to be a success or not. Often the thing is a run-away success. Orders amounting to thousands pour in and existing stocks are sold out in a few days. Since no machinery has been installed in the factory for coping with such a demand, the maker does not know where to turn.

A little more vision is, I think, required. If I were a manufacturer and got hold of what I believed was a bright idea, I would send my component out for test, and if the test reports were enthusiastic I would have everything ready for big production when I launched my advertising campaign. I am sure that everyone would benefit if something of the kind were done. The maker who achieves a big paper success but cannot supply the demand does himself a lot of harm, for disappointed customers remember the old proverb, "Once bitten, twice shy," when another component of his comes along.

THERMION.

### DO YOU KNOW—

that in your new short-waver you might try a .0001-mfd. grid condenser and a 3- or 5-megohm grid leak, the lower end of which should be taken to the arm of a potentiometer connected across the low-tension supply? This gives a very nice control of reaction.

that with most pick-ups a negative bias of 1½-volts is advisable on the grid of the first valve? The average pick-up delivers about 1-volt maximum, although some develop a considerably greater voltage, and adequate bias is needed to prevent overloading the first amplification stage. If your pick-up quality is not all that it might be, then try increasing the bias.



# HIGH QUALITY WITH LOW H.T.

*It is generally imagined that first-class quality demands very high H.T. voltages. There is, however, a method of obtaining quality with comparatively low voltages, as Alan Hunter explains in this article*

TO achieve better quality of reproduction, power valves used to be connected in parallel; grid to grid, anode to anode, and filament to filament. That was before really good power valves were available. Yet the notion must still prevail that two power valves in parallel are an advantage. An amateur friend of mine was quite surprised when I recently condemned his output stage. He had two P215 2-volt power valves in parallel, with 150 volts high-tension supply, as in Fig. 1.

When asked the reason for this arrangement, he said he thought it contributed to the cause of good quality. We can see what this misguided amateur was doing by comparing the characteristics of his paralleled P215 valves with the characteristics

valves increases the permissible grid voltage swing.

Just as the grid swing of two paralleled valves of similar characteristics is no greater than for one of them, so the anode voltage must remain the same for both as for one. To increase the anode voltage of paralleled valves beyond the maker's rating has the same effect as upon one of them—the filament emission is quickly ruined.

At the back of these ideas of using two power valves instead of one is a sound enough theory—that one power valve cannot always effectively deal with the signal handed on by the preceding stages. Every listener knows of sets that behave perfectly until the orchestra reaches a

more important is the fact that the grid swing of push-pull valves is double that of either used separately.

## Grid Swing

There is no magic in grid swing. If we can get the required power with a small grid swing so much the more efficient is the power valve. But with this proviso, namely that grid swing in itself is no aim, there is still a lot in favour of providing facilities for as great a grid voltage swing as possible. For then the peaks of reception—those passages that cause the average set to wince!—can be handled without strain.

Overloading, or exceeding the permissible voltage on the grid of the output valve, is a much more common fault than

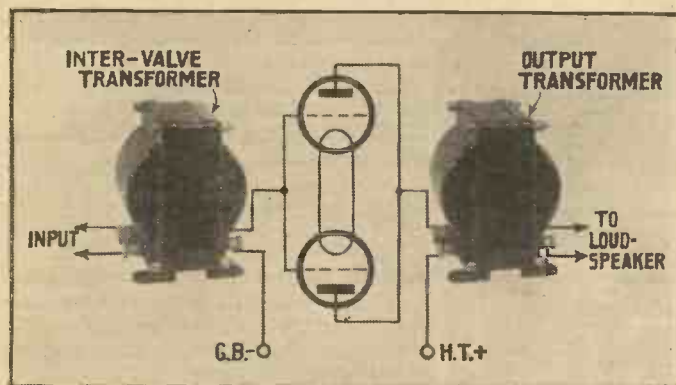


Fig. 1. This pictorial diagram shows the arrangement of two power valves connected in parallel

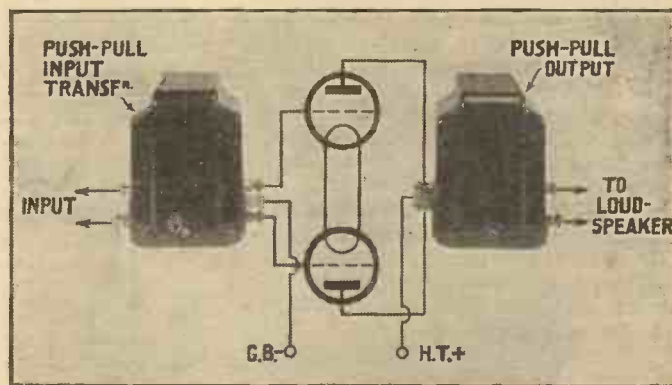


Fig. 2. Here is a better system with valves connected in push-pull, which allows of using a lower H.T. voltage

of the new P2 power valve. Here are the essentials:—

Valves.	Impedance.	Amplification.	H.T.	Grid Bias.
P215's	2,500 ohms.	7	150	12
P2	2,300 "	6.5	150	10.5

The P215's singly have impedances of 5,000 ohms, which is halved when they are in parallel. What advantage is there in the paralleled P215's? I can see none. The amplification factor is no greater than the P2 alone. The grid swing of the P215's is hardly any greater than the P2. The impedances are also similar. When valves are in parallel the input voltage is applied equally to the two grids. So the grid swing of the pair is the same as for one. The pair will overload just as easily as one.

## Effect of Paralleling

The only effect of paralleling is to halve the impedance, but that is done more conveniently in the P2, by slightly increasing the filament consumption. In fact, the make-shift arrangement of paralleled valves is now no longer necessary. Modern power valves used singly have the low impedance that was the only advantage of paralleled valves. But it is extraordinary how the idea persists that paralleling

crescendo part of the score, when terrible "blasting" occurs. The trouble with the average set is its inability to handle the peaks of radio reception.

Most sets are worked up to the limit of their power-handling capabilities, so that when an extra strain is put upon them the quality breaks down. My previous mention of modern power valves reminds me that if one has enough "juice," even this general short-coming of reception can be remedied. Experience bears out the axiom that good quality with a single power valve is not possible with less than 300 or 400 volts.

That sounds fairly impracticable for the average amateur, but where there is a will there is a way. And the way is push-pull, a logical method of using pairs of power valves. Two valves of similar characteristics connected in push-pull, as shown by Fig. 2, provide scope for good quality and with low high-tension supplies.

There is a world of difference between paralleled and push-pulled valves. For one thing the impedances of push-pull valves are in series. So in push-pull two 2,300-ohm valves, P2's for example, would have an impedance with respect to the loud-speaker of 4,600 ohms. That point is important when the question of matching the loud-speaker is considered, but still

many are prepared to admit. Those who do admit the fault go to push-pull, unless they have sufficient high-tension voltage to work a really large power valve.

The amateur, forced to use batteries, naturally shies at much more than 120 volts, owing to the big increase in the current drain on the battery. But, assuming he will go to 150 volts, two P2's in push-pull will provide a grid swing of over 20 volts. This compares very favourably with the 24 volts grid swing of a P625, needing 250 volts on the anode.

## Push-pull

Those going in for radio gramophones would do well to remember push-pull. In gramophone reproduction, more than in radio, the way "blasting" occurs during loud passages is positively heart-rending. If push-pull appeals to the battery user, it should appeal no less to those with an electric-light supply. Large 400-volt power valves could be used in the home-builder's radio gramophone, but why go to all the expense of high-voltage smoothing apparatus when two 250-volt power valves in push-pull will do the trick equally well.

One of the biggest fallacies about push-pull is the theory that for distortionless reproduction both the push-pull valves

(Continued in third column of next page)





# IN MY WIRELESS DEN

WEEKLY TIPS—  
CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

## Microphonic Screen Grids

HAVE you ever had a microphonic screen-grid valve? I had one in a set last week and a fine noise it caused, too. There must have been a bad weld somewhere.

It could not be seen, of course, but the poor contact was there all right and there was nothing which could be tried to remove it. Generally, we go straight to the detector when a noise starts, but here is an instance of the screen-grid valve being the faulty one.

## Stray Sounds

Some stray microphonic noises are difficult to trace, being due to an intermittent disconnection somewhere in the set. A dry joint is often surprisingly hard to locate. The best plan is to test each joint by starting it with a pair of pliers. Sometimes it is a component that is faulty, the poor contact being between the terminal and the part itself. An example is certain types of valve holders, which seem especially troublesome.

## Mains-unit Matters

A point which is sometimes overlooked when fitting a filter to a rectifier, whether valve or metal, is that the size of the condenser connected directly across the rectifier puts a limit on the maximum safe rectified current.

The larger the condenser is made, and the actual output from the unit remaining constant, the greater is the loading of the rectifier.

A usual value is 4 microfarads. If, for the purpose of obtaining perfectly quiet reception, the condenser is increased in size to say, 8 microfarads, the loading of the rectifier has also been increased and, therefore, its heating.

It may or may not stand the extra load. The point is that we should note the effect of the condenser and be ready to reduce the output if necessary.

## Soft Valves

Have you ever had a really soft valve? I was trying a set the other day with new valves and found that the power valve was "blue glowing."

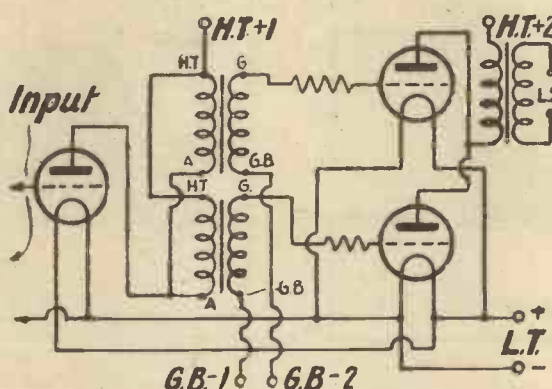
Out of curiosity I measured the anode current which was passing, and found it to be well over 50 milliamperes. The battery, a super-capacity type, would soon have been ruined had the valve been left on. Soft valves are, fortunately, rare in these days.

## Parallel Valves

It is not very often that valves are connected in parallel in the output stages of amateurs' sets, but when they are three points ought to be remembered.

The first is that a resistance of, say, 10,000 ohms or more ought to be joined in each grid wire. This is for the purpose of preventing self oscillation of the output stage, which, if it did occur, might ruin the valves.

The second point is that a separate grid



If you want to get extra low-frequency power, then you might care to try the scheme of connections shown here. Details are given in the accompanying paragraph

bias is needed for each valve if the finest results are to be obtained. This applies more particularly to the larger power valves and not so much to the small types.

Two transformers may be used to feed a pair of valves in parallel, being connected as indicated in the accompanying diagram. Note particularly that the two primary windings are connected in parallel in the right direction. If one is reversed the net result will be poor signals.

The third point referred to above is that the output circuit must be adapted for the relatively low impedance. Therefore, the choke or transformer must be designed to pass the relatively heavy current with safety.

## Pick-ups and Hum

There is nothing like a pair of long pick-up leads for introducing hum into a set, especially when it is of the mains type.

When there is a volume control in the set or a transformer, the effect is not always so bad. The hum is collected by the pick-up wire going to the grid of the valve, and sometimes the long wire will cause the set to howl.

Obviously, the wires ought to be made quite short. This is not always possible, I know, so that other steps must be taken.

You can try an armoured cable, earthing the aluminium sheath, as is often arranged in the anode circuits of screen-grid valves. This sometimes helps. Another tip is to connect a grid leak across the ends of the pick-up wires as near to the valve as possible.

This grid leak ought not to be lower in resistance than is necessary, for the reason that a low resistance cuts off the higher notes and thus reduces the strength of the treble. It may even be necessary to use a grid leak and shielded cable and also to earth the pick-up carrier.

## "Wandering" High-frequency Currents

More trouble than you might think possible is caused by allowing high-frequency currents to pass into the low-frequency and anode-supply circuits. Instability, howling, and poor quality, with loss of magnification, are all to be expected if the precaution of fitting suitable filters is not taken.

When high frequency reaches the loud-speaker wires, for example, the amount fed back to the aerial may well be sufficient to cause the set to oscillate.

Proper filtering includes the use of by-pass condensers, stopping resistances, and sometimes chokes.

## "HIGH QUALITY WITH LOW H.T."

(Continued from preceding page)

must have absolutely the same impedance. I have measured quite appreciable differences in the impedance of push-pull valves without being able to detect aurally or to measure any distortion.

As long as the common grid bias is adjusted to the value recommended for one valve, slight differences in the valve characteristics do not affect the quality. For those who want to match up the impedances exactly, one well-known firm markets a push-pull transformer with a broken centre tap secondary, so that separate grid bias can be applied to each push-pull valve.

In brief, let it be said that the need for paralleled valves has been eliminated by the production of better power valves; and that when the fullest advantage cannot be taken of the modern super-power valve, owing to insufficient anode voltage, two power-valves in push-pull point the way to the ultimate goal of true reproduction.



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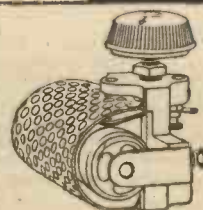
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# THE MAKING OF A RADIO PLAY

*A continuation of the article in last week's issue describing the highly technical work which broadcast drama entails.*



The picture shows the Dramatic Control Panel by means of which the productions of several studios are blended before being actually transmitted

THERE is a department at Savoy Hill which deals with what is known as "Outside Broadcasting."

This department handles all the broadcasting which concerns the relay of such events as the Grand National, the Cup Final, the Boat Race, evening dance music from popular hotels and so on, and, strange to say, this department has been called in more than once to help in the production of radio plays.

Last year the B.B.C. produced a radio version of the well-known novel, "The Prisoner of Zenda," and it was found necessary to include the sound of a church organ in the wedding scene.

A full-size organ being unavailable at Savoy Hill, the producer elicited the services of the outside broadcast department—generally known as the "O.B.'s"—and a microphone was installed in a certain church in the City of London, the local organist engaged and the necessary Ruritanian nuptial music provided. At a given signal the organist burst forth and the same was relayed to Savoy Hill by land-line, conveyed to the Dramatic Control Panel, where the producer "brought it in" for the wedding scene as required.

## Rehearsals

Rehearsals are interesting. Let us eavesdrop at, for example, the first rehearsal of a radio play. Imagine if you will that the artistes, orchestra, chorus, crowd, effects man and so on, are all assembled in their various studios. The producer has taken his seat at the Dramatic Control Panel, and his assistant is by his side, ready to work the cue switches—or, as we have previously called them—the "flicks."

At the producer's side is a telephone connected with the engineers in the main control room. In front of him is the D.C.P. and over it his microphone for "talking back." On the desk in front of the D.C.P. itself lies the script of the play carefully marked with the various cues. The room is in darkness except for one powerful shaded light which illuminates the "working area" itself.

"All ready, Mr. Saunders?" says the producer.

and leans forward to the microphone which is connected to the loud-speakers in all studios.

## The Call

"Stand by everybody, please. Mr. Parkington," he calls the leader of the orchestra, "commence as soon as I give you the red flick, will you?"

Back comes the reply through the loud-speaker on the wall: "Right-ho—all ready here."

"Get that stop-watch ready will you, Saunders?" goes on the producer. "O.K.? Good—all right—flick No. 7!"

And through the loud-speaker comes the strain of the overture from the orchestra in No. 7 studio.

"Stand by to give the artistes in No. 4 their flick. Are you ready? Right! Flick 4."

Down goes the switch and a second later a girl's voice is heard. The producer slowly revolves the knob on the panel marked 7, and the music fades out.

"I suppose you've heard the news, Harry," says the girl's voice.

"What news?" asks a male one.

"Why—George Fenton is coming down for the week-end: aren't you glad?" continues the girl's voice.

"Why, yes," says the man, "I'm—er—delighted, I—"

"Just a moment, please," "cuts in" the producer, "Harry."

The actor answers "Yes."

"You don't get that 'why, yes' quite right you know," continues the producer through his microphone. "I want your voice to sound much more 'dead.' Give the impression that for a long time you have been expecting this George Fenton to turn up, you hate the sight of him, of course, but as your wife likes him you are resigning yourself to the circumstances. Have you got that?"

"Yes, I see what you mean," comes the answer.

"All right," replies the producer. "We'll just go back and try that again. And don't forget, Harry" (actors are nearly always addressed by the name of the character they are portraying), "make your

"Yes, everything O.K.," answers his assistant.

The producer puts down his talking switch

voice as *dull* as you possibly can. We'll give you another flick to start—stand by everybody."

And so it goes on. Later, perhaps, there is an effect to be brought in. "George Fenton" arrives by car and as the girl says: "Here is George coming down the drive" down goes the flick switch marked 2E—the effects studio—and promptly comes the noise of the approaching car. A pained expression comes over the producer's face. "Half a minute, everybody. Hullo, Effects studio—Hullo 2E."

Back comes the reply, "Hullo, yes, Effects here."

"I say, I'm awfully sorry, Effects, but I forgot to tell you that this George Fenton arrives in a perfectly good 30/98 racing affair—the car noise you sent me sounded like a runabout. Can you improve on that?"

"Yes, O.K., Mr. Howard. I'll give you a deeper exhaust note with a muffled bass drum. Would you like to hear it?"

And so the runabout becomes a high-powered sports model and the producer is satisfied.

As a general rule radio plays require anything from six to eight rehearsals, each lasting about three hours and the concentration required by all concerned would be a lesson to most people.

## A Tense Atmosphere

To sum up, the atmosphere at Savoy Hill is tense to an extreme. Many of my readers have experienced that "pent up" feeling always connected with the first night at a theatre. Well, that is precisely what almost every night feels like to the radio play producer.

And this worthy never experiences that delightful sensation which is often attendant after theatrical first nights—the sensation of success and the knowledge that the play is in for a long run and the well-earned holiday in sight. No, our hard-worked friend wakes up the next morning with the cold facts of another production staring him in the face and the knowledge that he must be at the office early to read through the new script of another play which, maybe, must be ready for production only a few days later.

Of course, television is on its way—the first sight and sound play, has already been produced—but this will be something different again, and there will have to be born a new art, a new sense of production, a new technique and most important of all, a new type of artiste. PRODUCER.



# WHAT IS AN INDUCTION MOTOR?

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

MANY of the gramophone motors which are available to-day for running off alternating current supply are listed as "induction" motors. It is urged in their favour that they have no brushes, so that there can be no sparking, with its attendant interference with reception. Many readers must have wondered what this peculiar form of motor is, and what are its limitations, if any.

The induction motor is a device which is only suitable for use with alternating current, and operates on an ingenious principle. In the diagram we have two coils at right-angles to one another, these coils being each wound in two sections with a gap in the centre. In this gap we place a small magnet, which is pivoted so that it can rotate. Let us pass a current through the coil A B. A magnetic field will be produced, and this will cause the magnet to set itself in line with the field; that is, along the dotted line A B. If we switch off the current from the first coil and pass a current through the coil C D, a magnetic field will be produced at right-angles to the first one, and the small pivoted armature will rotate and take up a position along the line C D.

## A Rotating Field

If we go one stage further than this we can alternately switch the current on to the first coil and then on to the second, and then on to the first coil in the opposite direction and again on to the second, causing the armature to rotate 90 degrees at each change of connection. If we can continue to change the connections in this manner the armature will rotate continuously. We can, however, produce the same effect without actually changing connections, if we supply an alternating current to the two coils. Such a current is one which rises to a maximum value and falls to zero again, and then passes through the same state of affairs in the opposite direction. Thus, if we apply alternating current to the two coils we shall have the same effect as the switching on and off; in fact, it will be rather better, because the variation will be gradual instead of sudden.

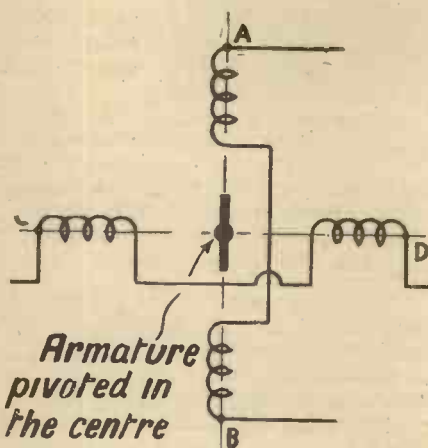
The effect is, then, that on switching on the current to the system we produce what is known as a rotating magnetic field, which will act upon an armature placed in the centre in the manner just described.

## Practical Construction

This is a very brief discussion of the underlying principles. Practical forms of the motor differ in detail. For example, the armature is not a simple pivoted magnet. In most cases it consists of a laminated cylinder of sheet steel in which is embedded a winding. This winding is completely short-circuited on itself, and the currents which are set up therein, due to the magnetic field, serve to magnetise the armature so that it acts in the same manner as the simple model we have just described. There is thus no point in the system at which the current has to be led

in and out of a rotating piece of mechanism. Such a device, which is known as a commutator, is essential with a D.C. machine or with a universal motor which can be used on either type of supply, and it is here that sparking occurs.

A further important advantage of this type of machine is that its speed is independent of the voltage of the supply. Reference to the original simple system will show that the armature will rotate once for every complete change of the connections, or in the alternating current



This diagram shows the principle upon which the induction motor works

case, for every complete cycle of operations. The ordinary alternating current fluctuates at a regular rate, anything from 25 to 50 times per second, the latter figure being the most usual in this country, and being the standard which will ultimately be adopted. Therefore, in a simple system such as that described, supplied with 50-cycle alternating current, the armature would rotate 50 times per second, or 3,000 revolutions per minute.

The voltage of the supply does not affect the speed, provided that sufficient power is obtained to drive the armature (and any associated mechanism) round. The frequency of the ordinary A.C. supply is much more constant than the voltage. It depends upon the speed of the gen-

erators at the power station, and these are all governed within very fine limits. Indeed, it is essential, in these days of inter-linked supply stations, that the frequency shall remain absolutely constant. The voltage, on the other hand, may vary at different times of the day, according to the load which is being taken by the various consumers.

The induction motor is thus a constant-speed motor, the rate of revolution being determined entirely by the construction of the machine and the frequency of the supply. This in some cases is a disadvantage, since it renders it less flexible in use, but for gramophone practice it is a good point, since the motor is suitably geared to the turntable and the speed then remains constant irrespective of fluctuations in the voltage.

## "Slip"

There still remains the proviso just made; that the motor must be capable of handling the power which it is called upon to supply. The speed of rotation is actually not quite the same as that of the rotating field. If a load is placed on the motor the armature slows down very slightly, and this causes current to be induced therein. The interaction between these currents and the magnetic field sets up a mechanical force and urges the armature round, so overcoming the resistance due to a mechanical device, such as a turntable, which has to be driven. The heavier the load, the more is this "slip," as it is called. Thus on a gramophone, for example, it is possible for the motor to slow up slightly on a heavy passage on the record where the resistance is suddenly increased, but if the motor is designed correctly this variation will be negligible.

Usually the motor is made to drive against a governor. It is provided with an excess of power, and the greater proportion of this power is absorbed in the braking action of the governor. The variations in the additional load due to the record are thus very small and are automatically corrected for by a slight easing up of the braking action of the governor.

To sum up, the induction motor gives a very steady speed in actual practice, and a complete freedom from any sparking or worse troubles. Its disadvantage is that it only operates on alternating current and that it can only run at a fixed maximum speed.

## MOTOR-MADE "STATIC"

WIRELESS beam stations receiving wavelengths in the neighbourhood of 10 metres are subject to considerable interference from passing motor-cars, which radiate short-wave oscillations from the ignition systems. In order to avoid this type of disturbance, a screen of short conductors is sometimes hung across the road so as to form a kind of archway. The conductors are earthed at one end and act as reflectors to absorb the disturbing radiation away from the beam aerial. B. A. R.

## DO YOU KNOW—

that the best method of using two speakers together is not always to connect them in series? The best way to use more than one speaker is to fit a choke-output transformer, so that the impedances can be matched. Alternatively, a high-resistance speaker can be connected directly in the anode circuit, and a low-impedance one via an output transformer or choke filter.

that the word "omroep" which you see so often in connection with the Dutch stations means "broadcast"? It is derived from the old Dutch word "omroepen," which was the name given to the town crier in small villages in Holland.

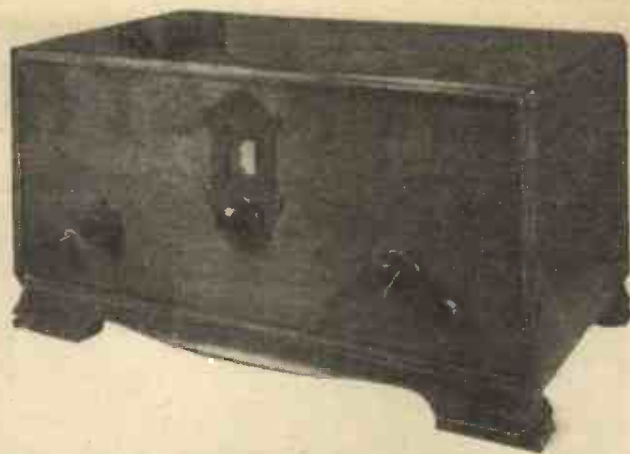


## SETS OF DISTINCTION

THE  
1931 MULLARD  
ORGOLA

Makers: Mullard Wireless Service Co., Ltd.

Price: £8 for complete kit and valves.



ALTHOUGH I have not had a chance to build the new Mullard Orgola, the makers recently supplied me with a completed model, so that I could substantiate their claims by actual tests.

As the Mullard people say, valves are available to-day of an efficiency undreamed of a few short years ago. With such progress in valves, modifications and improvements are constantly being called for. So while we all thought that, in last year's Orgola, the makers had reached the peak

employed. Although designed for one-dial operation, this condenser has a thumb adjustment to correct the aerial tuning. In this way simplicity of control is achieved without loss of efficiency.

Looking at the circuit diagram, I find every evidence of modern practice. The screen-grid valve is choke condenser-coupled to the detector grid-tuning circuit. Differential reaction is employed in the anode circuit of the detector valve. The aerial is variably coupled by means of a

small aperiodic rotor inside the aerial tuning coil.

When we come to look at the completely assembled Orgola, the well-planned layout of the components is proved. Right in the middle of the cabinet front is the tuning control—a knob rotating a clearly-engraved scale. On the left and right are pairs of knobs and

switches, making a symmetrical layout.

The switch on the left operates a very simple wave-changing mechanism. Next to it is the volume control, a rheostat in the filament circuit of the screen-grid valve. The switch on the right is for switching the set on or off. Next to it is the reaction control knob.

## Valves Recommended

To work this set, the makers recommend a Mullard PM12 for the high-frequency stage, a Mullard PM2DX for the detector

and a Mullard PM2 power valve, Mullard PM252 super-power valve, or Mullard PM22 pentode for the output stage.

I tested the completed set with a pentode output valve and the other valves were as specified. My biggest impression of the set was gained during the first five minutes, when the enormous power of several foreign stations convinced me that the set is a winner.

## Single Tuning Control

The single tuning control was much appreciated after the initial matching up of the aerial tuning had been accomplished. Then stations simply rolled in. Thanks to the variable coupling of the aerial coil, the selectivity was good enough to enable me to cut out the Regional and National stations within a few degrees.

With my linen-diaphragm loud-speaker, the pentode output valve gave a fine, crisp rendering of speech and music.

Now I am going to give details of my log. Starting at the top of the tuning scale, I got Budapest at 87. Munich, a station I have not heard lately, came in at 85, quite strongly. Vienna, at 82, was still stronger, as was Milan, at 80. Then came the Midland Regional, at 77.

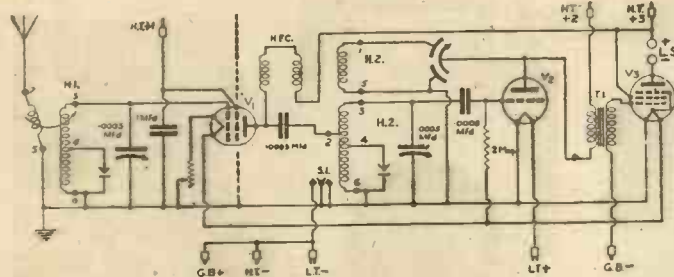
Rather to my surprise, Langenberg at 76 was quite clear of the Midland station. Lyons la Doua at 75 was very strong. So was Rome at 70 and Stockholm at 69. Katowice at 65 was very clear. So was the lady announcer of Bucharest at 61.

Frankfurt at 60, Toulouse at 59, and, biggest surprise of all, Manchester at 58 were the last three stations before London Regional at 54. Then followed Barcelona

at 50, not very good, and Breslau at 46. Göteborg at 45 was tremendous. And Cardiff at 43 was quite good. Another strong station was Bordeaux at 41, above the British relays at 36.

Then I got Lyons at 35.5, followed by Bratislava, very strong at 34, and Rennes, equally strong, at 32.5. The National 261-metres transmitter was at its maximum at 29. Below it was Hörby at 28, and Leipzig at 26.

SET TESTER.



The circuit of the 1931 Mullard Orgola

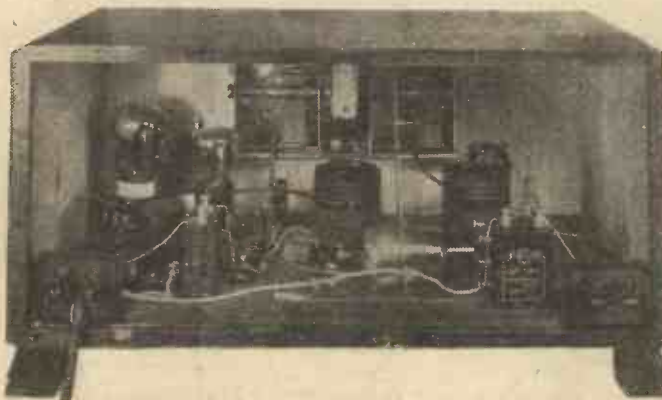
of efficiency for a three-valver, this year's model proves that still more could be done to simplify tuning, to improve selectivity, and still further to reduce the number of constructional processes.

Let me run through the main points of the 1931 Orgola. Of the three valves, the first is a screen-grid high-frequency amplifier, preceding the second valve, which is a leaky-grid detector, in turn coupled by means of a Mullard transformer to the power or pentode output valve.

While there is nothing original in such a sequence of valves, which, indeed, statistics would probably reveal as the most popular among constructors, the practical interpretation of it is peculiarly Mullard's. What then, is there "different" about a Mullard design? Firstly, I think they aim at the last word in a clean and efficient layout of the components. The mounting of the two tuning coils and the screen-grid valve between them is a masterpiece of simplicity combined with efficiency.

The two dual-range coils are mounted on a small square of baseboard screening. Between the two coils is erected a simple vertical screening partition. The screen-grid valve is mounted horizontally, so that the anode terminal on top projects through the vertical screen to make contact with the coupling tuning coil.

For tuning, a two-gang condenser is



The design of the Mullard Orgola has many distinctive features as will be observed from this photograph of the interior



# BROADCAST ARTISTES IN PICTURE



**SEYMOUR DOSSOR.**—This well-known tenor has a wide following throughout the provinces, and appeared on October 13.



**ELSIE GRIFFIN.**—An artiste noted for her choice of works, Miss Griffin was heard in a recital from the Belfast station on October 13.



**JOHN BUCKLEIGH.**—Originally commencing professional life as an artist, luckily Mr. Buckleigh discovered he possessed a fine baritone voice.



**MAY BLYTH.**—A magnificent oratorio singer, as witness her performance in "Elijah" (Mendelssohn), when relayed from the Town Hall, Birmingham, on October 16.



**VIVIAN LAMBELET.**—The famous daughter of a famous father, Napoleon Lambelet, the composer.



**JOSEPH SLATER.**—One of the first "star" artistes to join the B.B.C. concerts, Mr. Slater, has played in public since the age of twelve.



**EDITH ATHEY.**—A soprano often heard in the provinces, Miss Athey is noted for her wide range of songs.



**HAROLD CASEY.**—An early assistant director of Birmingham station, this fine singer was known for long as "Uncle Pot."



**ISOBEL BAILLIE.**—Heard from nearly all stations, Miss Baillie is a favourite broadcast artiste by reason of her clarity of diction.



**ARNOLD TROWELL.**—One of the foremost cellists. His broad "singing" tone is especially noticeable and ever welcome when he gives a recital.



**PAUL MOLCHANOFF.**—One of the finest of Russian singers, M. Molchanoff was heard to special advantage in the first week of October in a recital of Russian songs.



**LILLIAN HARRISON.**—A clever young actress often heard from London. She played the title role of the Nurse in "Nurse Henrietta," on October 24.



**DAME ETHEL SMYTH.**—Composer, conductor, musician, and keen politician, there are very few roles in life that Dame Ethel Smyth has not essayed and achieved success.



A Weekly Programme Criticism—By SYDNEY A. MOSELEY.

# Without Fear or Favour



## THE SYMPHONY CONCERTS

### THE NEW STUDIO

THE first B.B.C. Symphony Concert at the Queen's Hall rather alters some views I proposed to express this week. I was going to write, after some experiences in Paris and Berlin, that there was only one way of enjoying music in any shape or form—and that was via wireless.

The audiences, particularly at the opera, simply distract one, and it is impossible to concentrate. I had some irritating examples of this during a week-end visit to Paris when I went to the Opera House, and in order to get the right atmosphere—as the announcer puts it—got a seat in the front row. When my neighbours on my right and left were not whispering to each other, members of the orchestra themselves were talking, and I vowed never to go to the opera again.

But on my return to London I thought I would go to the first performance of the B.B.C. Symphony Orchestra at the Queen's Hall, and it well repaid a visit.

Adrian Boult is a real worker, and, what is more, a finished worker.

The B.B.C. is right in getting hold of a man with more ability than "side."

And, my, doesn't the orchestra know how to play "God Save the King"! You would have thought it was an Empire Free Trade orchestra playing it—a challenge emphasised by the conductor who sent in straight rights from the shoulder again and again. No wonder poor Adrian had to put on a new collar after the interval.

As I say, a great evening; but, nevertheless, millions of listeners can console themselves with the fact that in most transmissions they can settle down quietly without being disturbed by irksome and restless neighbours. That is why I am dead against studio applause. If I had my way, I would have no public performances of the orchestras at all. Noise and music do not blend well.

As it happens, I was invited to the first Sunday concert which was given in the new B.B.C. studio. I went, because I like to see at first hand things that I may have to criticise.

Less than a dozen of us were privileged to visit the new studio, which is still called Big Tree Wharf, which is on the other side of Waterloo Bridge; and what

an eerie scene the place presented.

I tried to find the steps leading from the bridge to the somewhat squalid surroundings below, and was only stopped in time from walking right down into the river itself!

But it was worth all the excursions and alarms. The wharf had been transformed as thoroughly and effectively as could possibly be conceived.

Then, the air of informality! Members of the Symphony Orchestra taking off their coats, and the example was followed by Adrian Boult, who is a very human fellow.

Kate Winter sang with her back towards me, but I imagine her voice is more suited to broadcasting than to the concert platform.

I hope listeners enjoyed the concert as much as I did.

The entertainment side has certainly not been neglected of late. The extracts from the new Cambridge Theatre show, Charlot's "Masquerades," were successful, although I think that the three little episodes were rather more suitable for the studio than for the stage.

Beatrice Lillie's personality came over



Jack Payne and his B.B.C. Dance Orchestra

## VAUDEVILLE SUCCESSES

### "TALKIE TOWN"

well. Each episode had a central idea which, although not always original, was certainly humorous, which is the main thing.

What was irritating was the fact that the listener was given the impression that this was a continuous broadcast from 10 o'clock, with interludes by the B.B.C. Dance Orchestra, whereas it was really the dance orchestra with interludes from the theatre. Those of us who had no desire to listen to Jack Payne found it rather uninteresting to hear dance tunes which sounded so much alike.

Gillie Potter provides entertainment, and his patter is quite good. I advise him, however, not to speak too quickly when he is broadcasting. Even with the best set, it is more difficult to listen when one has not sight as well; very often I find him difficult to follow.

How not to arrange your programme — 6.45. "Midsummer Night's Dream" (Mendelssohn).

9.0. "Midsummer Night's Dream" (Mendelssohn).

As against the vaudeville successes mentioned above, Leslie Weston had the duldest material I have listened to for a long time.

"Algy met a tiger, the tiger was bulgy, the bulge was Algy" was quite funny during the time of Noah. And "Is your husband insured? I hope you won't have as much trouble in collecting his insurance as we have had in collecting him" is not funny at all—not even in Grand Guignol.

A Sister to Assist 'Er, on the other hand, was as funny as it always is. The good things can always bear revival.

By the way, I wonder if Doris Emney is related to the redoubtable Fred, who made such a hit as "Mrs. May"?

Suggia must be seen to be believed.

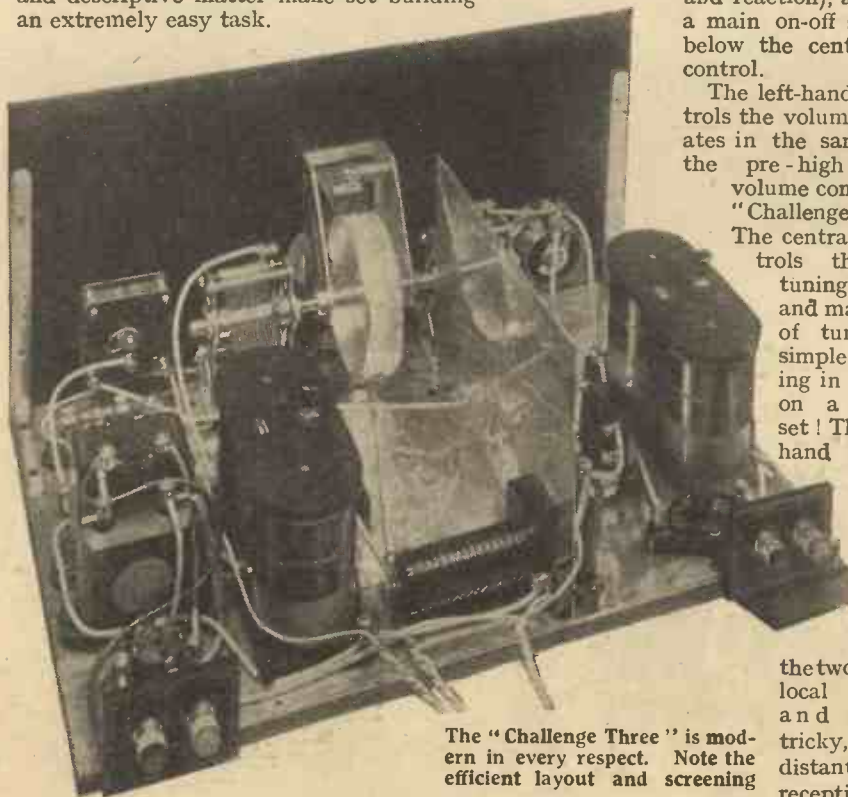
I didn't see anything in *Talkie Town* to merit its being dug up and re-presented on two nights running. It started off fairly well, but degenerated into the usual concoction of songs, strung together with would-be humorous stuff. The plot was, as usual, silly.



THE "Challenge" has set a challenge among sets! A free blueprint was given away three weeks ago of the "'A.W.' Challenge Four," a set designed by Mr. W. James, and this proved to be one of the most popular receivers ever described in AMATEUR WIRELESS. Readers were quick to realise that in this new series of "Challenge" receivers there is a real attempt to produce something out of the ordinary, for there still is a great deal which is yet to be tried in radio receiver design and of which many set users are not aware simply because set designers are afraid to break away from conventionality.

### Outstanding Points

Well, here is a worthy successor to the first "Challenge" set: it is the "'A.W.' Challenge Kit Three." There are two things about this which you must observe. First, it is a "three," which means that it is slightly cheaper to build and maintain than the "Challenge Four"; you need have no qualms about the running costs of this new set. Second, it is a "kit" set. This needs a little explanation. All the receivers which are described in "A.W." can be made up without difficulty, particularly if advantage is taken of the fact that full-size blueprints are available for a small sum. "A.W.'s" guides to the home constructor, in the way of photographs, blueprints, wiring diagrams, components list, and descriptive matter make set building an extremely easy task.



**The "Challenge Three" is modern in every respect. Note the efficient layout and screening**

# THE CHALLENGE THREE

: ONE-KNOB CONTROL :

Here, however, is still further simplification. Blueprints and photographs show you how to mount the components and they indicate where the connections are made; but they do not show exactly each lead in detail, nor do they give the exact length of each wire. In an accompanying panel you will see a list of all the wires needed for this set (there are only 33), and against each you will find the length of the insulated sleeving of each.

What could be easier? With the aid of this panel you can cut each piece of sleeving to its exact length, slip a slightly longer piece of wire through it, and then, using the blueprint as a guide, you can put the wire in its correct place, from terminal to terminal. This does away with all possibility of a wrong connection being made, and consequent short-circuits.

## A Simple Layout

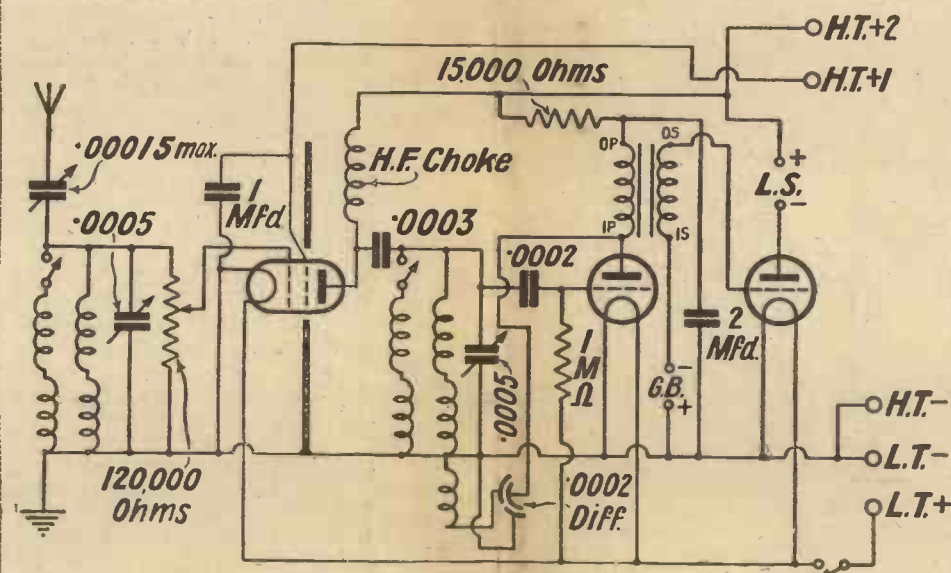
But before we go any further into the details of construction, just a word about the set and its circuit. Take a glance at the panel. It could not be designed on more straightforward lines. There appear to be only three knobs (one only of which is used for tuning, the others being volume and reaction), and there is a main on-off switch just below the central tuning control.

The left-hand knob controls the volume and operates in the same way as the pre-high-frequency volume control in the "Challenge Four."

The central knob controls the ganged tuning condensers and makes the job of tuning as simple as bringing in stations on a crystal set! The right-hand knob is the reaction control. This need not be adjusted for

the two or three local stations and is not tricky, even on distant-station reception.

BY  
THE  
"A.W."  
STAFF



The circuit of the "Challenge Three." Features are the novel volume control which does not affect tone or tuning, differential reaction and efficient L. F. filtering

### COMPONENTS REQUIRED FOR THE "CHALLENGE THREE"

Cabinet (Clarion, Camco, Pickett).  
Ebonite panel, 16 in. by 8 in.  
(Becl, Trelleborg).  
Baseboard, 16 in. by 10 in. (Clarion,  
Camco, Pickett).  
Two-gang .0005-mfd. condenser  
with drum dial (Lotus, Polar, Formo,  
J.B., Burton).  
.0002-mfd. differential reaction con-  
denser (J.B., Polar, Lotus).  
120,000-ohm variable resistance  
(Regentstat, Igranic, Rotorohm,  
Lissen, Varley).  
Piece of aluminium foil, 12½ in. by  
10 in. (Parex, Read-Rad, Wearite,  
Peto-Scott).  
Screen, 7½ in. by 6 in. (Parex,  
Read-Rad, Wearite, Peto-Scott).  
Panel brackets (Bulgin, Read-Rad,  
Camco, Keystone, Parex).  
Pair of "Challenge" coils, one  
aerial, one anode with reaction (Tune-  
well, Atlas, Wearite, Read-Rad,

**H. & B.)**  
**Universal valve holder (Junit, W.B., Parex).**  
 Two valve holders (Telsen, Lotus, W.B., Junit, Benjamin, Burton, Brownie, Wearite, Lissen).  
 .0003-mfd. fixed condenser (Lissen, T.C.C., Telsen, Dubilier, Graham-Farish, Watmel, Atlas).  
 .0002-mfd. fixed condenser (Lissen, T.C.C., Telsen, Dubilier, Graham-Farish, Watmel, Atlas).  
 One megohm grid-leak (Lissen, Dubilier, Graham-Farish).  
 Grid-leak holder (Lissen, Bulgin, Dubilier).  
 2-mfd. fixed condenser (Lissen, T.C.C., Dubilier, Igranite).  
 1-mfd. fixed condenser (Lissen, T.C.C., Dubilier, Igranite).  
 Low-frequency transformer (R. I. "Hypermu," Lissen, Ferranti, Varley.

Lewcos, Telsen, Igranie, Lotus, Burton, British General).

High-frequency choke (Lewcos, Read-Rad, Telsen, Lissen, Watmel, Tunewall, Sovereign, Igranie).

Filament switch (Read-Rad, Bulgin, Benjamin).

Pre-set aerial condenser, .00015 mfd. max. capacity (Igranie, Formo, Sovereign).

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

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

Twelve feet of 20 s.w.g. tinned copper connecting wire (Lewcos).

Five lengths of insulated sleeving.

Five wander plugs, marked : H.T.—, H.T.+1, H.T.+2, G.B.+ , G.B.— (Belling-Lee, Igranie, Clix).

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



# E KIT SET

## EASY TO BUILD

The back-of-panel arrangement of the "Challenge Kit Three" is on exactly the same straightforward lines. The special "Challenge" coils are used, which can be bought complete or which you can wind yourself, and there is just sufficient screening in the high-frequency and detector stages to make the whole set quite stable in working. Too much screening tends to damp the performance of the set, while too little makes it tricky to adjust. In the "Challenge Kit Three" there is just the right amount of metal.

### Easy Connections

Terminals are used only for the aerial and earth and for the loud-speaker output connections. The connections to the accumulator, high tension, and grid bias are made by means of twisted flex cables. This is a much cheaper and simpler idea than the use of terminal strips; furthermore, there is no possibility of bad contacts occurring after the set has been in use for some time. Of course, this "Challenge Kit Three" can be either battery or mains driven. A large-capacity dry high-tension battery is used or, alternatively, practically any medium output direct or alternating current mains eliminator may be used. The type of eliminator needed depends mainly on the size of the power valve; but more will be said of this in the final operating notes, when full details will be given of suitable valves and "juice" supplies.

The circuit shows the salient features of the set. Aerial tuning is carried out with one of the new "Challenge" coils shunted by a .0005-microfarad condenser—one section of the ganged tuning condenser.

The volume control is particularly interesting, because it consists of a 120,000-ohm wire-wound potentiometer, the winding of which is placed

across the aerial coil and the slider of which is taken to the grid of the high-frequency amplifying valve. This makes a very convenient form of strength control, because it actually regulates the amount of

voltage applied to the receiver and is equivalent to altering the sensitivity of the aerial itself—and this without the difficulties that usually attend the alteration of aerial characteristics by normal methods, such as the use of pre-set condensers.

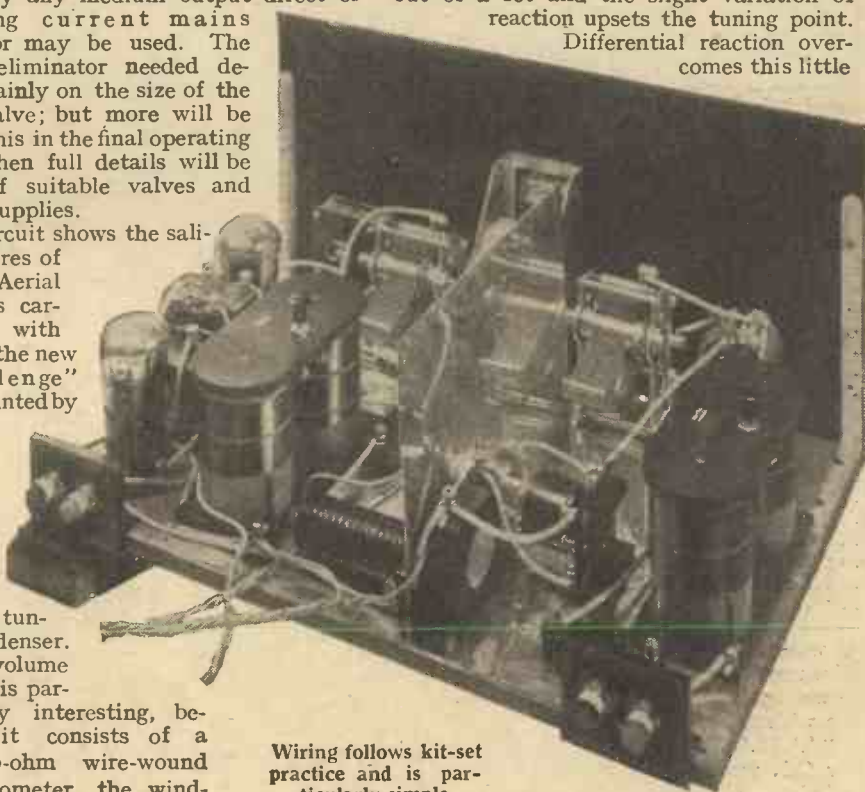
### Screen-grid Amplification

The screen-grid valve is connected in a quite straightforward circuit, and its efficiency and stability (which makes for easy tuning) are the result of the careful disposition of parts and the arrangement of the screening. The detector is a grid-leak rectifier, and a notable good point is the use of a differential reaction circuit.

Differential reaction is a most satisfactory arrangement, and has been incorporated in the design of the "Challenge Kit Three" because it results in particularly easy tuning, which is most appreciated when the set is being used for the reception of the foreigners.

As you doubtless know, turning the reaction knob in an ordinary set affects tuning, and this is rather disconcerting when you are straining to get the utmost out of a set and the slight variation of reaction upsets the tuning point.

Differential reaction overcomes this little



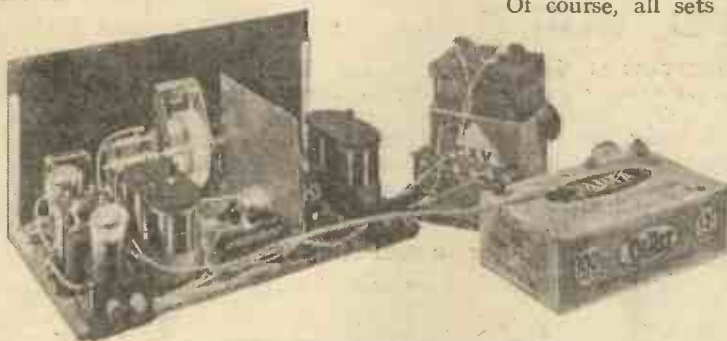
Wiring follows kit-set practice and is particularly simple



# "THE 'CHALLENGE THREE' KIT SET" (Continued from preceding page)

trouble, and also makes for very smooth regulation of oscillation.

The power valve is coupled with the detector with one of the new special alloy core transformers, and there is a filter circuit to prevent any motor-boating. This may be very useful if you intend working the set from the mains.



The "Challenge Three" ready for testing

Now for the constructional work. In an accompanying panel you will see a list of the parts needed, the first mentioned components being those actually used in the set illustrated here, the others being alternatives which you may use. Of course, some small rearrangement of the set layout may be needed with the alternatives.

## Wiring

A full-size blueprint has been prepared for the "Challenge Kit Three," and this can be obtained, price 1s., post free, from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4. This shows all parts in their correct positions and full size, and it also gives the wiring, each lead being numbered. These numbers correspond with those given in the panel below showing the lengths of the insulated sleeving.

## LENGTHS OF SYSTOFLEX REQUIRED

Wire	Length	Wire	Length
No. 1	1 in.	No. 18	5½ in.
No. 2	2½ in.	No. 19	7½ in.
No. 3	1 in.	No. 20	3 in.
No. 4	5½ in.	No. 21	3 in.
No. 5	4 in.	No. 22	2½ in.
No. 6	2½ in.	No. 23	1 in.
No. 7	1 in.	No. 24	6 in.
No. 8	4½ in.	No. 25	1 in.
No. 9	8 in.	No. 26	3½ in.
No. 10	1 in.	No. 27	3½ in.
No. 11	11½ in.	No. 28	7 in.
No. 12	7½ in.	No. 29	½ in.
No. 13	3 in.	No. 30	1 in.
No. 14	1½ in.	No. 31	1½ in.
No. 15	2 in.	No. 32	4 in.
No. 16	2 in.	No. 33	¾ in.
No. 17	2½ in.		

Next week it will be shown how easy it is to wire up the parts, using the blueprint (or the wiring diagram given here) in conjunction with the wire-length panel.

The "A.W." Challenge Kit Three" is on view this week in the Radio Department windows of Messrs. Selfridge & Co., Ltd., of Oxford Street, London, W. The Radio Department is in Somerset Street, parallel with Oxford Street.

## DIRECT BATTERY LEADS

THERE are some sets which would be more convenient to handle if the terminals were omitted, and connections taken direct by flexes from the respective components to the batteries.

Of course, all sets would not be convenient in this way, but the average homeset, which is tinkered with only occasionally, is better off with positive connections from the "juice boxes."

Nor can all terminals be dispensed with. Well-spaced terminals on a strip

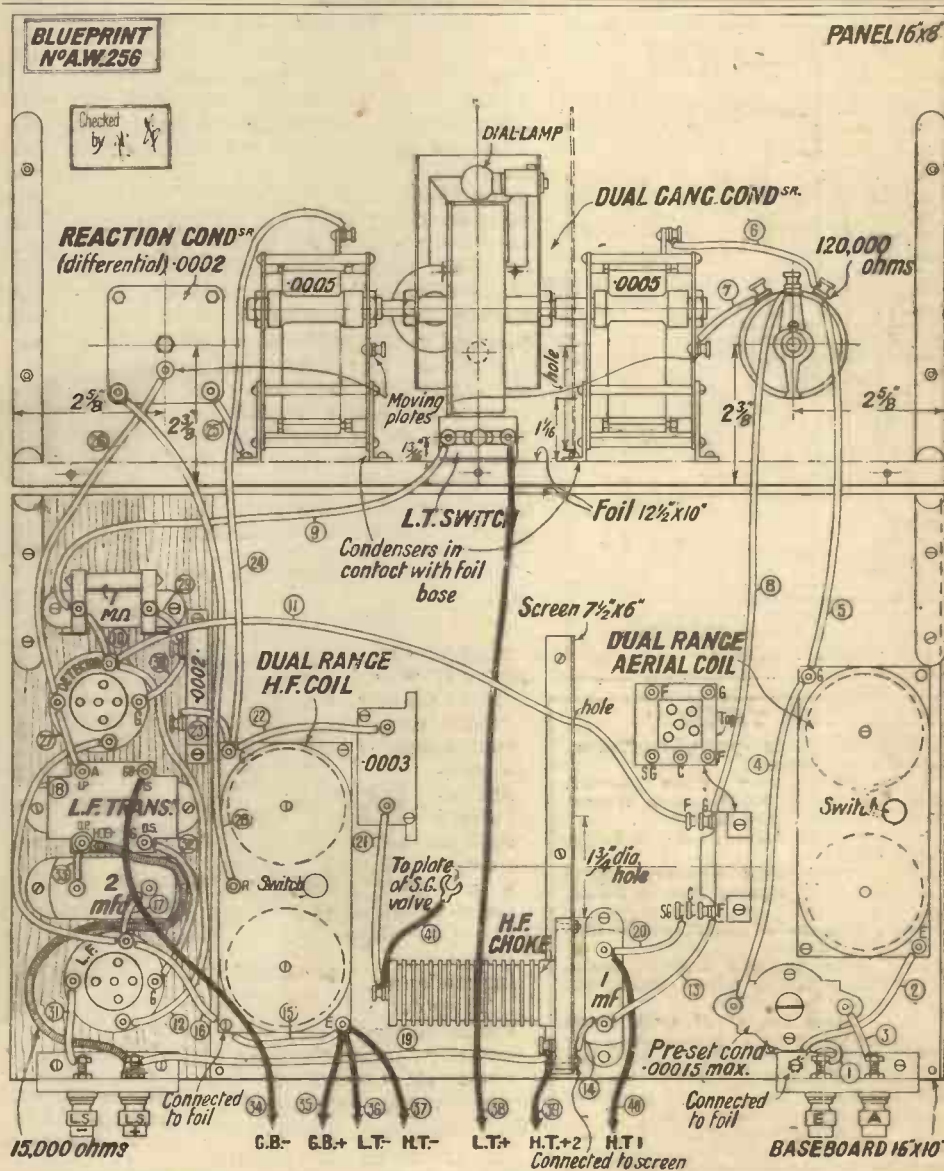
are really necessary for the aerial and earth, and multi-connection sockets are a great convenience for the loud-speaker output.

If the set is mains driven, too, the actual leads to the eliminator section should be taken via a safety plug. Direct flexes in such a case are often not at all convenient.

The ordinary H.T., L.T., and G.B. leads can frequently be made direct. They should be twisted in groups, and it is advisable to keep the G.B. leads separate from the H.T. leads. The bunches of leads can be secured at the edge of the baseboard by clamps, and here, again, the G.B. leads should be clamped separately.

Most important of all, clearly mark the ends of the flexes. Engraved wander plugs are best used. Simply tying knots in the positive wires is an old tip, but rather confusing.

K. U.

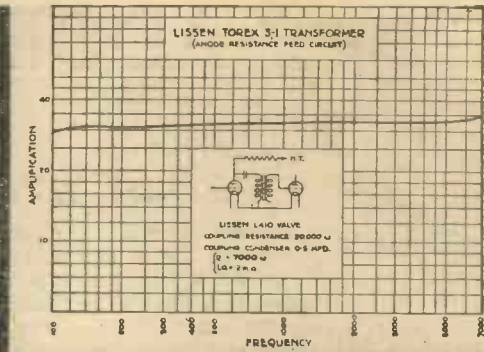


The wiring diagram.

A full-size blueprint, which is a great help in constructing, can be obtained, price 1/-



# A MIGHTY good TRANSFORMER WITH A CURVE!



for 5'6

**T**HIS new Lissen Torex Transformer enables you to make a big cut in the cost of building amplifiers. It is a high-grade silicon-steel core transformer, with remarkably even amplification over the whole band of audible frequencies (see curve). It is a neat, compact component; moulded bakelite case which is hermetically sealed and completely insulates the windings. Proof against shorting, leakage or moisture.

## WHERE TO USE IT

Use this Lissen Torex Transformer for the first L.F. stage of any amplifier. Use it where big amplification is desired at small cost. Use it for all temporary "hook-ups"—you can change it from set to set because it is a "general purpose" transformer.

Particularly fine results are obtainable when this transformer is used in an anode resistance feed circuit.



# LISSEN

## TOREX

### TRANSFORMER

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Please Mention "A.W." When Corresponding with Advertisers



IT is easy to add pick-up connections to both models of the "Challenge Four."

In the battery model we arrange a pair of switch or jack contacts in the grid lead to the detector and a further pair in the filament circuit of the two screen-grid valves.

The diagram (Fig. 1) shows the actual connections, from which it will be seen that when the plug, having the pick-up connected to it, is inserted into the jack, one end of the pick-up goes to the grid of

## ADDING A PICK-UP TO THE "CHALLENGE FOUR"

ohm potentiometer may be placed across the pick-up in the usual way or, as an alternative, the 100,000-ohm adjustable resistance could be connected across the primary coil of the intervalve transformer.

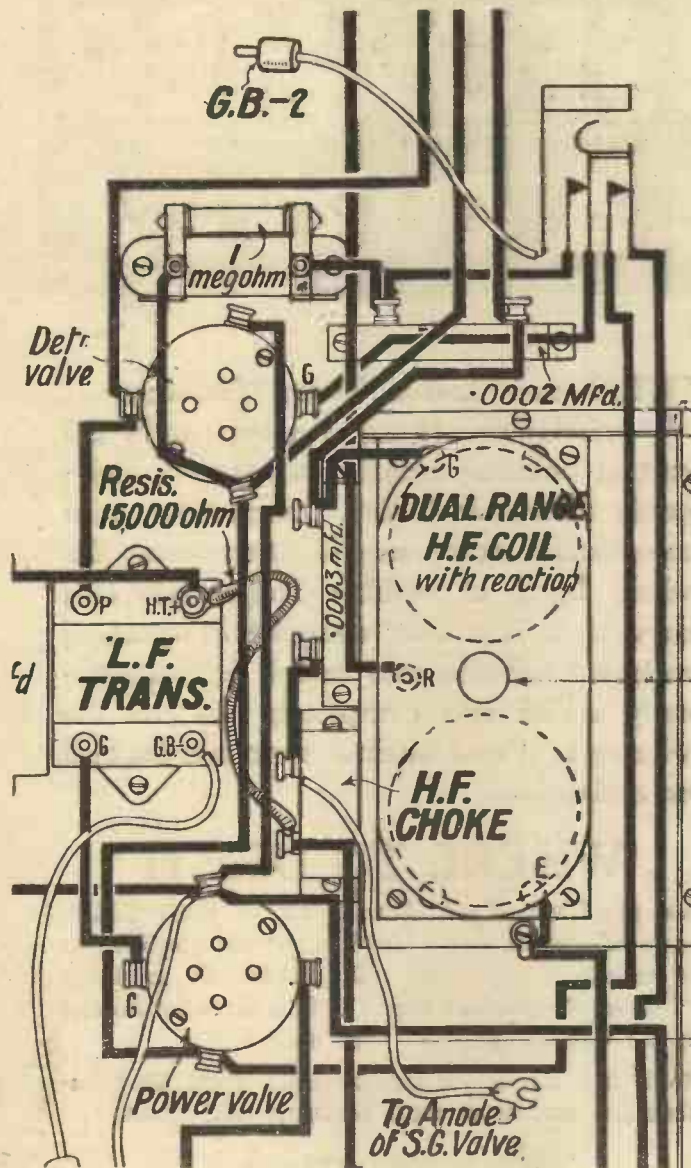
When used in this position, the volume of both radio and gramophone records may be adjusted, and no doubt many will prefer this control to the alternative. A smooth variation in the volume is obtained by both methods, but when the resistance is placed across the primary coil of the transformer we have the benefit of the control for radio as well.

Therefore, keep the wires short and also the grid-circuit wires in the set. When a potentiometer is connected across a pick-up, but fairly near the valve, the chances of hum occurring are greatly reduced.

Normally there is no need to place a transformer between the pick-up and the

the high-frequency valves in the mains set as the current comes from a mains unit and the circuit voltages would, in fact, be disturbed were these two valves switched in or out.

If long pick-up wires are used a hum may be heard.



Here is a section of the wiring of the battery-operated set showing the necessary pick-up connections taken to the jack

the detector, whilst the other side joins with the grid bias. The second pair of contacts break the filament circuit of the two screen-grid valves.

This jack should be mounted on the panel, with the object of keeping the grid-circuit wires as short as possible. Ample volume will be obtained from normal records and the grid bias may be  $-1.5$  volts applied at G.B.-2.

For controlling the volume a 100,000-

ohm potentiometer may be placed across the pick-up in the usual way or, as an alternative, the 100,000-ohm adjustable resistance could be connected across the primary coil of the intervalve transformer.

To add a volume control to the pick-up or low-frequency amplifier make connections exactly as described in the battery model.

Nothing would be gained by cutting out

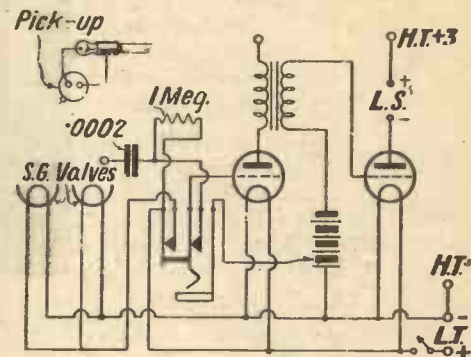
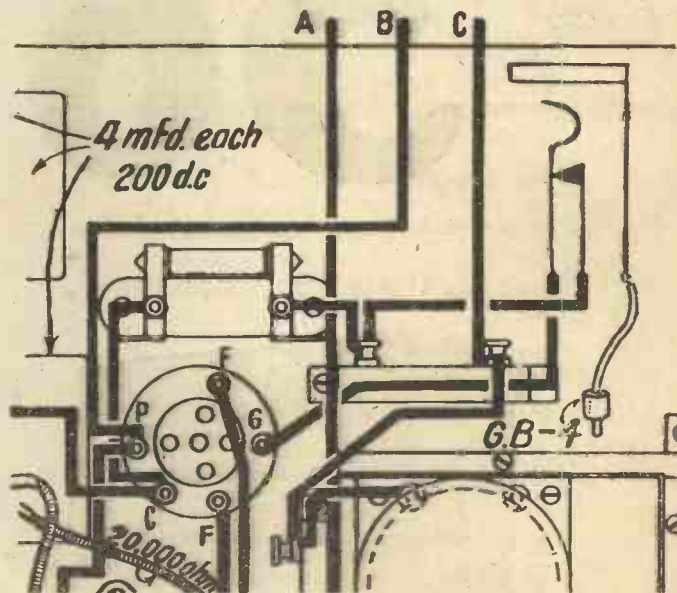


Fig. 1. Circuit of battery-operated set showing pick-up connections

### The Mains Set

Fig. 2 shows the pick-up jack joined to the A.C. set. Contacts are arranged in the grid circuit of the detector valve, as in

first amplifying valve, as sufficient magnification is obtainable without. Given a pick-up of an insensitive type, however, a transformer may be used, a suitable ratio for most types being about 7 to 1. The



These are the alterations required in the mains model. In both cases comparison should be made with the original wiring

volume obtained from normal pick-ups may be adjusted to a certain extent by fitting different needles. The tonal quality, unfortunately, will also change, but this may be a matter of secondary importance.

It is to be expected that more volume will be obtained from the A.C. model, as the valves are bigger and better than those which normally will be used in the battery type. At the same time interesting results

(Continued on page 717)



# USE READY RADIO APPROVED KITS FOR EVERY CIRCUIT

## TROUBLE-FREE SET BUILDING

## USE READY RADIO APPROVED NON-SOLDERING KITS ONLY

## USE JIFFILINKS FOR WIRING UP

## IMMEDIATE DISPATCH

## CASH OR EASY PAYMENTS

Advt. of READY RADIO (R.R. LTD.),  
159, Borough High Street, London, S.E.1.

### "CHALLENGE THREE"

	£	s.	d.		£	s.	d.
1 Percol ebonite panel 16"x8"x3/16" ...	6	0		1 ReadiRad '0003 fixed con-			
1 Hand polished cabinet with baseboard ...	1	5	0	denser ...			10
1 J.B. two gang condenser, '0005 mfd. condenser with drum dial ...	1	6	6	1 ReadiRad '0002 fixed con-			10
1 J.B. '0002 differential reaction condenser ...	4	0		denser ...			10
1 Regenstat 120,000 ohm type "A" ...	9	6		1 ReadiRad 1 meg. grid leak and holder ...	1	4	
3 Valves as specified by Mullard or Cossor ...	1	19	0	1 T.C.C. 2 mfd. condenser ...	3	10	
1 Screen 7 1/2"x6" and aluminium foil 12 1/2"x10" ...	4	0		1 T.C.C. 1 mfd. ...	2	10	
1 Pr. ReadiRad panel brackets	10			1 R.I. Hypermu L.F. transformer ...	1	1	0
1 Set Challenge coils (aerial and anode with reaction) ...	1	1	0	1 Readi-Rad H.F. choke ...	4	6	
1 W.B. Universal valve holder	1	3		1 Readi-Rad filament switch ...	10		
2 W.B. sprung type valve holders	2	6		1 Formodensator, type F ...	1	6	
				2 Junit terminal blocks ...	1	8	
				4 Belling-Lee terminals "B" ...	2	0	
				1 Set ReadiRad Jiffilink ...	2	6	
				5 Wander plugs H.T. -, H.T. +1, H.T. +2, G.B. +, G.B. - ...	1	6	
				2 Spade tags, wire, flex, screws, etc. ...	1	0	

TOTAL (including Valves and Cabinet) £9 : 5 : 9

ANY OF THE ABOVE COMPONENTS CAN BE SUPPLIED SEPARATELY, IF DESIRED

### "CHALLENGE FOUR"

KIT A less valves and cabinet £8 : 6 : 9

or 12 equal monthly payments of 15/3

KIT B with valves less cabinet £11 : 5 : 9

or 12 equal monthly payments of 20/9

KIT C with valves and cabinet £12 : 18 : 3

or 12 equal monthly payments of 23/9

#### RECOMMENDED ACCESSORIES

	£	s.	d.		£	s.	d.
2 Fuller 60-v. H.T. batteries, super capacity ...	1	7	0	1 Fuller 9-v. grid bias battery ...	1	6	
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## THE HOW AND WHY OF RADIO

# VIII—HOW YOUR BATTERIES WORK

*If you are a beginner in wireless, now is your chance to gain a clear conception of its theory and practice. In this series of articles, specially prepared for the beginner, no previous knowledge of wireless is assumed. Every aspect of the subject will be dealt with in ensuing issues, and the whole series will endow the beginner with sufficient knowledge to enable him to derive the greatest possible interest from the fascinating hobby of wireless*

**T**HERE are two entirely different batteries in every valve receiving set—the high-tension battery and the low-tension battery. A battery consists of two or more cells. A high-tension battery usually consists of primary cells and a low-tension battery of secondary cells. The big difference between them will be seen when their actions are explained.

Let us start with the primary cell. Fig. 1 will help. Take a look at the chief features

liberated, and this collects as minute bubbles on the carbon rod and acts as a resistance to the current flowing within the cell. If too great a current is taken from the cell for the size of elements employed, the hydrogen is produced at such a rate that the result is the current falls off very quickly, and may in extreme cases cease to flow almost entirely. Now, the purpose of the depolariser is to absorb this hydrogen and therefore permit the cell to continue its action. This it can only do with partial success, and polarisation, as a matter of fact, is liable to take place in any primary cell from which an excessive amount of current is taken.

We speak of an ordinary cell of the dry type as having a potential difference between its terminals of  $1\frac{1}{2}$  volts. The voltage of the cell is not determined by its size, but by the nature of its elements.

### The High-tension Battery

A high-tension battery consists of a large number of these  $1\frac{1}{2}$ -volt cells. The positive of the first forms the positive of the battery. Its negative is connected to the positive of the second cell, whose positive is connected to the negative of the third cell, and so on until the final negative is reached. In a word, the cells are connected in series. The total voltage is therefore the sum of the individual voltages of the cells. In a 60-volt battery there are forty cells.

While the voltage of the battery is very important, the current it can deliver is no less so. That brings us to the second part of the story. The size of

the elements in the cell, and their distance apart, and the resistance of the electrolyte, all affect the current output. For they all affect the internal resistance of the cell.

The larger the elements, the lower the resistance. For the fairly heavy current drain exerted by modern valves on the high tension battery, the large size of cell has been specially developed.

If a valve maker specifies a voltage on the anode of 120 volts and the current taken by the valve at that voltage is too much for the cell, the voltage actually

applied to the valve will fall and the valve will not operate efficiently. Most battery makers appreciate the need for specifying the current output as well as the maximum voltage. But many listeners do not fully appreciate this point, and the result is that the battery lasts only a very short time.

### The Low-tension Battery

Now consider the low-tension battery. Many misnomers apply here. It is not even a battery, as a rule, but just one cell. Accumulator and storage battery are two of the most common names for the secondary cell or battery used to heat the filaments of the valves in the set.

Neither term conveys the real action of this cell, which really stores energy in chemical form. The diagram Fig. 2 will save much description. A positive lead plate and a negative lead plate are immersed in the electrolyte, a solution of sulphuric acid and water.

The big difference between this secondary cell and the primary cell is that its chemical action is reversible. The secondary cell delivers current through chemical action between the lead plates and the acid solution. But current passed through the cell by the application of an external source of potential difference reverses the chemical action, and so prepares or "charges" the cell for a further delivery of current.

The elements of a secondary cell are not consumed. They are the agents whereby initial electrical energy is transformed into chemical energy, which then reappears as electrical energy when the cell is discharged. These cells are so efficient that almost as much energy can be taken out as is put in.

The voltage of the secondary cell is nominally 2 volts, but it rises to as much as 2.5 during the "putting in" or charging process. During discharge the voltage drops towards the end to 1.85 volts, at which re-charging is imperative for the preservation of the cell.

As in the primary cell, the current output of a secondary cell depends primarily on the size of the plates. To obtain the greatest possible current for a given size of battery, the positive and negative plates are inter-leaved so as to obtain a large area of plate surface (Fig. 2).

Within reasonable limits, it is possible to tell whether a secondary cell is charged (capable of delivering current) or discharged (incapable of further current delivery) by the colour of the plates. When fully charged the negative plates are a characteristic slate grey and the positive plates are a rich chocolate. But when the cell is discharged the positives turn much lighter and assume a greyish cast.

A more reliable way of telling the state  
(Continued on page 712)

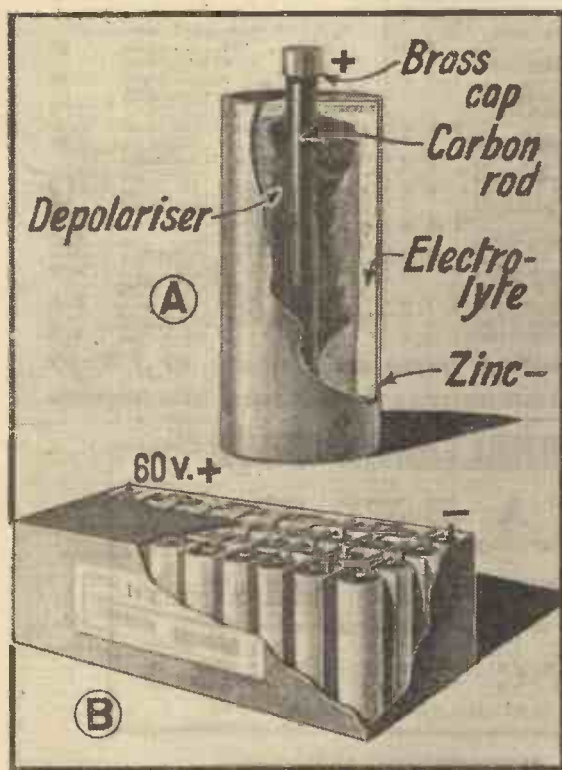


Fig. 1. This picture shows the features of a dry cell and the assembly of a H.T. battery

of its construction—the carbon rod, the zinc container, and the paste electrolyte.

In theory, the current always flows from the carbon to the zinc in a circuit completed outside the cell, and for this reason the terminal on the carbon is always spoken of as the positive and that on the zinc as the negative.

It is unnecessary to discuss here the chemical action which takes place in the cell and by which the current is produced, beyond explaining the purpose of the substance marked depolariser in the diagram. When the cell is in action, hydrogen gas is

**NEXT WEEK : IX—HOW TO CHOOSE THE RIGHT VALVES**



## QUALITY AGAIN

### The SPECIAL TRANSFORMER

used in the  
**POWER AMPLIFIER**  
described in this issue is a

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This Transformer has been specially designed to "A.W." specification

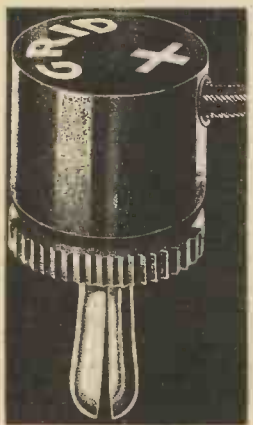
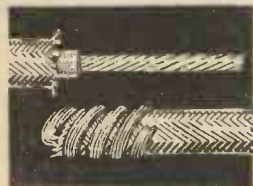
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NIKALLOY renders "Hypermite" the smallest efficient transformer for modern compact set assembly and use with modern valves.

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The leading set makers have chosen "Hypermite" for inclusion in modern receivers—it is specified in most popular circuits—it is indisputably the best at its price.

Resistance primary D.C. 1,000 ohms.  
Resistance secondary D.C. 6,000 ohms.  
Inductance primary 50 henries.  
Ratio  $3\frac{1}{2}$  to 1.  
Dimensions overall  $2\frac{1}{2} \times 1\frac{1}{8} \times 2\frac{1}{2}$  high.  
Weight 7 oz.  
Mounted in a neat bakelite case.

# 12/6

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## "HOW YOUR BATTERIES WORK"

(Continued from page 710)

of the cell is by testing the specific gravity of the electrolyte. During discharge the specific gravity falls. Assuming the acid is 1.22 when the cell is fully charged, as it should be, the indication that the cell requires recharging will be the drop in specific gravity to 1.17. With a hydrometer the exact specific gravity can be read as required.

If the capacity of the battery is known, (and this is usually stated on the case), and the filament current consumption is also known, it is a simple matter to work out how long the cell will last per charge. The capacity is stated in ampere hours. The filament consumption is reckoned in amperes or fractions of an ampere. So by dividing the ampere-hours of the cell by the total amperes consumed by the filament, the quotient will be the number of hours the cell will last before needing another charge.

Candour in advertising, as found in a Scottish shop window: "Prepare for long, dreary evenings with a wireless set."

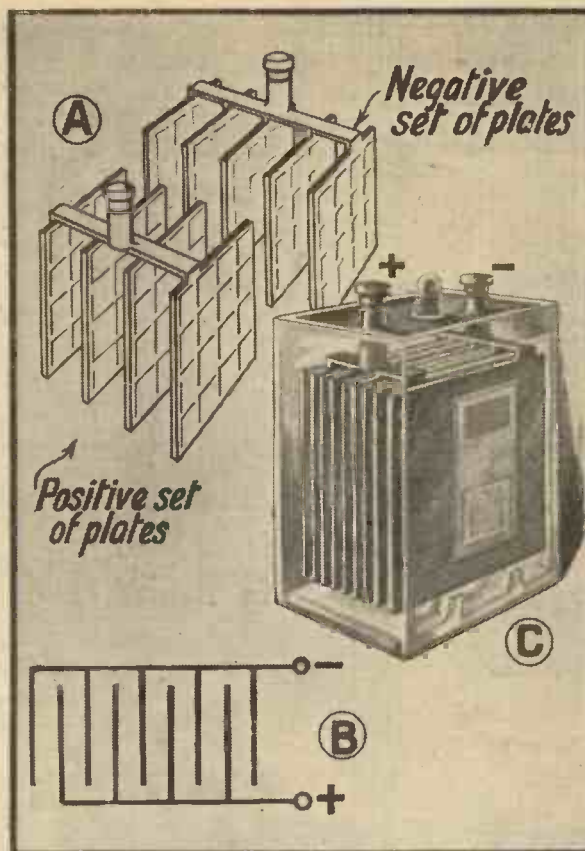


Fig. 2. Here are the constructional features of the accumulator. Note how the positive and negative plates are interleaved

## FIRST SCOTTISH NATIONAL RADIO EXHIBITION

ARRANGEMENTS for the first Scottish National Radio Exhibition, to be held in the Waverley Market, Edinburgh, from November 12 to 22 next, are now practically completed.

The exhibition is to be opened at 2 p.m. on the 12th by the Right. Hon. Thomas B. Whitson, the Lord Provost of Edinburgh, with David Cleghorn Thomson, Esq., the B.B.C. Scottish regional director, in the chair.

The B.B.C. exhibit is to take the form of a complete studio, from which actual broadcasting will take place every day in full view of the visitors.

Practically all the available space in the hall has been allocated.

In view of interference by the Oslo transmitter, Hilversum has abandoned the 1,071-metre wavelength for the present and transmits throughout the day on 299 metres. Scheveningen-Haven, for commercial purposes, still works on 1,071 metres.

## NEW PAROUSSI ELIMINATOR

IT should be noted that the eliminator shown in the Paroussi advertisement on page 637 of "A.W." No. 437 is for direct-current mains supplies only. The address of Messrs. E. Paroussi is 10 Featherstone Buildings, High Holborn, W.C.1.

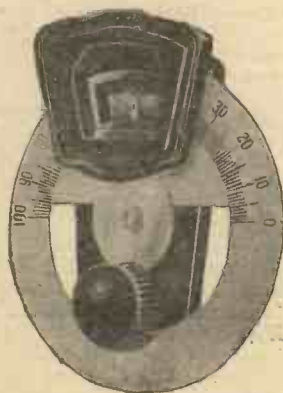


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Here are three popular J.B. Precision Instruments. J.B. Drum Dials are unsurpassed for smoothness of action and freedom from slip. There are two models. The smaller model can be supplied for illumination without extra cost.

The J.B. range includes three types of Thumb Controls. The Dual Thumb Control, costing 8/6, can be used to convert two J.B. Universal Log Condensers into a Dual Gang Unit.

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Will fit any panel up to  
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with lamp holder, 5/-  
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Drum diameter, 4 in. Ver-  
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J.B. THUMB CONTROL  
Type No. 3, Dual. May  
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ers, making Thumb  
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New dual range coil  
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high and low waves.  
Super-selective.  
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Tunewell Trans-  
former. Ratios 3 to  
1 and 5 to 1.  
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Tunewell range of  
Speakers, including  
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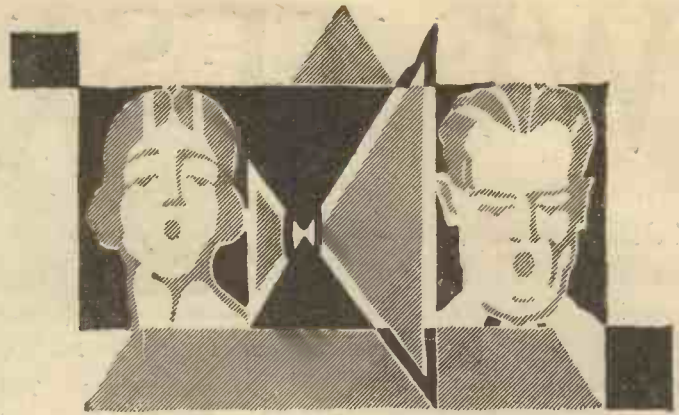
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Centre-tapped and X  
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FAVOURITE.

Prices from 1/6  
Condensers, .0005,  
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3/11 each  
H.F. Chokes—97%  
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PRINCIPLE OF SOUND  
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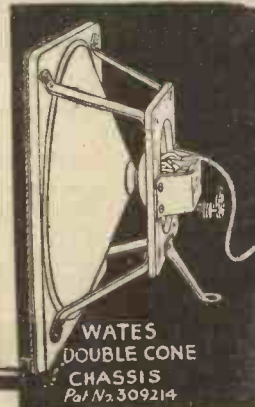
The large cone responds to the lower frequencies and the small one to the upper registers, with a purity and fidelity that immediately transforms your speaker into a superb instrument, with a range of tonal quality that will amaze you.

Buy the Wates Chassis now, and for a few shillings enjoy fifty per cent better results. Supplied complete with screws, extension piece and fully detailed instructions for fitting to all popular units.

READ THE EXPERT'S REPORT ON  
PAGE 714 IN THIS ISSUE.

This report is your assurance of the high performance that is claimed for this fine chassis.

From all Radio Dealers or if any difficulty write direct for particulars to:—



The Standard Battery Co.  
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PRICES: £ s. d.	
Wates Chassis, 12"	11 6
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new components



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

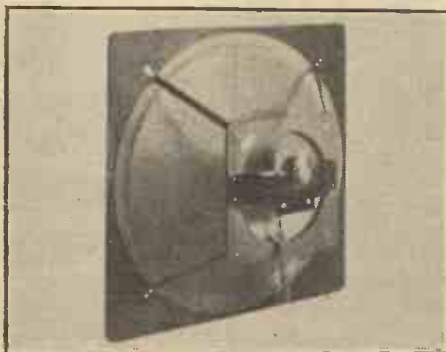
## Wates Double-cone Speaker

THERE are some who consider that the normal cone speaker has now been fully developed, and that further improvements must be sought from other speakers such as the moving-coil type. In view of great improvements made in the design of certain cone speakers during the past few months, it is very doubtful if this theory is correct. It seems more logical to presume that the moving-coil speaker has set a standard which normal cone loud-speakers are struggling to reach.

We were agreeably surprised on testing the latest Wates double-cone chassis fitted with the Wates four-pole unit. The diaphragms in this chassis are made of a stout material, and the one received for test has a large diaphragm of  $17\frac{1}{2}$  in. diameter, the smaller being  $7\frac{1}{2}$  in. diameter. The apexes are clamped together to the armature spindle of the four-pole unit, and a double adjuster is provided with

suitable stops. The framework is of wood, held together by metal strips.

On testing this speaker on a normal two-



A fine speaker—the new Wates double-cone

valve set and on our super-power amplifier, we were impressed with the sensitivity and,

secondly, with the volume obtainable without distortion. The general tone is fairly low-pitched, but it is not in the last "boomy." The speaker having passed these tests satisfactorily, we applied some two watts of undistorted power to it. The volume under these conditions was such that on the lowest notes the armature had a certain tendency to touch the pole pieces with a violent rattle, and it was necessary to remove one of the stops on the control to prevent such an occurrence. After this had been done, it was found that the volume was astonishingly great, without any predominating resonance. On first impressions one could easily mistake the results as coming from a moving-coil speaker, while the actual volume output was greater than our standard moving-coil loud-speaker. We have no hesitation in recommending this speaker which sells in chassis form for £2 2s. 6d.

(Continued on page 716)

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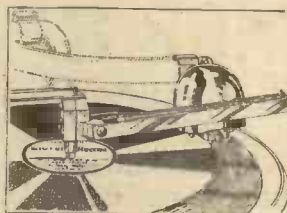
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## Use of Patents in the Manufacture of Broadcast Receivers



THE GRAMOPHONE COMPANY LIMITED  
MARCONI'S WIRELESS TELEGRAPH CO. LIMITED  
and  
STANDARD TELEPHONES & CABLES LIMITED

have pleasure in announcing that they have made arrangements which they think will be of benefit to the Trade in general, whereby patents owned or controlled by any or all of the three Companies, including those resulting from the extensive research facilities at their disposal, will be available for use by Licensees through a single organisation.

Applications for a joint licence by the three Companies are invited from interested manufacturers of broadcast receiving apparatus. Such applications should be addressed to Marconi's Wireless Telegraph Company Limited, Marconi House, Strand, London, W.C.2. In approved cases a licence will be granted which will be generally similar as regards conditions and field of use to the licence hitherto issued by the Gramophone and Marconi Companies jointly and known as Type "A3."

All present holders of the usual "A3" Licence will be able to obtain the benefit of patents owned or controlled by Standard Telephones and Cables Limited without any increase in the rates of royalty and they will receive a communication upon the subject in the course of a few days.

In conclusion, the above mentioned three Companies wish to give special notice of their combined intention to take such action as they may deem necessary to protect their own and their licensees interests in regard to the patents in question.

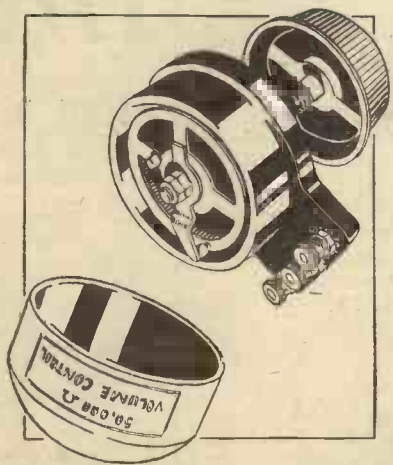


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Graham Farish made it just so.

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FARISH**  
BROMLEY, KENT

**42/-**

## "WE TEST FOR YOU"

(Continued from page 714)

### Exide Unspillable Accumulator

THE widespread popularity of portable sets in this country has resulted in the design and gradual perfection of special parts for such sets. Of particular importance is the unspillable accumulator, since the escape of acid is detrimental in the extreme.

There is no doubt that Exide Unspillable Accumulator model C.P.2 is a very efficient article of its kind. During the time this article was in our hands, we did all that was reasonably possible to persuade the acid to spill, happily without success. It was carried for distances upside down, was tossed up, and was even dropped on the



For transportable-set users, the Exide non-spill accumulator

ground, without any sign of acid leakage.

This particular portable model has a capacity of 16 ampere hours actual.

On test at a rate of  $\frac{1}{2}$  an amp. discharge, we obtained somewhat over the capacity rating of 16 ampere-hours, indicating that the accumulator is conservatively rated.

### R.I. Varicap Condenser

ONE of the neatest preset condensers that we have tested is the Varicap, made by Messrs. Radio Instruments, Ltd.,

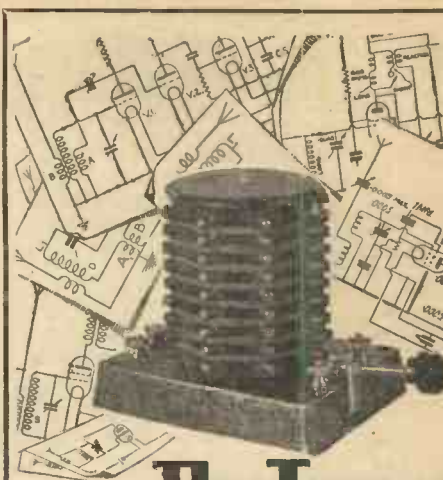
It occupies a baseboard space of  $1\frac{1}{4}$  in. by  $\frac{3}{4}$  in., and is fitted with an insulated adjusting knob and locking nut. The two terminals are arranged diagonally.

The plates contained within are made of phosphor-bronze, with mica separation. The top plate is of considerably greater thickness, and is fitted with an inlaid steel bearing to take the pressure of the adjusting screw. The top plate has considerably more movement than the other plates, and therefore provides a fine variation of capacity at



The R.I. Varicap—a well-made preset condenser

the minimum values. The component, which was rated to have a capacity of .0003 microfarad, exceeded this value on test. The capacity was measured on the laboratory bridge, and was found to range from .000033 to .00049 microfarad. The price is 2s. 6d.



## The Tuner for ALL circuits

This tuner is practically indispensable for all circuits now that the new broadcasting arrangements are being developed.

The Watmel Tuner selects—it gives absolute separation. It is efficient—volume and tone do not suffer. Its special winding and loose aperiodic coupling make it a Universal Dual-range Tuner and a wavetrap as well.

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Inductance - 200,000 mh.  
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M.C.14



## "ADDING A PICK-UP TO THE CHALLENGE FOUR"

(Continued from page 708)

will be obtained from the battery set and a pick-up is well worth trying if you play gramophone records. The cost is not very great and the wiring is straightforward.

A good jack should, of course, be used, as should a fault occur after a time repairs

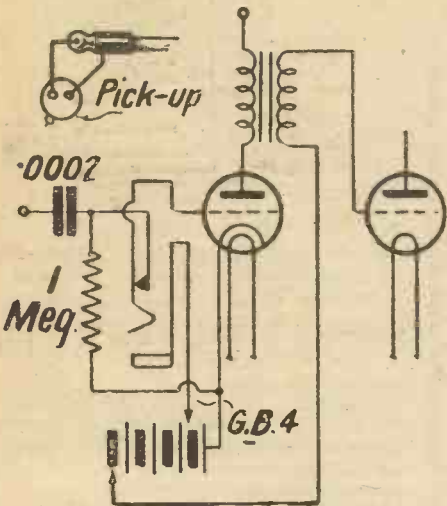


Fig. 2. Circuit showing connections of pick-up for mains model

would be difficult without taking the front panel off. When wiring the jack follow the general instructions given when building the set and first join the wires to the jack. Afterwards, when the jack is in position in the set, the ends of wire can easily be taken to the various parts on the baseboard.

A record will be created at the B.B.C. Symphony Concert at the Queen's Hall on November 12, when Bach's six Brandenburg Concertos will be performed, all in one evening. Harold Samuel, Keith Falkner, Arthur Catterall, Alec Whittaker, Ernest Hall, and Aubrey Brain will be the soloists and Sir Henry Wood will conduct.

In the Kolster Brandes advertisement in our issue of November 1 the price of the K.B.232 attracted-armature type cone speaker should have read £3. and not £3 3s., as printed.

## When Asking Technical Queries

PLEASE write briefly

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

# RECOMMENDED BY WESTINGHOUSE IN EVERY CIRCUIT



**THE NEW REGENTSTAT**  
Totally wire-wound.  
Resistance value ranging from 500 ohms to 180,000 ohms. In two types.  
Prices 9/6 and 11/6.



**REGENTONE  
POWER TRANSFORMERS**  
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Prices 12/6 to 35/-



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The "Regentstat" variable wire-wound resistance offers advantages not obtainable with the fixed type where it is not possible to calculate the resistance with reasonable accuracy. It is particularly useful where a fine adjustment of the voltage is required as in the case of a screen-grid potentiometer tapping, etc.

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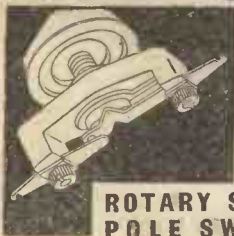
Regent Radio Supply Co., 21, Bartlett's Bldgs., Holborn Circus, London, E.C.4.

Tel.: Central 8745 (5 lines).

Irish Free State Distributors: Kelly & Shiel, Ltd., 47 Fleet Street, Dublin



## Colvern's new lines

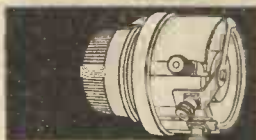


### ROTARY SINGLE POLE SWITCH

A make - and - break switch. Smooth rotary movement, spring action, self - cleaning, pressure contacts. Price **1/3**

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Action as above. Suitable for wave-changing and adaptable for ganging. One hole fixing. Price **2/6**



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## COLVERN RADIO

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THE COLVERN BOOK SENT FREE ON REQUEST.

## Postcard Radio Literature

### For Set-builders

**I**F you want to save trouble in making up your new set, and in fitting it with a cabinet, then you should get in touch, through my free catalogue service, with Messrs. F. Digby, the cabinet people. Cabinets can be supplied to match furniture, and panels can be cut to fit. An illustrated catalogue is available. **86**

### Ekco Easy Payments

You can now purchase practically any Ekco mains unit on very easy hire-purchase terms. I have just been glancing through the form which you have to fill in, and it is one of the simplest of this kind which I have seen. The whole business is quite straightforward. **87**

### The Lively "O."

It is not often that one sees anything really new in accumulators these days, but the Oldham Lively "O" series surprises me as having some interesting new features. These new accumulators have some very commonsense points about them. **88**

### The Dawn!

Under the title of "The Dawn of Better Radio" is produced a very attractive catalogue of the sets manufactured by Electrical & Radio Products, Ltd., of Horley, Surrey. The E.R.R. range includes portable sets, transportables, table models, and radio gramophones. This is worth seeing. **89**

### Coil Problems

Many people have their coil problems these days owing to the need for sharper tuning. On this account the new Colvern booklet is well worth seeing, because not only does it tell of all the new Colvern coils, but it shows how provision is made for a special degree of selectivity. If you are bothered with Brookmans Park get this booklet. **90**

### New Parts

A little booklet well worth having for your file is that produced by Ediswan. This gives details of sets, R.K. speakers, handy small components and gramo radio apparatus. **91**

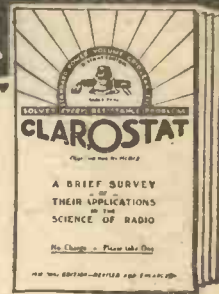
### Connections

My friend, Mr. E. M. Lee, of Belling and Lee, Ltd., has written a useful booklet on terminals. This is not just a catalogue of Belling-Lee products, but it gives some really useful advice. **92**

### GET THESE CATALOGUES FREE

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.

## The 1930 CLAROSTAT BOOK



### FREE!

This new 48-page Wonder Booklet is of vital importance to every "Radio" Enthusiast.

It contains over 100 illustrations and 66 exceptionally useful circuits covering the correct construction of D.C. and A.C. H.T. Eliminators using all types of Rectifier, such as Valve, Discharge Tubes, or Metal Rectifiers; Advice re Smoothing Circuits; Construction of L.T. Eliminators; Construction of A.C.-operated Amplifiers; 24 circuits covering the correct use of High-resistance Potentiometers for Volume Control, Reaction, Screen-grid Adjustment, Grid-bias Adjustment, Speaker Control, Improvements in Amplifiers, etc.; Mains Switches and their Uses; information re New Chokes, New Pick-ups, New Amplifiers, New Gramophone Motors, etc., including grid-bias resistances, grid-bias rheostat, and 30-ohm Hum-Dinger specified in the excellent "Amateur Wireless" Standard Amplifier.

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### UNSOLICITED TESTIMONIALS

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Special Screen and Aluminium Foil, 3/-  
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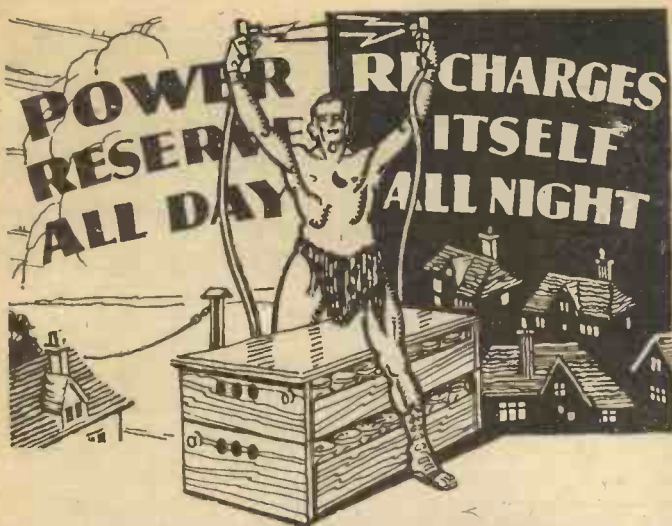
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Though mains supply for your set may not be available in your district, you can enjoy trouble-free H.T. supply for twelve months or more with the added benefit of the smooth, unfluctuating flow of power from a Standard Cartridge type Wet H.T. Battery. Millions of Standard Cells are in daily use with thousands of users who were determined to stop wasting money on costly dry batteries. Why continue to suffer the inconvenience of wasteful dry batteries! Install the Standard for 7/6 down and get wonderfully improved reception—without trouble.

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Pls. send booklet and details of 2-tray battery  
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7/6 DOWN and five monthly pay-  
ments of 7/6. Cash £2 2 11.  
Spare No. 2 cells, 15 Volt,  
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of any voltage  
supplied.

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FROM  
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## Sponsored Programmes

SIR,—In Mr. Alan Hunter's article in a recent issue of AMATEUR WIRELESS he refers to the Continental programmes of the "sponsored" type as being on the "wrong lines"; jazz and light music not being up to B.B.C. standard (whatever that is), and too much advertising clap-

trap. He also says the orchestras are mediocre.

I cannot possibly agree with Alan Hunter in his statements, as I find the jazz is generally the same—foxtrots, waltzes, etc.—as our old friend Jack Payne gives us, or else records by H.M.V., Columbia, etc., as played to us by Chris

Stone (long may he "play")

As to the advertising clap-trap, in two hours' broadcast this evening I timed the announcements, and the total time was 9 min. 36 sec.; this included the final announcements and a request for a post-card to the firm sponsoring the programme containing criticism and suggestions for

## CHALLENGE

## H. &amp; B. SPECIAL KIT

	£	s.	d.
1 Ebonite Panel, 16 by 8 (Trelleborg)	0	5	4
1 Polar Two Gang .0005 with Drum Dial	0	18	6
1 Polar .0002 Differential Condenser	0	5	6
1 Regentstat 120,000 ohms	0	9	6
1 H. & B. Screen and Foil exact to specification	0	2	6
1 Pair H. & B. Panel Brackets	0	1	3
1 Pair H. & B. specified Coils	1	1	0
1 W.B. Universal Valve Holder	0	1	3
2 Telsen 4 Pin Valve Holders	0	2	0
1 Lissen .0003 Fixed Condenser	0	1	0
1 Lissen 1-meg. Grid Leak	0	1	0
1 Lissen Grid Leak Holder	0	0	6
1 Lissen 2-microfarad Fixed Condenser	0	3	6
1 Lissen .0002 Fixed Condenser	0	1	0
1 Lissen 1-mfd Fixed Condenser	0	2	6
1 R.I. Hypermu Transformer	1	1	0
1 Lewcos H.F. Choke	0	7	9
1 On-off switch	0	1	3
1 Igranio Pre-set .00015 mfd max.	0	2	0
2 Junit Terminal Blocks	0	1	4
4 Terminals (Belling-Lee)	0	1	6
7 Spade Ends and Wander Plugs (Belling-Lee)	0	1	11

CASH PRICE £5 13 1

Included in this kit, all necessary wire, screws, and baseboard. Panel is drilled ready.

## CHALLENGE FOUR AND THREE COILS



2 Matched Coils for Challenge Three, £1 1s. 0d. pair, post free.

3 Matched Coils for Challenge Four, £1 11s. 6d., post free.

Trade supplied. Immediate delivery

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1 Set of Screens and Foil with earthing terminals and screws, 2/6 post free.

1 Set of Screens for Challenge Four, complete with foil base and screws, 3/9 post free. Trade supplied.

3 Mullard or Mazda Valves. £1 19s. extra. Hand Polished Oak Cabinet, 17/6 extra.

If it's Radio it's H. & B. Carriage paid on all cash orders. C.O.D. charges paid on orders over £1.

**H. & B. RADIO CO.,**

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**EBONITE  
PANELS**

British Made.



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LOW LOSS  
FORMERS  
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Choke Formers**

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Illustration shows  
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good item  
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*Player's  
Please*

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*It's the  
Tobacco that Counts*



its improvement. All this in two languages, mark you! Is this so terrible?

R. H. (Hereford).

### "A.W." Linen-diaphragm Speaker

SIR,—Re "A.W." Linen-diaphragm loudspeaker, there is no doubt it is the finest ever. I made one, 22 in. inside frame. I have heard moving-coil speakers, but none with the happy medium that your design furnishes. I have had a set since pre-broadcasting B.B.C., and I am only just hearing music as it ought to be. I have made an alteration in the means of fastening wire by using a washer with a hole drilled at each side, through which the wire is passed.

E. W. (Alfreton).

### Talkie Speakers

SIR,—Having charge of a talkie installation, I was surprised, on reading "Thermion's" notes on speakers in use in cinemas, to find that he omitted to mention the directional baffle which is used on R.C.A. equipment.

On a recent test this type of speaker was proved to have a wider frequency range than the exponential horn, which results in a more natural tone without any metallicness.

Using an 8-in. cone (moving coil) with a 6-ft. deep directional baffle, one gets crispness of speech without losing the tone in music, which happens when an exponential horn is used.

For the exponential horn it must be said that it gives greater volume than the directional baffle for a given input.

"Thermion" states that frequencies above 5,000 are usually lost. This is due in the majority of cases to ineffective type of photo cell employed.

There are only two types of P.E. cells, potassium and casium having a straight-line response, the others having a peak of about 2,500 cycles.

With most talking films (sound film or disc) the bass is over recorded, making it necessary to use a tone control to by-pass some of the bass, to render speech intelligible. This is most important when a cone speaker is being used.

G. E. D. (Gravesend).

### THE B.B.C. CONCERTS

I WALKED under the Waterloo Road to the converted warehouse that the B.B.C. is using as a studio, to watch the first of the new Sunday night concerts. It is a big room, below the surface of the river, capable of holding at least two full orchestras, and simply but very effectively decorated with a vast green carpet, green painted girders, and cream walls.

The concert itself was well planned, but so far the orchestra, under Dr. Adrian Boult, has not quite got into its stride. The "Unfinished Symphony" was a tame affair, and so was "Fingal's Cave," at the second Queen's Hall concert.

The "Eighth Symphony" at the Queen's Hall, was dull, both in its fast and its slow periods, but there was life in the Tchaikowski B-flat minor concerto. Rubinstein puts the fascination of doom into his Tchaikowski. It was a tremendous performance.

L. R. J.

**Everyone wants the best** in radio. So everyone wants the Six-Sixty Mains Valves. But you must

### Convert your battery set

to all-mains operation. It is so simple with the Six-Sixty A.C. All-Mains Conversion Equipment. No internal wiring alterations. Dimensions of complete equipment do not exceed the batteries replaced. Price Mains Unit only (H.T., L.T., & G.B.) £6 : 6 : 0. Complete Conversion Equipment from £8 : 5 : 0. Think of the added power, range, selectivity, convenience and delight of

**All-Electric operation** and write for our **FREE literature** of the whole Six-Sixty range.

**SAY SIX-SIXTY**  
(E.V.A. RADIO VALVES AND EQUIPMENT)

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A handy book telling in plain, non-technical language all that the average man needs to know about Wireless.

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**STANDARD WET H.T. BATTERIES.** 144 volts, 20,000 m/a. Cash price £4 2s. 0d. Other voltages and capacities available, detailed prices on application.

Balance in 11 monthly payments of 7/6

**EKCO 3F.20 H.T. ELIMINATOR.** 20 m/a. Tappings for S.G., 60 volts and 120/150 volts. For A.C. Mains. Cash price £3 19s. 6d. Balance in 11 monthly payments of 7/4

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(Established 1924) Telephone: CENTRAL 2716



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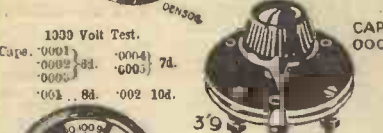
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! OF COURSE!**



Drum Dial, Illuminated	..	8/8
With One Condenser	..	13/-
With two ditto as Twin Gang		17/6



Made of  
Best Mica  
and  
Finest  
Bakelite.



VERNIER DIAL of our  
35  
Lines

CAPS.  
.0005  
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.00025  
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MAX  
F .0001 1/8, J .0008  
G .001 1/8, H .002



**GOLDEN SQUARE**  
**Piccadilly Circus**  
**LONDON**  
C.F.S.      **Gerrard 1863**

# RADIOGRAMS

A TOC H message by the Rev. P. B. Clayton will be relayed from the Albert Hall to the National transmitters on December 6.

Three new musical productions are in preparation for the microphone. *Mizzi*, a musical romance by John Watt, owes its melody to Viennese composers of the Strauss type; *Phi-Phi*, with book and lyrics by Holt Marvell, will include numbers from the delightful opera of the same name; *Evelyne*, adapted by John Watt from a German play, is syncopation up to date.

One of the most important series of talks that the B.B.C. has yet undertaken will be opened on November 10 by Professor Arnold Toynbee, his title being "World Order or Downfall?"

The Birmingham Grand Opera Society is an old friend at the Midland Regional station. Its performance of Gounod's *Faust* on November 13 will remind many listeners of the company's presentation several years ago of *Faust* in modern dress. Faust was a modern young man, while Margherita still had a Victorian coyness, although her frock was short! Some of the cleverest members have been chosen for the performance on November 13.

The "Duds" Concert Party, which is to broadcast for Midland Regional listeners on November 15, was formed by members of a battalion of the King's Liverpool Regiment. After the War the party was reorganised and at least four of the original members will be heard.

Jack Venables, who is frequently heard in Midland Regional vaudeville as a syncopated pianist, will give a recital for Midland listeners on November 18. He was one of the first artistes in syncopation to broadcast from the old Witton station.

"Stars of the Past" is the title of a Midland Regional programme to be given by Sara Sarony and Sydney Lester on November 17. Miss Sarony has done a good deal of broadcasting since she left the stage a few years ago. She has made a name among listeners for her imitations of famous personalities.

The National Orchestra of Wales concert at the Park Hall, Cardiff, on November 16, will be relayed. The vocalist will be Percy Heming.

On November 18 the third relay for the season of the Scottish Orchestra will be taken from St. Andrew's Hall, Glasgow, and broadcast to the Scottish Region. The programme consists of the Overture, *The Siege of Corinth*, by Rossini, the Symphonic Poem, *In A Summer Garden*, by Delius, and the *Jupiter* Symphony, by Mozart. Again the Orchestra will be under the direction of the British conductor, John Barbirolli. The relay will be preceded by a short song recital given by Philip Malcolm.

The Post Office direction-finding van is visiting the Cardiff area at present and is having a very busy time !

(Continued on next page)

# FIVE YEARS GUARANTEED

**T**HERE is a five years' guarantee behind the new W. B. Permanent Magnet Moving Coil Speaker. The massive Sheffield-made Magnet of Cobalt Steel, weighing 10½ lbs., needs no energising from the mains. Its powerful field ensures sensitivity and adequate volume.

Hear the new W.B.  
Permanent Magnet Mov-  
ing Coil Speaker yourself:



**Mahogany**  
**£8:18:6**

**Oak Cabinet**  
**Model**  
**£8:8:0**

Also  
available in  
chassis form  
with 14 in.  
baffle  
**£6:6:0**

Made by the makers of the famous W. B. Valve holders

WHITELEY BONEHAM & CO., LTD., NOTTINGHAM ROAD,  
MANFIELD, NOTTS.

**The ACTUAL  
MANUFACTURERS OF THE  
NEW "A.W." LINEN  
DIAPHRAGM  
LOUD - SPEAKER**

This entirely new-principle Linen Diaphragm Loud-speaker, constructed entirely of Kone Done components, was the biggest attraction at Olympia and Manchester where it drew enormous crowds to the "A.W." Stands. The reproduction and tone of this speaker is far in advance of any yet designed and is equal to, if not better than the majority of moving-coil loud-speakers. Owing to the tremendous demand for this new speaker slight delays in delivery have been unavoidable, but now that an increase in premises and staff has been made we are in a position to execute all orders without delay.

Complete Speakers, ready for mounting unit,  
can be supplied immediately.

Size 14 in. x 14 in. 17/6 post free  
Size 14 in. x 16 in. 18/6 post free  
Size 16 in. x 16 in. 19/6 post free  
Size 16 in. octagonal 22/6 post free  
Size 24 in. x 24 in. 25/- post free

For constructors who wish to assemble their own speakers, kits of parts can be obtained immediately.

Size 14 in. x 14 in.	15/8 post free
Size 16 in. x 16 in.	17/6 post free

Complete Speakers and Kits are guaranteed to be exactly as the original made for "Amateur Wireless." Other sizes made to customers' requirements. Write for quotation.

K.D. Double Magnet Loud-speaker Unit, very powerful, 15/6, post free. The JUNIOR Unit is 9/8 post free.

Specially Doped Linen, 5/- per square yard.  
Dope, 6d. and 1/- per bottle; postage, 3d. extra.  
Double cone chucks, 1/- each post free.

Post your order now and enjoy perfect reproduction:  
**KONE-DOPE CO.,** 54 IDMISTON ROAD,  
 STRATFORD. E. 15

**KONE-DOPE CO.**

54 IDMISTON ROAD,  
STRATFORD. E. 15



The eve of Armistice Day is a suitable time for a short concert of music which was popular during the war years. The Northern Wireless Orchestra will play selections from some of the most popular revues of the day in the North Regional programme on November 10.

Chamber music will be the order of the day at the Manchester Tuesday Mid-day Society's concert on November 11. The artistes are Johan C. Hock, 'cellist, and Tom Bromley, pianoforte.

On November 11, the Rev. E. C. Tanton will give the last of his series of talks for North Regional listeners on "The Northern Region in Famous Books."

The Black Dyke Mills Band is one of the greatest Yorkshire Brass Bands. On November 13 a concert will be given by the Band from the Leeds studio.

On November 15 the Northern Region will hear a talk on "Gliding" by Mr. Norman Sharpe.

The Birmingham Grand Opera Society will visit the studio of the Midland Regional station to broadcast a performance of Gounod's *Faust* on November 13.

Beginning with the New Year a new style of vaudeville entertainment will be introduced into broadcast programmes. For this purpose three or four artistes will be specially engaged, their ever-changing material being prepared for them in the B.B.C. offices. These repertory artistes will be supported by leading "stars" from the music-halls.

The Czechoslovakian broadcasting stations, with a view to economy, have decided to specialise in their transmissions. Prague, with its studio orchestra of forty-two musicians, in future will provide all symphony concerts. Dance melodies will be supplied by Moravska-Ostrava, and Brno and Bratislava will hold themselves responsible for the light and popular musical broadcasts.

Neuilly-Plaisance, a small transmitter in the immediate neighbourhood of Paris, broadcasts musical entertainments every Sunday morning between 10 a.m. and midday on 308 metres.

Exactly on the Leeds wavelength, a private transmitter at Roubaix (France) puts over gramophone records every Saturday between 6 and 8 p.m., and again on Sundays between 11 a.m. and midday. The call, given out between items, is as follows: "Ici station d'émissions du Radio Club du Nord de la France, 55 rue du Marechal Foch, Roubaix."

As an opening and interval signal, Brussels No. 2 has adopted a few bars of the Preludium of the Malines Cathedral carillon.

The new Velthem (Louvain-Belgium) broadcasting station now tests every Tuesday afternoon from midday until 2 p.m. G.M.T. Transmissions are carried out both on 338.2 metres and on 508.2 metres.

Radio Strasbourg, at present testing on 346 metres, is to be officially inaugurated by the French State authorities on Armistice Day (November 11). The broadcast will be relayed simultaneously to all French State transmitters.

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See important announcement on page 723.

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The construction of the new 60-kilowatt German transmitter at Durrmenz-Muehlacker is rapidly nearing completion, and it is hoped to bring it into regular operation in the course of this month. It will work on the Stuttgart wavelength.

The Dundee Town Council has refused an application for permission to install a radio-relay service in the city. The erection of private lines across the street was the principal cause of objection.

The establishment of the Institut National de Radiodiffusion in Belgium is now an accomplished fact, and the Belgian State Ministry of Posts and Telegraphs will shortly take over the two new broadcasting transmitters now under construction at Velthem, near Louvain. Two wavelengths—namely, 338.2 and 508.5 metres—will be used, the transmissions being put out with a power of 15 kilowatts in the aerial.

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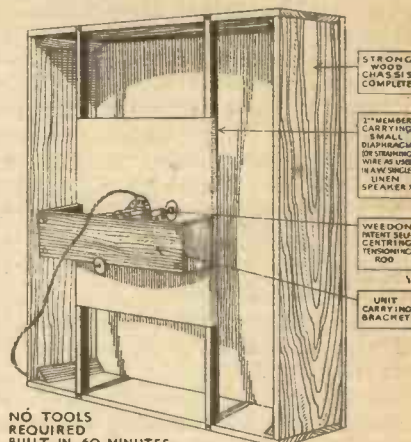


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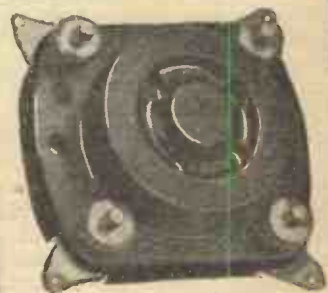
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## B.B.C. NEWS FROM THE NORTH

THE North Regional Director, Mr. Liveing, has been making out forthcoming programme arrangements for the northern stations, and, following his broadcast talk on this subject recently, he explained these schemes in greater detail.

While it is not expected that Slaithwaite will be in full operation before March or April, a fair degree of group broadcasting would be continued during the winter. In particular, the linking together of the Manchester and Leeds transmissions will result in a frequent interchange of programmes between these centres, and as a result of this it is hoped to "tap" the resources of the West Riding far more fully than in past winters.

For instance, the relay of the Huddersfield Choral Society's Concert on November 7 will be the start of a policy for offering listeners an opportunity of hearing some of the famous Yorkshire choirs.

Arrangements have been made for relaying a considerable number of the Hallé Society's concerts on the National and northern wavelengths, four of the Liverpool Philharmonic Society's concerts, and three by the Leeds Symphony Orchestra. In addition, listeners will continue to hear studio performances by the Northern Wireless Orchestra. Thirty of the Manchester Tuesday Mid-day Society's concerts are again being relayed this season.

Among the plays chosen for next season may be mentioned Vincent Douglas's Lancashire play, *The Partners*, Harold Brighouse's *Hobson's Choice*, and *The Northeners*, St. John Ervine's *The Ship*, and J. L. Hodson's war play, *Red Night*.

Durham, Manchester and Liverpool Cathedrals and St. Sebastian's Dominican Priory at Pendleton figure among places of worship from which services will be relayed in the near future.

A competition in connection with the North Regional Children's Hour is open to all schools in the Region who will be invited to submit pageants written specially for broadcasting around any such subjects as towns, castles, or famous personalities of the North.

In addition to music by Bertini's Dance Band, relayed from the Empress Ballroom, Blackpool, dance music by Henry Hall's Gleneagles Hotel Dance Band is also to be relayed regularly from the Midland Hotel, Manchester.

K. U.

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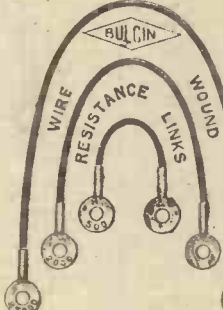
General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets. Contributions are always welcome, will be promptly considered, and if used will be paid for.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," 58-61 Fetter Lane, London, E.C.4.

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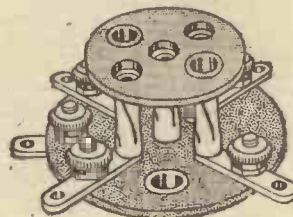
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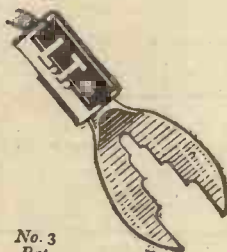
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Foursome Portable (SG, D, 2 Trans) .. .. . WM206 1/6

## AMPLIFIERS

All these 1s. each, post free.  
Utility (RC, Trans) .. .. . AW68  
Hook on Short-wave .. .. . AW104  
Purity Amplifier .. .. . AW108  
Add-on Distance-getter .. .. . AW117  
Screened-grid HF Amplifier .. .. . AW138  
Searcher Unit (HF) .. .. . AW176  
"A.W." Gramophone Amplifier .. .. . AW205  
Beginner's Amplifier (iv.) 9d. .. .. . AW210  
Brookman's Separator (HF Unit) .. .. . AW212  
Two-valve Amplifier .. .. . AW216  
"Mag." Gramo Unit .. .. . AW224  
Audiotrol Amplifier .. .. . WM132  
Concentrator (HF, Unit) .. .. . WM160  
Radio-Record Amplifier (D.C. Mains) .. .. . WM183  
Selecto Amplifier (H.F. Unit) .. .. . WM210

## MISCELLANEOUS

Arcadian Linen-diaphragm Loud-speaker (full-size) .. .. . AW177a 1/-  
Short-wave Adaptor (1 v.) .. .. . AW183 1/-  
Gramophone Amplifier (3-v.) .. .. . AW187 1/-  
High-tension Battery Charger .. .. . AW191 1/-  
Mains Unit for S 8 Valves .. .. . AW193 1/-  
Simplest H.T. Unit .. .. . AW197 1/-  
B.P. Wave-trap .. .. . AW204 -/6  
By-pass Unit (Wave Trap) with copy "A.W." .. .. . AW218 -/4  
Home-constructor's plated paper Loud-speaker .. .. . AW219 1/-  
"Twin" Brookman's By-pass .. .. . AW222 -/6  
"A.W." Paper Loud-speaker .. .. . AW231 1/-  
James H.T. and L.T. Charging Unit .. .. . AW232 1/-  
Simplest H.T. Eliminator for D.C. Mains .. .. . AW234 1/-  
Simplest H.T. Eliminator for A.C. Mains .. .. . AW236 1/-  
Choke Output Unit .. .. . AW240 1/-  
Simple Tester Unit .. .. . AW246 -/6  
"A.W." Improved Linen-diaphragm Speaker .. .. . AW248 1/-  
James H.T. Unit for D.C. Mains .. .. . WM133 1/-  
Short-wave Adaptor for Dominions Four .. .. . WM149 1/-  
Two Ampere Low-tension Unit .. .. . WM147 1/-  
A.C. Mains Amplifier .. .. . WM149 1/-  
A.C. Mains Unit for All-wave Lodestons Five .. .. . WM151 1/-  
H.T. Unit for A.C. Mains .. .. . WM150 1/-  
"W.M." Linen-diaphragm .. .. . WM172 1/-  
Trimmer (Selectivity Unity) .. .. . WM181 -/6  
Brookman's "Wipe-outs" .. .. . WM186 1/-  
Short-wave adaptor for Overseas Five .. .. . WM192 1/-  
Staminator Unit for A.C. Mains .. .. . WM202 1/-  
Universal Push-pull Amplifier .. .. . WM204 1/-  
Outspan Short-wave Adaptor .. .. . WM207 1/-  
"W.M." Standard A.C. Unit .. .. . WM214 1/-  
"W.M." Standard D.C. Unit .. .. . WM215 1/-  
Falcon A.C. Unit .. .. . WM219 1/-

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



# BROADCAST TELEPHONY

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

Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)	Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)	Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)
<b>GREAT BRITAIN</b>				<b>GERMANY</b>				<b>NORTH AFRICA</b>			
25.53	11,751	Chelmsford (G3SW)	15.0	304	988	Bordeaux (PTT)	35.0	363.4	825.3	Algiers (PTT)	13.0
200	1,500	Leeds	0.10	308	973	Neuilly (Paris)	0.3	416	721	Radio Maroc (Rabat)	10.0
242	1,238	Belfast	1.2	309	970	Natan-Vitus	0.5	1,350	222.2	Tunis Kasbah	0.0
261	1,148	London Nat.	68.0	316	950	Marseilles (PTT)	1.5	364	824	Bergen	1.0
288.5	1,040	Newcastle	1.2	328.2	914	Grenoble (PTT)	1.2	366	819.5	Frederiksstad	0.7
288.5	1,040	Swansea	0.10	329	910.3	Caen (Normandy)	0.0	453.2	662	Porsgrund	1.5
288.5	1,040	Stoke-on-Trent	0.10	329.5	869	Strasbourg	15.0	453.2	662	Nidaros	1.2
288.5	1,040	Sheffield	0.10	385	779	Radio Toulouse	8.0	1,071	280	Oslo	0.5
288.5	1,040	Manchester	0.16	447	671	Paris (PTT)	1.0	<b>NORWAY</b>			
288.5	1,040	Liverpool	0.16	466	644	Lyons (PTT)	2.3	214.2	1,400	Warsaw (2)	1.9
288.5	1,040	Hull	0.16	1,446	207	Eiffel Tower	15.0	234	1,283	Lodz	2.2
288.5	1,040	Edinburgh	0.4	1,725	174	Radio Paris	17.0	244	1,229	Cracow	1.5
288.5	1,040	Dundee	0.16	<b>GERMANY</b>				313	959	Wilno	0.5
288.5	1,040	Bournemouth	1.2	31.38	9,560	Zezen	15.0	338.1	887.1	Poznan	1.9
288.5	1,040	Bradford	0.16	218	1,373	Flensburg	0.0	409.8	732	Katowice	16.0
301	995	Aberdeen	1.2	227	1,319	Cologne	1.7	1,411	212.5	Warsaw	14.0
309.9	968	Cardiff	1.2	227	1,319	Münster	0.0	<b>PORTUGAL</b>			
356	842	London Reg.	45.0	227	1,319	Aachen	0.31	240	1,247	Oporto	0.25
376.4	797	Manchester	1.2	232.2	1,292	Kiel	0.3	320	937.6	Lisbon (C14AA)	0.25
398.9	752	Glasgow	1.2	239	1,256	Nürnberg	2.3	<b>ROMANIA</b>			
479	626	Midland Reg.	38.0	246.4	1,217.2	Cassel	0.3	394	761	Bucharest	10.0
1,554	193	Daventry (Nat.)	35.0	253.4	1,184	Leipzig	2.3	<b>RUSSIA</b>			
<b>AUSTRIA</b>				259.3	1,157	Gleiwitz	5.0	720	416.6	Moscow (PTT)	20.0
240	1,220	Linz	0.0	270	1,112	Kaiserslautern	0.25	800	375	Kiev	20.0
240	1,220	Salzburg	0.0	276	1,085	Königsberg	1.7	824	364	Sverdlovsk	25.0
283.6	1,058	Innsbruck	0.0	283.6	1,058	Magdeburg	0.0	938	330	Kharkov	25.0
352	851	Graz	9.5	288.6	1,058	Berlin (E)	0.0	1,000	300	Leningrad	20.0
453	666	Klagenfurt	0.0	316.6	947.6	Stettin	0.0	1,000	283	Tiflis	10.0
517	578.5	Vienna	20.0	318.8	947.6	Bremen	0.3	1,304	230	Moscow-Stschelkovo (C.C.S.P.)	100.0
<b>BELGIUM</b>				325	923	Dresden	0.3	1,380	217.5	Bakou	10.0
206	1,460	Antwerp	0.4	360	833	Breslau	1.7	1,481	202.5	Moscow (Kom)	20.0
212	1,415	Binche	0.2	372	806	Stuttgart	0.0	<b>SPAIN</b>			
210	1,391	Chateaufort	0.25	419	776	Hamburg	1.7	251	1,193	Barcelona (EAJ15)	0.5
243	1,335	Courtrai	0.1	452.1	662	Frankfurt	1.7	260.7	1,125	Barcelona (EAJ13)	10.0
244.7	1,226	Ghent	0.25	473	635	Berlin	0.25	349	860	Barcelona (EAJ1)	8.0
251.4	1,194	Schaerbeek	0.5	533	563	Danzig	17.0	368	815	Seville (EAJ5)	1.5
338.2	887	Brussels (No. 2)	15.0	560	536	Langenberg	1.7	424	707	Madrid (EAJ7)	2.0
509	590	Brussels (No. 1)	1.2	566	530	Munich	0.3	400	653	San Sebastian (EAJ8)	0.5
<b>CZECHO-SLOVAKIA</b>				570	527	Augsburg	0.35	<b>SWEDEN</b>			
263	1,139	Moravska-Ostrava	11.0	570	527	Hauover	0.3	135	2,222	Motala	30.0
279	1,076	Bratislava	14.0	1,635	183.5	Freiburg	0.3	231	1,301	Malmö	0.75
293	1,022	Kosice	2.5	1,635	183.5	Zezen	35.0	257	1,266	Hörby	15.0
342	878	Brunn (Brno)	3.0	1,635	183.5	Norddeich	10.0	300.2	999.3	Falun	0.65
487	617	Prague (Prah)	5.5	<b>HOLLAND</b>				322	932	Göteborg	15.0
<b>DENMARK</b>				31.28	9,599	Eindhoven (PCJ)	30.0	436	680	Stockholm	75.0
281	1,067	Copenhagen	1.0	209	1,004	Hilversum	3.3	542	554	Sundsvall	15.0
1,133	260	Kalundborg	10.0	290	1,004	Radio Idzerda (The Hague)	0.6	770	380	Ostersund	0.75
<b>ESTONIA</b>				1,071	280	Scheveningen-Haven	5.0	1,223.5	244	Boden	0.75
401	748	Reval (Tallinn)	0.7	1,875	160	Huizen	8.5	1,343	222.5	Motala	40.0
<b>FINLAND</b>				<b>HUNGARY</b>				<b>SWITZERLAND</b>			
221	1,355	Helsinki	15.0	210	1,430	Budapest (Csepel)	1.0	318.8	943	Basle	0.05
291	1,031	Viipuri	15.0	550	545	Budapest	23.0	408	743	Berne	1.1
1,796	167	Lahti	54.0	<b>ICELAND</b>				459	653	Zurich	0.75
<b>FRANCE</b>				210	1,430	Reykjavik (shortly testing)	10.0	678.7	454.0	Lausanne	0.0
172.5	1,739	St. Quentin	0.3	<b>IRISH FREE STATE</b>				700	395	Geneva	1.5
200	1,500	Radio Roubaix	0.2	224.4	1,337	Cork (IFS)	1.5	<b>TURKEY</b>			
210	1,430	Radio Touraine	0.2	413	745	Dublin (2RN)	1.5	1,200	250	Istanbul	5.0
222.9	1,336	Fécamp	0.7	<b>ITALY</b>				1,958	153	Ankara	7.0
235.1	1,275	Nîmes	1.0	25.4	and 80	Rome (3RO)	0.0	<b>YUGOSLAVIA</b>			
244.7	1,226	Béziers	0.0	247.7	1,211	Trieste	3.0	306.8	978	Zagreb (Agram)	0.7
249.5	1,202	Juan-les-Pins	0.5	295	1,013	Turin (Torino)	8.5	430.7	696.5	Belgrade	3.0
256	1,171	Toulouse (PTT)	1.0	332	905	Naples (Napoli)	1.7	377.1	519.9	Ljubljana	2.8
265	1,130	Lille (PTT)	1.0	379.5	790	Genoa (Genova)	1.5	<b>Latvia</b>			
272	1,103	Rennes (closed)	1.2	441	680	Rome (Roma)	75.0	525	572	Riga	12.0
286	1,049	Montpellier	2.0	453	662	Bolzano (IBZ)	0.2	<b>Lithuania</b>			
287.2	1,044.6	Radio Lyons	0.5	501	599	Milan (Milano)	8.5	1,985	155	Kaunas	7.0
290.4	1,012.1	Limoges (PTT)	0.08	<b>Latvia</b>				<b>Poland</b>			
299.5	1,001.3	Paris Experimental and on 40.9 m.	3.0	525	572	Riga	12.0	214.2	1,400	Warsaw (2)	1.9
300	1,000	Strasbourg	0.35	<b>Lithuania</b>				234	1,283	Lodz	2.2

## LOUD-SPEAKERS

THE new moving-coil speakers of the permanent-magnet type require no extra current to energise the field-windings, and for this reason are specially suitable for music lovers who do not happen to have access to electric supply mains. The special cobalt-steel magnets give an enormously powerful "field." Though somewhat weighty, the latest models are conveniently compact, the cone being only 6 inches in diameter.

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M. A. L.

## A PICK-UP PROBLEM

IT is sometimes convenient to be able to locate the "record" turntable and loud-speaker in a different room from the wireless set, when this is being used as an amplifier. A long lead, however, usually produces trouble, especially when the pick-up is of the high impedance type. A good plan in these circumstances is to insert a coupling transformer between the pick-up and set, and to earth the primary winding.

M. B.

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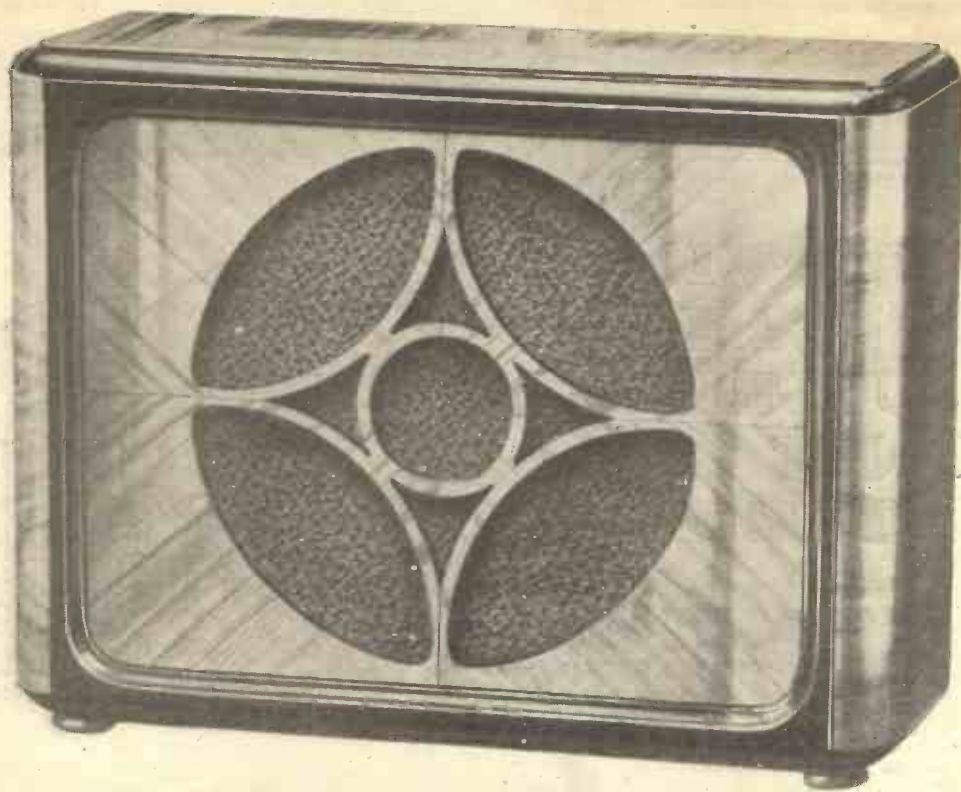
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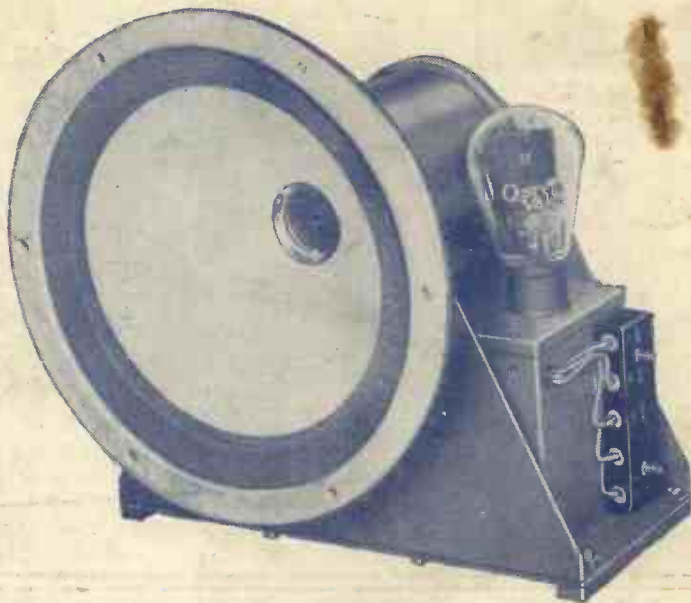
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