Amateur Wireless
October 4, 1930

## A NOVEL SPEAKER IDEA

**LATEST DEVELOPMENTS—HOW YOU CAN TAKE ADVANTAGE OF THEM**

# Amateur Wireless

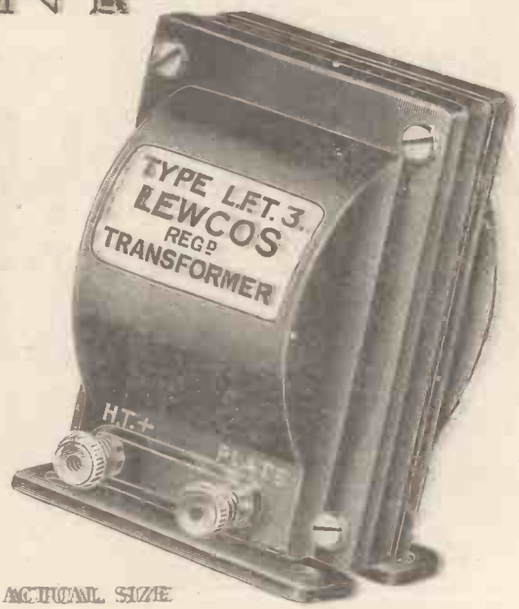
and Radiovision

Every Thursday 3d

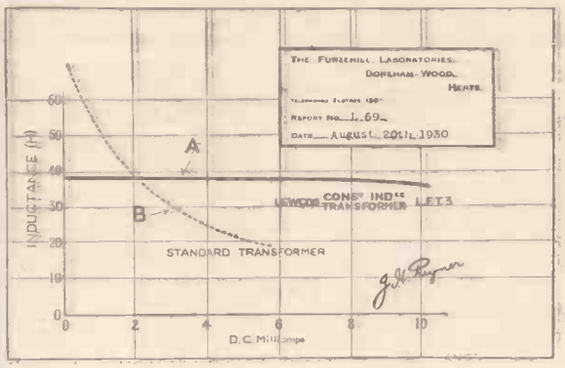
Vol. XVII. No. 434 Saturday, October 4, 1930


Registered at the G.P.O. as a Newspaper

# PREDOMINANT IN ITS OWN SPHERE




ACTUAL SIZE




# The LEWCOS L.F. TRANSFORMER 3

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## *Another Lewcos Achievement!*

The Lewcos L.F.T.3 Constant Inductance Transformer has a constant inductance for different values of anode current.

If a valve takes a mean anode current of, say, 2½ milliamperes, it is quite possible that this current may fluctuate between ½ and 4½ milliamperes when the valve is working on a loud passage of sound. With an ordinary transformer the inductance of the winding is considerably different in the two cases. (See Curve B.)

In other words, the two halves of the low-frequency wave are not amplified equally, introducing marked distortion. This is the reason for the failure of the average radio set to reproduce loud passages clearly, since the transient effects are particularly affected by this lack of symmetrical amplification. If the inductance is constant, however, the amplification remains the same, irrespective of signal strength (see Curve A), so that an instrument such as a piano, which is notoriously difficult to reproduce with standard apparatus, regains its natural tone where the Lewcos Constant Inductance Transformer is employed.

The Lewcos Constant Inductance Transformer maintains its inductance at a high figure up to 10 milliamperes D.C. It will be seen, therefore, that there is no trouble experienced from saturation. This transformer can be used after any normal valve, whether in the first or second stage, since the inductance is high enough for good first-stage working, whilst it is capable of carrying the large anode currents likely to be encountered in the later stages. The turns ratio is 3 : 1, and the Curve A, which is reproduced, has been independently taken by a well-known radio engineer.

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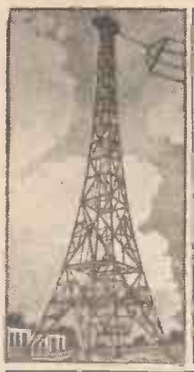
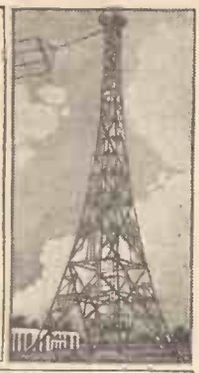
No. 434. Vol. XVII. OCTOBER 4, 1930



# Amateur Wireless and Radiovision



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## NEWS · & · GOSSIP · OF THE · WEEK

### THE AFTERMATH

NOW that the Show is over there is a glorious opportunity for you to put 1931 ideas into practice. "A.W.'s" object is to help you to make the most of these, and in this issue you will find useful advice in an article entitled "The Latest Developments, and How You Can Take Advantage of Them." If you went to Olympia you will find much of interest in "Thermion Looks Back at the Show."

### FORTY "MIKES"!

FORTY microphones were used for the "Diversions" broadcast from the Northern Regional in the National programme last week. Typical aspects of life in the North of England were presented in the programme, which included a relay from the Moor-Head Woollen Mill at Gildersome, in Yorkshire; the arrival and departure of the Mersey ferry boats from the Pier Head at Liverpool; mining incidents from the Benwell Colliery, near Newcastle; and relays from Blackpool, one of the most popular of Northern seaside resorts, which provided excerpts from the Tower Circus and the Palace Theatre, dance music, and "glimpses" of the Pleasure Beach. That is probably the largest number of "mikes" that has been used at a time.

### POOR FOREIGNERS!

THE B.B.C. Advisory Whateveritis on Pronunciation has been kind to foreigners in deciding that Slaithwaite shall, in one form, be called *Slaythwaite* "because it looks like it." What has been forgotten is that most speakers of the Latin tongues cannot manage a proper pronunciation of the "th" part of the word, and they will most likely compromise with "Slaitwaite." The local pronunciation of "Slowit" would be easier for foreigners. "Daventry" is none too easy either, as many foreigners discovered when 5XX started operations.


**Compare this with the Brookman's Park gear! Listeners who went to the Show saw this original 2LO transmitter in the B.B.C. exhibit. It is the transmitter used by the B.B.C. from 1922 to 1925, and has a power of 1½ kilowatts**

### PUSHFUL PUBLICITY

THE B.B.C. may not like radio publicity, but it certainly isn't averse to getting subtle advertisement for its own affairs. For instance, the Press officials at Savoy Hill recently circulated this paragraph about Philip Ridgeway, the producer of several recent broadcast revues: "When Philip Ridgeway gets ideas for songs for his shows he stops whatever he happens to be doing at the time and sings the new tune into a dictaphone. Sometimes ideas come to him in the middle of the night; sometimes he is in his bath. His record time for composing a number is ten minutes and he rarely takes more than fifteen minutes." That sounds very American. We wonder what Ridgeway thinks about it.

### A CANADIAN NIGHTINGALE!

SO many requests for a broadcast of the song of the nightingale have been received from British settlers in Canada by the Canadian National Railways radio people that a novel arrangement has been made. It has been found impracticable to relay a broadcast direct, but a selection of nightingale records has been secured in Miss Beatrice Harrison's garden at Oxted, and these records will be broadcast in one great relay across Canada. Has Canada no bird like the nightingale? We must look up our natural history!

### A CONSOLING THOUGHT

HOW many listeners may have wondered if their sets are so good that they give better quality than the transmitters? A correspondent raised this question recently, so far as the American stations are concerned, and when an "A.W." man asked Savoy Hill what the position is with the new B.B.C. transmitters he was told that not one receiver in a hundred has a frequency range so even as is dealt with in the transmitter.

### NO MORE PRAGUE PLANS

IT will be many years before reception suffers because of defects at the transmitting end, though if any more station-squeezing-in schemes like the Prague

# NEWS & GOSSIP OF THE WEEK—*Continued*

Plan come into being matters will become very difficult for the B.B.C. engineers.

### ABOUT JACK PAYNE

RECENTLY a story was circulating to the effect that when Jack Payne and his band give outside vaudeville shows the B.B.C. shares in the proceeds. Actually, all the B.B.C. gets out of these private contracts is the kudos of advertisement. Within reason, and subject to B.B.C. arrangements, Jack Payne and his band are allowed to make outside contracts for vaudeville shows and gramophone-record recording. It is not the business of the B.B.C. as to how Jack Payne shares profits made from these activities.

### "SONG PLUGGING"

SINCE the B.B.C. gave permission to dance-band leaders in outside places of entertainment to announce the names of the numbers broadcast, there has not been a serious return to the evil of "song plugging," which got so bad before that drastic action was taken by the B.B.C. There is still a certain amount of "song plugging" that the B.B.C. is powerless to prevent. But its action last year clearly showed that it was not a party to the spasmodic plugging that now occurs.

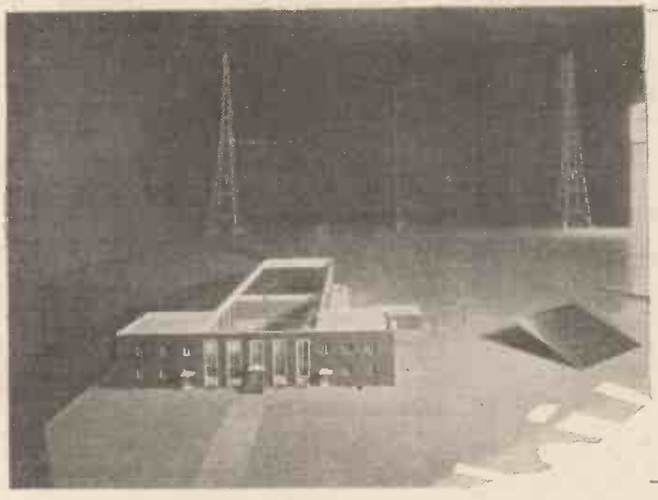
### B.B.C.'s GOOD QUALITY

VISITORS to the Radio Exhibition at Olympia were greatly impressed with the good quality of reproduction given by the loud-speakers on the various stands. Even the very small and inexpensive models sounded fine; to the B.B.C. must be given the credit for this happy state of affairs, for it fitted up a really magnificent amplifying equipment in the gallery.

Although the general level of quality was so good, there was a noticeable difference between music coming from Savoy Hill and music reproduced from gramophone records. The Queen's Hall broadcasts were relayed by the Exhibition loud-speakers in a way that proved the superiority of the studio as compared with the gramophone record.

### THE QUEEN'S HALL

THOSE who have passed by the rapidly growing skeleton of the B.B.C.'s Broadcasting House at Portland Place must have wondered whether the nearby Queen's Hall will be more extensively utilised when the B.B.C. is installed. As a matter of fact the big studios being erected in the middle of Broadcasting House will render the B.B.C. practically independent of outside halls, so it is not likely that they will make expensive arrangements with the concert-halls, as is being done at the present time.



### A REGIONAL SCHEME IN GERMANY

**Germany's "Northern Regional" station in miniature. An architect's model of the new high power station which is to be erected at Heilsberg, near Konigsberg, and which if successful, will replace existing North German stations**

### THE NEXT SHOW

THE next show, of course, is that at Manchester. The seventh of the series of exhibitions promoted jointly by the *Manchester Evening Chronicle*, the Radio Manufacturers' Association, and Provincial Exhibitions, Ltd., will be opened on October 8 by Sir John Reith. This show, which ranks only second to Olympia, will occupy the whole of the ground floor at the City Hall, Deansgate, Manchester. Make a note of the dates —October 8 to 18.

### IS BROADCASTING HOUSE BIG ENOUGH?

THIS is a question that has been asked recently by more than one reader. The B.B.C. states that, so far as it is possible to foresee, Broadcasting House should meet all requirements, even television, if and when it comes. There is not the slightest intention of having outside departments; all the staff is to be accommodated in Broadcasting House. So we may take it that the new headquarters are quite commodious enough.

### B.B.C.'s "MIXING"

ONE aspect of Broadcasting House shows how different is the B.B.C.'s technique from that of the Germans' and the Americans'. We refer to the tremendous number of studios involved in dramatic broadcasts. The B.B.C. dramatic department really is unique in its ability to mix the outputs from several studios when broadcasting plays. The Americans got very muddled when Cecil Lewis went over there to teach them how to work a dramatic mixing board.

### MOORSIDE EDGE—LATEST NEWS

APPARENTLY we have been too optimistic in stating that the Northern Regional station at Moorside Edge will be "on the air" before Christmas. The B.B.C. states that no aerial tests are expected before the New Year. Then the Northern Regional station will start up on 479 metres. Later the Northern National outlet will come in on 301.5 metres.

### CHANGE AT LEEDS

MEANWHILE, in preparation for the proposed Northern reorganisation, Leeds is to take the Manchester programme as from September 28. Up till now Leeds has relayed the National programme, but apparently there has been a lot of agitation in Yorkshire for a change-over. Now we suppose there will be an outcry for Leeds to be given back its National programme! We await the comments of the local wireless correspondents with interest.

**"DX" television has been accomplished by this London amateur, Mr. Douglas Walters, who, on the equipment shown here, has succeeded in picking up American television**

# HERE IS A NOVEL SPEAKER IDEA

*How you can make a Simple Gadget that will improve Speaker Performance*

JUST a little trouble taken with the output stage or with the speaker arrangements improves the working of many sets. For example, there are quite a few speakers which do not give the best possible results unless being used in conjunction with an output choke or transformer. This modification to the set is quite easy to carry out and, as has so often been explained, not only improves the quality of the output but prevents any damage to the speaker, or to the user of the set, arising out of the fact that without some such device the speaker wires are at a high tension potential above earth.

### What the Unit Does

Here is a novel idea which also will improve the working of the set. It is so simple that when you have made it and are trying it out you will wonder why it has not been thought of before. This little gadget consists essentially of a fader. It is connected to the speaker terminals of the set and two speakers are connected to the output terminals of the unit. Then by means of the knob you can conveniently fade from one speaker to the other, or you can use both at equal strength, or, again, you can match up the tone of one speaker with that of the other so that the two speakers can be worked together in one room. Alternatively if you have only one speaker this unit can be used as a volume control.

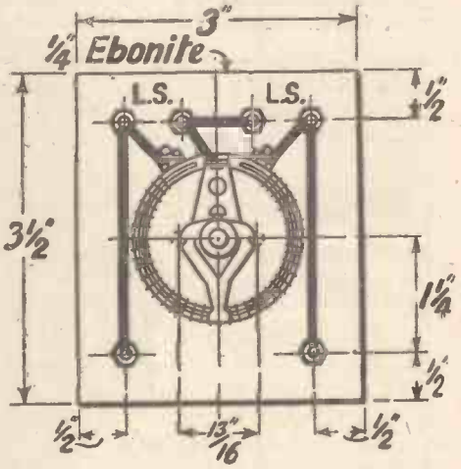
It is so easy to make up speakers nowadays, using ideas such as the new single linen diaphragm, that there is no reason why everyone should not have more than one speaker. The extra cost is so small, and it avoids the necessity for carrying the speaker from one room to another, or, again, if you find that one speaker gives plenty of bass, while the other has a naturally high tone, then by means of this fader you can use the two together in any desired proportion of volume and so arrive at a very pleasant tone combination. The speakers can stand facing each other in opposite corners of the room.

### Few Components

The fader can be made up at the cost of a few shillings. The main component in it is a wire-wound potentiometer and in the original unit, the new Regenstat, the 120,000-ohm model, is used. Six terminals are needed marked + and — (these being connected to the set) and two each marked L.S. + and L.S. —. The very simple wiring can be clearly seen from the photographs. The four output terminals are placed in a row on a small piece of ebonite, and the two centre ones (L.S. + and L.S. —) are wired together and to the arm of the potentiometer. The two outer terminals, L.S. + and L.S. —, are wired one each to the outer ends of the potentiometer windings and also to the positive and negative input terminals.

### How it Works

The theory of the unit is quite simple. When the potentiometer arm is in the mid position, the two speakers are in series and each is shunted by half of the winding of the potentiometer, that is about 60,000 ohms. This high resistance makes practically no difference to the performance of either speaker. As the arm is turned towards one or other of the ends of the potentiometer winding, so the value of the shunting resistance across one speaker is decreased, and the other correspondingly increased. With a good wire-wound potentiometer this rate of increase and decrease is noiseless and a very smooth control is provided.




**The few connections are shown by this diagram**

### As a Volume Control

If only one speaker is to be used, and the unit is acting simply as a volume control, then one of the pairs of output terminals should be short-circuited. All speaker units have not the same impedance and it may be found that when two speakers are in use equal volume from each is not obtained when the arm is in its mid position but at some distance away from this point. This is immaterial and indicates that when the arm is set so that the volume from each speaker is the same, that the potentiometer winding is counteracting for any difference between the two units. With this unit it does not make any difference if one speaker is used at a considerable distance from the other, but it will, of course, upset the setting for equal volume. If you do not use an output filter arrangement of some kind it is rather important to get the polarity correct.

**How simple is the construction of the gadget is apparent from this picture showing the unit in course of assembly**

## THE HOW AND WHY OF RADIO

# III—Why Wireless Waves are Detected

***If you are a beginner in wireless, now is your chance to gain a clear conception of its theory and practice. In this new 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***

WHAT a misnomer is that word detector; the valve or crystal we use as a detector would be more correctly named separator; for one of the main things it does is to separate the musical and speech frequencies from the very high frequencies of wireless waves.

But let me start at the beginning. I have sketched what I always regard as the main sequence of events in the process of wireless.

### At the Beginning

We start with our old friend the announcer; his speech is picked up by the microphone as sound waves; and his speech comes out of the loud-speaker as sound waves. But between the transmitter and the receiver the medium of propagation is the ether, not air. So, obviously, sound waves do not journey from microphone to loud-speaker.

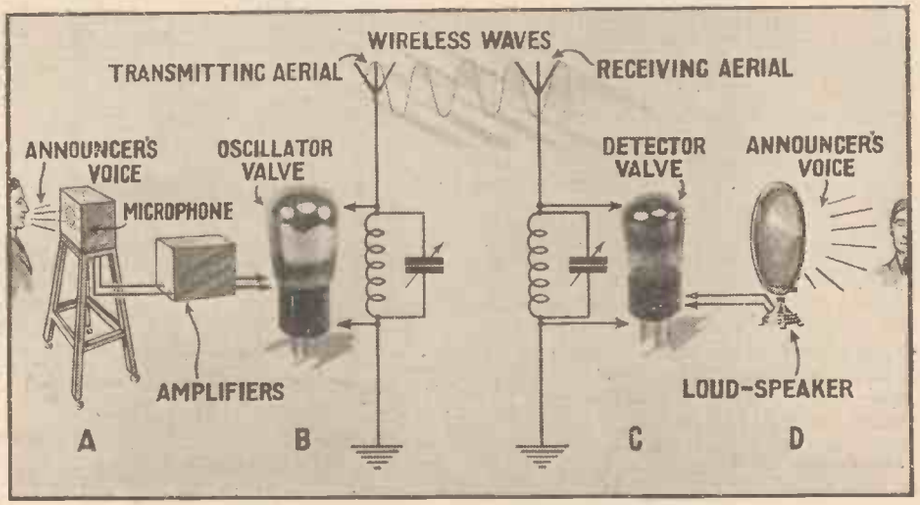
Clearly, something drastic happens to the sound waves created in the studio air before corresponding sound waves are created in the home. What *does* happen in between?

The answer to that question shows why a detector is needed. A series of conversions takes place. Firstly, the announcer's speech variations are converted by the microphone into electric-current variations. These are amplified sufficiently to affect what is know as an oscillator.

In turn the oscillator converts the electric-current variations into wireless waves. Obviously, before we can hope to hear the announcer's speech, two re-conversions must take place. Firstly, the detector interprets the ether vibrations, or wireless waves, as electric-current variations. Secondly, the loud-speaker converts the electric-current variations into sound waves.

The two ends of the whole process can easily be understood by following the diagram. The microphone A and loud-speaker D form the liaisons between sound and electric current. The oscillator B and the detector C form the liaisons between electric current and wireless waves.

The bare outline of the broadcasting process is not often put to readers in this way; but once it is understood, and I think every beginner should be able to grasp what has been said, we can go more intimately into the actual detector question, which more nearly concerns us than the apparatus at the other end of the chain.




**The simplified sequence of transmission and reception**

### Really High-frequency

I have said that the detector's job is to convert wireless waves, which are ether vibrations, into a varying electric current. For the loud-speaker can only operate by means of a varying electric current passing through its winding.

Wireless waves cannot directly affect a telephone or loud-speaker for two reasons. Firstly, the waves are oscillating so rapidly that the diaphragm of the loud-speaker cannot follow their movement and even if it could the alternating nature of the waves would cancel out any movement. Secondly, the human ear could not detect anything, because the frequency of wireless waves is above the highest audible frequency.

The human ear can distinguish as sounds all air vibrations from 16 per second to 15,000 per second. When I tell you that the frequency of a medium wavelength station is of the order of 1,000,000 cycles per second, you can understand that, apart from the mechanical inability of the loud-speaker, the ear itself has limitations where wireless waves are concerned.

### An Analogy

Having picked up wireless waves on the aerial and tuned them, how are we to make them audible? By detection; or as it is sometimes called, rectification. The detector is really a separator. For this reason; when the electric-current variations of the microphone were impressed upon the transmitted wireless wave they modulated it; these low-frequency speech frequencies were impressed upon the very high frequencies of transmission.

The detector de-modulates, by separating the high-frequency waves from the superimposed low-frequency waves. You may find it difficult to picture this modulation process; but perhaps an analogy will help.

Imagine a fast-swinging pendulum being slowly lowered at its pivot. You may compare the fast side-to-side movement of the pendulum with the high-frequency wireless waves; and the slow downward movement of the pendulum to the speech frequencies.

This analogy—like most others—is far from perfect, but I think it helps. Itself oscillating at a tremendous frequency, determined by its wavelength, the transmitted wave bears the imprint of the very much lower frequencies caused by speech and music.

The action of the detector is very complicated; but next week I will show *how* it does its job.

### How to Tune the Set

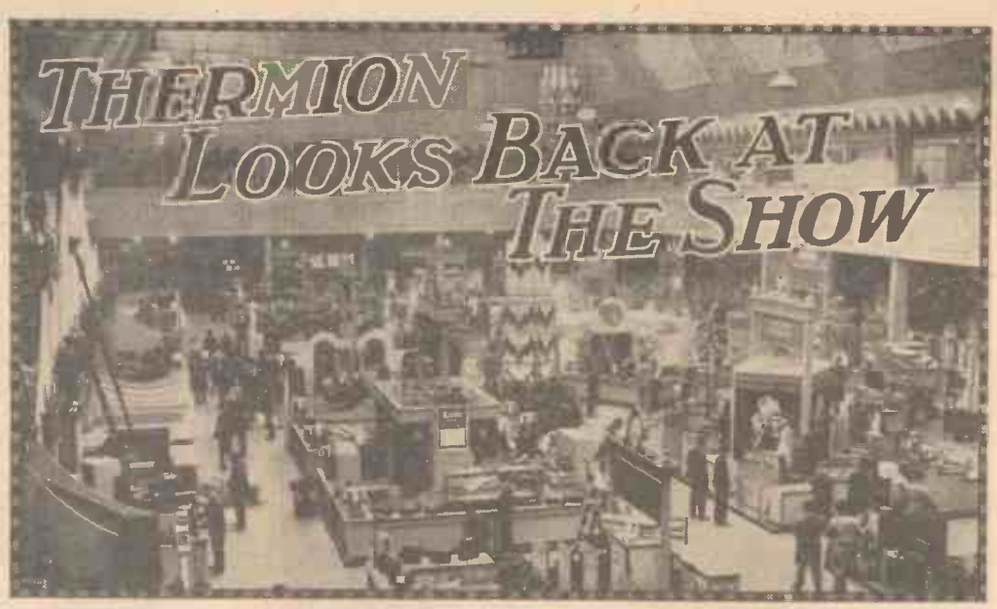
Under the illustration of the article on "How to Tune the Set" which appeared in last week's issue, the inscription should have read as follows: (*a*) simple tuning circuit, (*b*) tapped aerial tuning circuit, and (*c*) dual-range tuning circuit. The variable condenser on the left was inadvertently included in the lettering of the diagram.

HOTSPOT.

**NEXT WEEK: IV—HOW THE DETECTOR WORKS**

All theatres and concert-halls in Uruquay (North America) have been compelled to permit the relay of their performances.

# THERMION LOOKS BACK AT THE SHOW



*Of interest to every amateur who went to the National Radio Exhibition this year is a summary of recent progress*

WELL, there is no doubt about one thing: this year's Show was unquestionably the best that we have ever had. It was, of course, the biggest in the history of wireless, for to accommodate the stands the authorities found it necessary to overflow on to the first floor of the new Empire Hall. But it wasn't a question just of quantity: the quality of the exhibits was the thing.

The first thing that struck me on looking round was that it was a thoroughly sound, practical, and common-sense exhibition. Stunts, such as five-valve sets in a cigarette case and that kind of thing, were conspicuous by their absence—and a jolly good thing, too. There has hardly ever been a stunt that has had any real wireless value. The lay journalist does love them, though, and the certain way in past years of attracting attention in the notices in non-technical papers was to have some striking but quite useless "novelty" at your stand.

## Mains Sets Popular

Rather a curious feature is to be found in the great preponderance of all-from-the-mains receiving sets. Actually, the houses throughout the country that have not electric light greatly outnumber those which have it, so that one would naturally expect to find battery-operated sets in the majority. I suppose the explanation is that a very large part of this season's trade will consist in satisfying the demands of those who want to change over from batteries to the mains. Also, people who live in houses with electric light are possibly rather better off, on the whole, as regards this world's goods than those of us who don't.

This concentration upon mains sets has produced one interesting development. So long as you have electricity, so to speak, on tap, the number of valves that you use does not very greatly matter, for current is cheap. This year's main receivers, therefore, contain a considerable proportion of four- and five-valvers. Last year the three-valve set was easily the most popular; this year it will remain so for battery operation. It has, however, a real rival in the ultra-modern two-valver, which is capable of really wonderful performances. Anyone who now lives within reasonable range of a twin-wave station can obtain ample loud-speaker strength from two valves, and as the regional scheme progresses the battery-run two-valver will, I think, become exceedingly popular.


**STAND No. 1**

**The home of "Amateur Wireless" and the "Wireless Magazine," where crowds of readers came every hour of the Show to get blueprints and free radio advice**

## Battery-operated Sets

There is one very striking point about the battery-operated set of to-day, and that is its extreme economy in both high-tension and low-tension current. Two-volt valves are pretty well sweeping the board for battery use and wonderful things have been done in the matter of their design. There are super-power valves now that, with a filament current of only .2 ampere at 2 volts, are capable of an enormous output. This means that the two-valve set of to-day need consume no more than .3 ampere of filament current and the three-valver .4 ampere if it uses triode valves, and rather more if it goes in for an S.G. and a pentode.

Then H.T. current. I have been experimenting recently with some of these 2-volt output valves, and I am amazed to find how great an undistorted volume can be obtained from them with a very small ration of juice from the H.T. battery. A two-valve set need draw no more than about 7 milliamperes, all told, which means that it is well within the compass of a standard-capacity H.T. battery.

## Loud-speaker Progress

The present-day loud-speaker is a marvel of perfection. Practically only two types are extensively shown, the moving-coil and the balanced armature. In its early days I was not particularly drawn to the M.C. loud-speaker, for two reasons. First of all, it required an energising current for the pot magnet, and I am not one of those who are fortunate enough to have electric light. To run it from a 6-volt battery was rather an expensive business. Secondly, the earlier moving-coil speakers could not do themselves justice unless you allowed them to reproduce with very large volume. There are times when I want what some people call realistic volume, but generally I like a rather quiet reproduction. In the modern M.C. speaker both of these drawbacks are done away with. Permanent-magnet types of excellent design and performance are shown by many firms, and one can nowadays obtain small volume with excellent quality.

The balanced-armature unit has always been a favourite of mine, and in its present-day form it is a very wonderful instrument. From some units you can get a fine response right down to 50 cycles, and even below, whilst others deal excellently with the highest audible musical harmonics. If you run two loud-speakers of this type as a team you can cover the whole musical

(*Continued at the foot of next page*)

# RADIO NEWS FROM THE U.S.A.

Culled by ALAN HUNTER

STARTLING plans now under discussion in New York relate to the erection of a radio city, housing in one vast centralised unit radio, talkies and television. According to latest reports, work actually starts within the next month. The present plans will be considerably altered before the scheme is completed, so any statements made at the moment are only indications of the immensity of the scheme.

High finance is involved in this typically bizarre American project. John D. Rockefeller, jun., is behind it; the total investments involved have been computed at 250,000,000 dollars! This huge sum will be spent in pulling down the present buildings now occupying three complete blocks comprising the proposed site, and the erection of a group of sky-scraping buildings to house all the latest devices connected with aural and visual broadcasting.

Prominent radio concerns will lease the radio city, which will include four large theatres, one to seat 7,000 people, and a huge symphony hall. I wonder in which of the proposed buildings one could entirely lose our B.B.C.'s Broadcasting House?

### Radio Advertising

Advertisers sponsoring American broadcasting programmes had a bad setback just recently when Dr. Lee Deforest, presiding at the Convention of the Institute of Radio Engineers, at Toronto, made a harsh attack on the blatant way radio advertising is introduced. Mr. Eric Palmer, apropos this outburst, says: "There is a happy medium." He implies that sometimes advertisers overstep the bounds of good taste but, he adds: "I believe even you (meaning the English) would probably accept a modest amount of advertising in return for excellent programmes." I would, myself, but so far as one can see there is neither modesty nor excellence in some of the present American programmes.

A typical American receiver—the Grebe, which sells at 225 dollars

### American Receivers

What do American listeners want in radio to-day? So far as receivers are concerned, the A. H. Grebe Company supply an answer. "The American public, this year, is most anxious about the tone quality of receivers. The women, particularly, insist upon fancy cabinets. That is why this company, for example, has introduced a receiver encased in what we Americans call occasional furniture. It certainly does not look like a radio set."

This company claim to have introduced a device into their receivers capable of counteracting the distortion of landlines between studio and broadcasting stations. Some of our northern listeners would, no doubt, be glad to be able to do the same with the B.B.C.'s landlines.

Just as the big automobile firms in America are experiencing a considerable curtailment of orders due to the aftermath of the great Wall Street crash, so all American radio manufacturers are restricting production. Last year, quite apart from the economic disturbance, most radio firms greatly over-produced, but they have learned a lesson after being brought very near to disaster.

### A Short-wave Push

There is all the difference in the world between amateur and public interest, as I am again reminded by the big push now going on in America to popularise short-wave sets. Many of the big firms are turning out A.C. mains-operated short-wave sets. "Everyone here is anxious to get foreign programmes, either direct or by re-broadcasting," says a New York correspondent. "5SW is very popular over here, although some of the programmes make Americans thankful they are not under a radio broadcasting monopoly, in spite of the blatant advertising that still continues." This is an unkind cut at our broadcasting system, but the B.B.C. will not even mind.

## "THERMION LOOKS BACK AT THE SHOW" (*Continued from preceding page*)

scale with a close approach to perfection. This year's models are a tremendous advance upon those of the past, partly because they will handle greater volume without a sign of overloading or chattering and partly because scientific design has rendered their response curves so much freer from the jigs and jags that denote unwanted resonances.

Between the moving-coil and the balanced-armature loud-speaker comes the inductor dynamic drive, which can be described as a balanced-armature unit working on moving-coil lines. This was shown by several firms, and I was greatly impressed both by its design and by its performances.

### Valve Improvements

Amongst valves there are many that are worthy of more than passing notice. There are no surprises, such as that provided some years ago by the introduction of the screen-grid valve and at a subsequent exhibition by the pentode.

But what enormous improvements have taken place in a quiet and unostentatious way in certain classes of valves. This year we saw for the first time a screen-grid valve which really was screened. In early models, as you may remember, so much plate-grid capacity remained that there was an ample path for feed-back effects unless very inefficient circuits were used. The result was that the average S.G. gave very little more amplification than could be obtained from a good triode. This year in some outstanding models of S.G. valves the plate-grid capacity has been reduced to something practically negligible and you can use with them circuits of real efficiency. This means that the actual amplification obtainable represents a very fair proportion of the theoretical figure. Output valves I have already mentioned, but I would like to call your attention to the newest non-microphonic detectors whose filaments are suspended at no less than five points.

### Output Arrangements

I hope that you noticed the excellent output transformers and chokes that were on show. In the old days, if you were incorporating an output filter circuit or an output transformer in a set, all you could buy was a choke with two terminals (one "in" and one "out") or a transformer with two primary and two secondary ditto. Unless the component happened to match exactly your output valve and your loud-speaker the results were not always too happy. To-day you have both the tapped choke and the tapped transformer. This means that by a little experimental work you can match your loud-speaker to your set and obtain from both the very best results.

If you should ever doubt whether progress is being made by wireless manufacturers, pick out from your junk box, say, a 1926 variable condenser and compare it with the 1931 model. The former contains great chunks of solid dielectric, whilst in the latter it has been reduced to the barest possible minimum.

There are scores of other things that I would like to mention, but I have already come to the end of my space. This is how "Thermion" looks back at the 1930 Exhibition—and he is already looking forward to that of 1931.

# On Your Wavelength!

## STILL THINKING OF IT

THOUGH the Exhibition is now past and over, I still have it completely on the brain and find it difficult to think of anything else. Elsewhere in this issue the reader will find my views upon it. This information will cheer him if he likes my stuff, or serve as a warning to him if he doesn't! Well, the biggest and the best, so far, of Wireless Exhibitions has come and gone, and everyone who went there (and even those who didn't, but merely read about its wonders) can have no doubt that wireless is now firmly established as the greatest of popular hobbies in this country, and that our manufacturers are going ahead with astonishing rapidity and on the soundest lines. The croakers who prophesied, when 2LO's voice was first heard over the ether, that broadcasting would be a mere passing craze may now put into their pipes and smoke two cold hard facts. The first of these is that the number of broadcasting licences issued is now well over the three-million mark; the second is that in the first two days of the Exhibition many firms booked orders enough to keep their factories going at full steam for the greater part of the ensuing year.

## BY-PASSING THE DETECTOR

BY-PASSING the detector is essential. Most people realise this, and if they are not using a differential reaction condenser they connect a small condenser, such as .0001 or .0002, directly from the anode of the detector to L.T.—. This does not upset the reaction, and does most distinctly result in an improvement both of signal strength and of quality.

The obvious objection to this course is that some of the high-frequency audio-currents are shunted to earth by this means, and therefore do not get passed on to the low-frequency stages in the proper manner. The pundits tell you that you should never use more than .0002 in this position, or perhaps, if you really must, .0003, otherwise the most extraordinary things will happen to your quality and probably the music will play backwards.

Now, this is a commonsense point of view, and most of us pay due regard to precautions of this sort. I know that I have always accepted this dictum as being true, because it seemed to me that it ought to be so. The other day I had a set containing two stages of H.F. in a somewhat confined space, and I could not make it stable on the long waves, try as I would. I knew really that the amplification was nowhere near the limit, so that it was not just a matter of using too efficient a circuit. Instability was occurring through some unauthorised feed-back in some place or another, and I could not, for the life of me, see where it was.

## A CASE IN POINT

NOW, anyone who has played with screen-grid circuits, particularly multi-stage ones, knows that detector by-passing is most important in a case like this. If the detector is not by-passed the circuit becomes unstable very easily. I had, however, a standard .0001 by-pass in the circuit, and it seemed to me to function properly. I increased the value, however, and was rewarded by an increase in the stability, although the circuit was not absolutely stable. Still further increasing this capacity until I reached the value of .0005 improved the stability enormously, and did not seem to notice any very marked reduction in the quality.

Feeling thoroughly excited by this time, I said: "Well, here goes! Let's plug on as much capacity as is necessary to make the blinking set stable, and see what happens to the quality." The result was that when I reached a value of about .0015 the set was beautifully stable. The quality, of course, was—well, what was it? Do you know, I could hardly detect the difference! Certainly the quality was not all muffled and wooffy, as I had anticipated; and, indeed, I left the circuit working in this condition.

I rather expected that, since I had to use this large value of by-pass on the long waves in order to obtain stability, I should find that the signal strength on the short waves had gone to pot. Believe me, the reduction in signal strength on the short waves was quite tolerable. There was a reduction, I admit, but it was not anything like so serious as I should have imagined. The result is that the circuit is now working very nicely and with every satisfaction, with a by-pass condenser fifteen times as large as it ought to be. What do you know about that?

## WORTH TRYING

TALKING of detectors, I have recently fitted to one of my big sets an arrangement which may appeal to many readers. This is a simple means of changing over from grid-leak-and-condenser rectification to anode-bending. For long-distance work, or for bringing rather feeble signals up to decent loud-speaker strength, there is nothing to beat the grid-leak-and-condenser detector. But it may rather fall down if you want the set to reproduce a powerful near-by transmission with perfect quality. The reason is that the grid-leak detector is very easily overloaded and that if you have a high-frequency stage for the sake of increasing selectivity you may furnish your detector valve with impulses that give it the wireless equivalent of indigestion.

## EASILY DONE

THE change-over scheme is very easily carried out. Arrange your grid leak straight across your grid condenser and provide also a simple on-and-off switch mounted quite close to them on the baseboard of the set. Open the switch and the two are in action; close it and they are short-circuited. Connect the bottom end of the grid coil to the middle contact of a double-pole change-over switch. One of the other contacts of the switch is taken to low-tension positive, whilst the other goes to the negative of a suitable biasing battery. This switch, again, may be fixed to the baseboard of the set. If you want to change over from grid leak to anode bend, all that you have to do is to lift the lid and to turn over the two switches.

## THE LITTLE MORE

"THE little more, how much it means," sang the poet years ago. He didn't own a wireless set, but had he done so he would have realised how true his words were. What I am driving at is this. You don't, in the ordinary way, want an enormous amount of volume from your loud-speaker, but when there is some big concert on you may feel that you would like to hear the music with majestic volume. For normal reproduction from 100 to 120 volts on the plate of the output valve and from 7½ to 9 volts negative grid bias may do all that you want. But when the great occasion arrives when you want a little more volume it is generally not so easy as it looks. You may find that when you begin to boost things up a bit there are very distinct signs of overloading and distortion. Here is my own method, which may be useful to fellow-users of battery-run receiving sets. Normally, I have in the last holder a smallish super-power valve that requires no great amount of plate current and I work with grid-leak-and-condenser rectification. But suppose friends come along who want to hear a "Prom." or some other big concert to perfection I make a few simple little changes. The detector goes over to anode bend in the way that I have already described and into the last holder of the set goes a P625A or some other valve of that class. The grid bias is pushed up to something hefty and I increase the plate voltage to the maximum available. Having a tapped output circuit, I am able to match the loud-speaker to the new output valve. These changes take very little time to make and the results are genuinely worth while, for the set is now capable of giving tremendous volume without a sign of distortion.

## ANOTHER TIP

AND that brings me to what is, I think, the best way of hearing a concert by way of the loud-speaker. In the concert-hall you don't sit right on top of the orchestra. It follows that in the home you should not be within a few feet of the loud-speaker if you want to get the right impression of the music. This kind of thing is all very well in the ordinary way, but it is not the best method of hearing an important concert. What I do is to arrange my set to give big undistorted volume and to listen not in the same room, but in the next, with the doors open between the two. In this way you obtain a much truer

# On Your Wavelength! (continued)

impression, since there is a respectable distance between your ear and the source of the sound. The other night, for example, one musical friend on whom I was trying out this method said, during a piano solo: "This is perfect; it is exactly like hearing a piano in a big hall." The tip, then, is to work up to the biggest volume that you can without distortion and to keep as far away as is reasonably possible from the loud-speaker. Naturalness is still more pronounced if you are running two loud-speakers in tandem placed well apart.

### A SOLUTION?

HERE is the only explanation that I can find for the astonishing problem that I placed before readers last week. A few days before, a thunderstorm suddenly blew up in the locality. It broke with great violence and continued for many hours. Inquiry showed that the earthing switch was not turned over when lightning first began to play, though this was done very soon after the storm had started. The storm was right overhead and a tree was struck within about three hundred yards of the aerial. My theory is that a very high potential was introduced in the aerial for a moment whilst the switch was still in the "receive" position. This charred the insulation of the aerial lead-in and probably set the loud-speaker leads, which were in contact with it, smouldering. Though the cotton, silk, and rubber were burnt up, their charred remains acted effectively as an insulator for the H.T. battery's 100 volts during the next day or two, when the set was not touched. Later, the maid, in the course of dusting operations, moved the loud-speaker a little, causing the burnt leads to rub against one another. The charred insulation simply crumbled away and the wires came into contact. They probably remained touching one another for about ten minutes or perhaps a little longer—it could not have been much longer, or the battery could not have shown the voltage and amperage that it did.

### STILL A MYSTERY

BUT there still remains one complete and utter mystery. Remember that it was the aerial and not the earth lead that was burnt. The only path between this and H.T. negative is through the winding of the aerial coil. Now, in the particular tuner used, this coil is made with No. 36 double-silk-covered copper wire. The current from the battery must, as we have seen, run into several amperes; yet the windings of the coil were intact and the insulation showed no signs of charring or any kind of damage. The maximum safe load for this wire is about ¼ ampere. It will carry more, but it heats up pretty considerably at a current of 3 amperes. You will admit, I think, that it is, taken all round, a pretty extraordinary case.

### A BIG LOSS

LIKE many other listeners who like to tune in foreign stations whose programmes are well received, I very much regret that Turin has had to adopt a wavelength pretty close to that of the Brookmans Park National. On my big set I can separate the two and receive the programmes of either when both are working, but with smaller sets Turin must be regarded as a dead loss to those who live within the Brookmans Park wipe-out area. Turin is one of the very best of the foreign stations, and so strongly do his transmissions come in that on his old wavelength they were receivable at loud-speaker strength even with two-valve sets. The only consolation is that we still have Rome, who, despite his wavelength nearness to Stockholm, is still completely reliable. I am glad to notice, too, that Milan is returning to form, and I have recently had quite good reception on several nights from Naples. The Italian programmes are nearly always worth hearing, and they are particularly good, as a rule, on Sunday nights, when a first-rate opera is often broadcast.

### RECORDS AND/OR RADIO

THE great prominence on all stands at the Radio Exhibition of the radio-gramophone brings up the old argument of which is best—radio or gramophone? The query is, of course, in regard to the quality of sound reproduction it is possible to obtain with either. It has always seemed to me that radio has done far more justice to the top and bass notes of music than even the best electrically recorded discs, and also that radio has a sense of "aliveness" that has not yet been achieved with gramophone recording. This view was confirmed one evening recently during a "Prom." transmission of Beethoven's "Fifth Symphony." I have a particularly good set of records of this symphony, which I put on my gramophone and endeavoured to synchronise with the broadcast of the music. Switching over quickly from the electric pick-up to the broadcast disclosed interesting contrasts.

### CONTRASTS

FIRST of all, I noted the excellent balance of the orchestra recorded on the disc. The balance did not seem so good on radio, certain instruments being unduly prominent; nevertheless, all instruments were completely audible and seemed to stand out in relief in comparison with a certain deadness of the disc recording. Certain instruments came through with much more resemblance to the real thing, especially the violins, the trumpets, and the double-basses. On the record the double-basses were weak.

### RECORDING METHODS

QUITE apart from the difference of the mediums of transmission, ether or disc, there are important differences in the methods of microphone pick-up employed by the B.B.C. and the gramophone companies. In gramophone recording and talking-picture making the condenser type of microphone is invariably used, whereas for broadcasting an improved type of Reisz carbon microphone is still used. The condenser microphone is notable for its "crisp clearness" and absence of background hiss; but it possesses a peculiar kind of metallic quality that sometimes gives to music what unkind people call the "canned" effect. On the other hand, the Reisz microphone has a "woody" tone that is especially kind to the recording of piano and other stringed instruments. It is only possible to detect the differences when listening on a high-quality loud-speaker, so slight they are. And I firmly believe that frequent listening to either type of microphone drugs the senses into believing that the most familiar tone is the right one.

### THE NATIONAL PROGRAMME

I HAVE noticed that, in general, the quality of the National transmitter on 261 metres is not so well reproduced as broadcasting from higher wave stations. This is especially noticeable on home-built receivers of the "Heath Robinson" type, and is due solely to the instability of these not-so-good receivers on low wavelengths. Listeners who own such sets have been inclined to blame the B.B.C. for this poor quality, but I am sure that the boot is on the other leg. Many obsolete receivers actually oscillate on this wavelength when an attempt is made to tune right in to 261 metres, while others are so near to oscillation that the reaction effect completely changes the tone of the station, and loud passages of music become tinny and distorted. The B.B.C. could obviate some of the difficulty by having less modulation on this low-wave station.

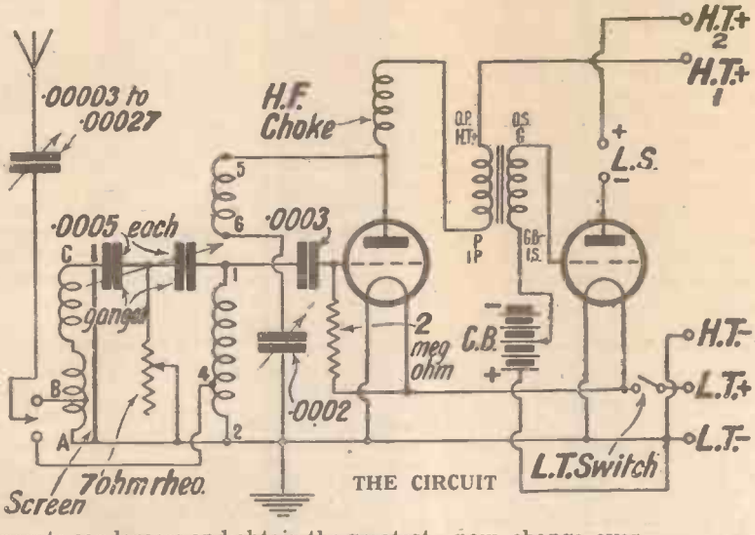
THERMION.

# GETTING RESULTS FROM The ARROW 2

*The First Set Using the New Ohmic-coupling Principle of which constructional details were given last week*

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

BEFORE discussing the operation of this receiver, I think it will be as well to refer to a letter which I have received from a Southend reader. He expresses himself very interested in the system of ohmic-coupling, and wishes to know if it is not possible to use separate tuning condensers. This, of course, is quite practicable. My object in using a ganged condenser was to minimise the number of controls, but if any reader feels that he would like to use separate condensers and obtain the greatest possible efficiency, this is quite a satisfactory arrangement.




THE CIRCUIT

To revert to the "Arrow 2," the first receiver to embody this new principle, there are numerous points of interest regarding its working which the user should find rather fascinating. I have already emphasised the fact that it is possible on a full outdoor aerial at Elstree to keep the Brookmans Park twins very much in subjection and to bring in quite a number of other stations, but the point that fascinates me is the ease with which one can change over from the single-coil arrangement to the band-pass filter, and really appraise the value of the new circuit.

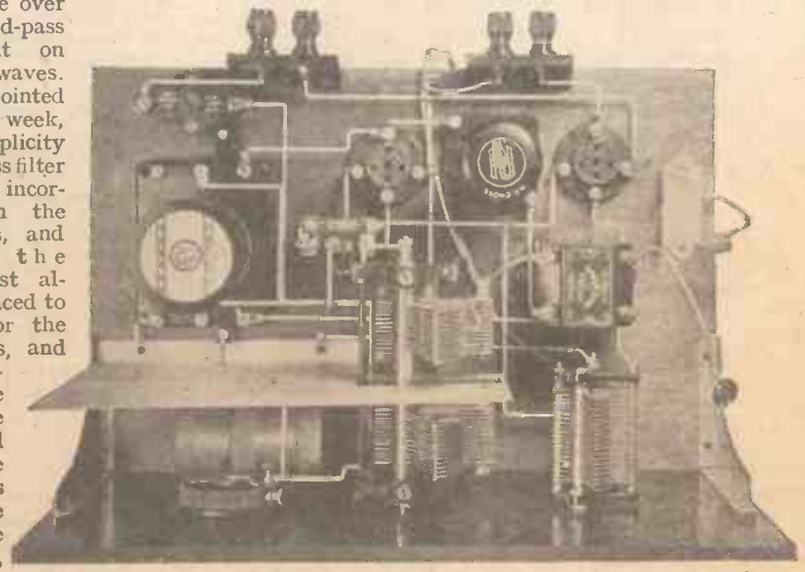
The first thing in testing the receiver out is to make sure that it is working well as a straight receiver. Therefore, place the circuit switch (immediately under the main tuning dial) in the left-hand position and connect the aerial directly on to the dual-range coil. It is desirable to place the coupling resistance in its minimum position for this test, i.e., so that there is no resistance in circuit. This may possibly be marked "Max." on the dial, as it would be the position of maximum current if the device were being used as normal rheostat. The circuit will work, however, whatever the position of the rheostat, provided that it is not entirely switched off.

Tune in the circuit in the ordinary way, making sure that it is tuning properly and the reaction is working nicely. Adjust the voltage on the detector until the reaction is smooth, and see that the last valve is properly biased, so that one can obtain satisfactory quality. Change over to the long waves, and see that the long-wave circuit is working correctly, and that the receiver is generally up to the expectations of a normal two-valve receiver.

One may now change over to the band-pass arrangement on the short waves. It was pointed out last week, that for simplicity no band-pass filter has been incorporated on the long waves, and therefore, the switch must always be placed to the left for the long waves, and the push-rod of the dual-range coil pushed in. For the short waves pull out the dual-range coil switch, and then change over the circuit switch to the right-hand position. This connects the aerial on to the band-pass coil, and the tuning may now be tried with the ohmic-coupled arrangement.

First of all, set the coupling resistance to a fairly large value, somewhere about the middle of the scale will probably be found best. Then, on tuning the set in the normal way, various local stations can be tuned in without difficulty. It will probably be found that slightly more reaction is required than before to make up for the small extra loss introduced by the other circuit. The next operation is the correct ganging of the two condensers. This is best carried out by means of the pre-set condenser in the aerial lead. Tune in a suitable weak station. A local station is not desirable, because it is rather difficult to choose the best point on a strong signal, but on a weak signal the ganging can be adjusted quite easily. Tune the pre-set condenser towards its maximum position and tune in the station. Now alter the setting of the pre-set condenser slightly, one way or the other, and re-tune. Signal strength will be found to be either slightly better or slightly worse than before, and after a little trial and error the best point on the aerial pre-set condenser can readily be found. Once the best position has been obtained, it need not be altered again.

(*Continued on next page*)



A plan view of the "Arrow 2." The wiring diagram was given last week and a full-size blueprint may be had, price 1/-

# "THE 'ARROW 2'" (*Continued from preceding page*)

It must be emphasised that this receiver is designed to work with an outdoor aerial having a fairly large capacity. If a short aerial is used it will probably be found that the aerial capacity is not quite enough to match the circuits. Two alternatives are possible here. The first of these is to adjust the end plate on the main aerial condenser, which is made adjustable so that the capacity of the whole condenser may be varied slightly. A somewhat better method, however, is to connect a small condenser, not exceeding .0001 mfd., across the aerial and earth terminals. This automatically increases the aerial-earth capacity, and it will then be found that the ganging point becomes nicely within the range of the pre-set condenser. The pre-set condenser in such a case would have to be unscrewed several turns, as the ganging point will probably come within the middle of this range instead of towards the top, as it normally does with the customary outside aerial

I have dwelt on these points at length because it repays one to spend a little time making sure that the circuit is correctly matched. At the same time, quite a good performance can be obtained if the circuits are slightly out; so that I do not wish to suggest that it is unduly critical in operation. It is, perhaps, a good plan to get an approximate setting, and to see what can be done with the set in that condition in order to get the "feel" of the controls. After this, the ganging may be returned to and one may make quite sure that it is really in its best position.

The first effect of introducing the band-pass circuit will be a marked improvement in the selectivity. The spread-over of the local station or stations will be found to be very considerably reduced, without any loss of quality; while, at the same time, the signal strength does not suffer, and foreign stations can be tuned in quite easily. The effect of varying the ohmic-coupling may now be tried.

Reduce the setting of the resistance. If one is using a receiver near the oscillation point, the reaction will also have to be reduced, because of the removal of part of the aerial damping from the detector circuit. On returning, the same stations will be found, but they will be freer from any interference than before, although the signal strength may be a little weaker. Conversely, if one increases the ohmic-coupling the signal strength will be increased, but the selectivity will be worse. It will also be necessary to increase the reaction setting somewhat, for the reason already explained.

A little trial will readily find the position which most suits one's own conditions. Then the setting can be left and only altered on special occasions. Generally speaking, it will be found that a number of stations which are normally blotted out by the local programme can be received without trouble with the ohmic-coupled arrangement and that these stations can be tuned in without any hair-breadth adjustments. This, of course, will be after dark, because the short-wave stations do not come in at all well until darkness falls; but most of one's reception will be in darkness for the next few months, so that this is quite a satisfactory feature.

### Band-pass Tuning

It is interesting, when one has the receiver really working well, to note the difference between the tuning with the band-pass filter in and with it out. Tune in to a distant station and throw over the circuit switch in the centre of the panel, from the band-pass to the single-coil arrangement. The results will be quite surprising. If the station happens to be fairly close in wavelength to the local station it is quite probable that the latter station will completely swamp it and that no trace will be found of the original distant station; yet changing the switch back to its former position will bring it up at once, clear of the interference. In making a change-over of this sort one should not have the reaction too close to the oscillating point, because of the difference which results from the different aerial damping in the two cases; but it is really quite an amusing trick to show one's friends how, by a mere touch of a switch, you are able to dispel the bogey of interference.

### The Rheostat

In some of the advertisements relating to the "Arrow 2" in last week's issue a 35-ohm rheostat was included in error. This rheostat must not exceed 7 ohms, as otherwise the circuit will not function correctly.

**It is a simple matter to use a pick-up in conjunction with the "Arrow 2." The picture shows the set installed in a gramo-radio cabinet made by the Miscellaneous Trading Co.**

### *LIST OF COMPONENTS FOR THE "ARROW 2"*

Panel, 14 in. by 7 in. by ¼ in. (Becol, Lissen, Trolitax, Resiston).
Dual condenser .0005 mfd., with brass support (Formo, Ormond, J.B.).
7-ohm rheostat (Lissen, Igranic, Varley, Wearite, R.I.).
On-off switch (Bulgin, Junit, Lotus, Lissen, Benjamin, Claude Lyons).
Change-over switch (Bulgin, Lotus).
.0002-mfd. reaction condenser (Burton, Bulgin, Lotus, J.B., Lissen, Dubilier, Formo, Polar).
Dual-range aerial coil (Lewcos type D.W.A.).
Two anti-microphonic valve-holders (Telsen, Lotus, Benjamin, Formo, Wearite, Burton, Brownie, W. & B., Junit).
Low-frequency transformer (Varley Ni-core II, Telsen, Ferranti, Lotus, R.I., Burton, Lissen, Igranic).
High-frequency choke (R.I., Lewcos, Lissen, Tunewell, Sovereign, Watmel, Igranic, Dubilier, Bulgin, Varley, Ready Radio).
.0003-mfd. fixed condenser with grid-leak clip, (T.C.C., Dubilier, Graham-Farish, Lissen, Ediswan, Watmel, Atlas).
2-megohm grid leak (Ready Radio, Watmel, Lissen, Ediswan, Graham-Farish).
Pre-set condenser .00027 max. (Igranic, Formo, Lissen, Lewcos, Ormond, Sovereign).
Vernier dial (Igranic "Minor," Brownie, Formo).
Coil former, 3 in. by 1½ in. diameter (Atlas, Wearite).
Two terminal blocks (Junit, Lissen).
Four terminals marked L.S.—, L.S.+, A., E. (Belling-Lee type B, Clix, Eelex).
Five wander plugs, marked: H.T.—, H.T.+1, H.T.+2, G.B.+, G.B.— (Belling-Lee, Clix, Eelex, Igranic).
Two spade tags, marked: L.T.+, L.T.— (Belling-Lee, Clix, Eelex).
Two ounces 28 D.S.C. Wire (Lewcos).
Glazite for wiring.
Pair panel brackets (Lissen).
Grid-bias battery clip (Bulgin).
Special screen (Ready Radio, Wearite, Parex, H. & B.).
Cabinet (Miscellaneous Trading Co., Cameo, Clarion, Lock).

## PHOTO-ELECTRIC "VALVES"

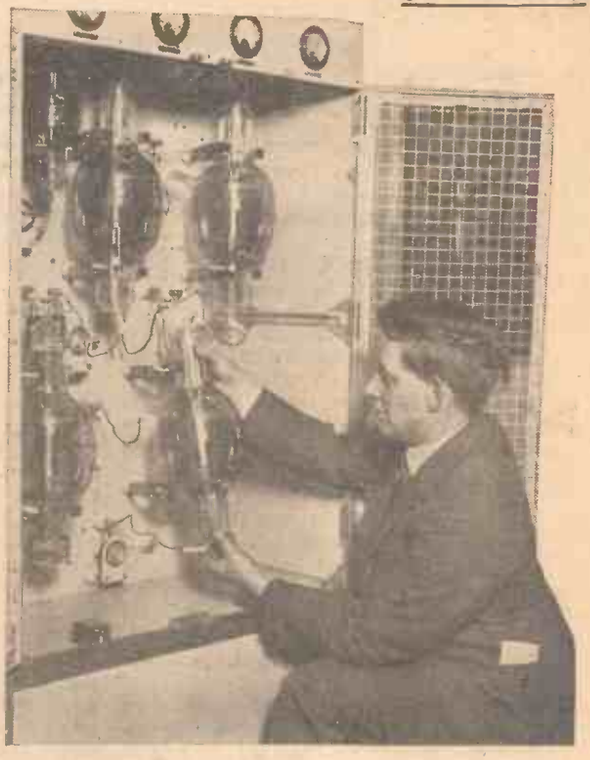
THE thermionic or heated-filament type of valve may soon find a formidable rival in the photo-sensitive cell in which a working "stream" of electrons is produced merely by the action of light on a light-sensitive surface. Photo-sensitive cells fitted with a special "control" electrode, similar to the grid in an ordinary valve, are already being used in the laboratory, particularly in connection with television work. The chief difficulty at present is to produce a sufficiently dense electron stream to work, say, a loud-speaker, but this problem may not always prove insuperable.

M. B.



The latest story from Aberdeen breaks away from the usual topic of the generosity of the natives. It describes how a crofter from an isolated district was investigating the mysteries of wireless in a city dealer's shop. The crofter was obviously impressed by the great variety of valve sets displayed, but did not appear altogether satisfied. At last he said: "D'ye think ye could fix me up wi' something that wad work wi' a paraffin lamp? We hae nae electreecity whaur I cam frae."

# AN AMPLIFIER TO FEED 250 SPEAKERS



***Out of the many thousands of wireless enthusiasts who passed daily through the turnstiles of the Radio Exhibition at Olympia, how many paused by the B.B.C. exhibit and, in particular, the monster amplifier designed to feed 250 speakers? How many have not wondered exactly how this great amplifier was designed, wired, and operated? Below W. H. O. SWEENY, an ex-B.B.C. Engineer, gives some interesting details***

HOW does the B.B.C. amplifier compare, say, with the super push-pull amplifier which we built ourselves recently, and which is giving us, in our own modest way, such good results? Let me whisper: The circuit diagram is exactly the same, basically, as our own. The only difference is the power fed to the valves, which are proportionately larger in size and power rating, thus giving a greater output. Does it surprise you to know that anode decoupling resistances and condensers, and series grid stabilising resistances are employed?

Let us examine the whole box of tricks. Looking through the glass window and past the attendant engineer, who is on his knees checking the meter readings, we see in the centre of the floor two main blocks. On the left is the input amplifier, constructed in three main panels. On examination of Fig. 1, which is a theoretical diagram of connections, we see that it is a four-stage resistance-capacity-coupled amplifier, with two LS5's in parallel in the last stage and a choke-capacity output. The first valve in the chain is an LS5B, followed by two LS5's, the output of which is taken to the output stage. Arrangement is made for using either a gramophone pick-up, a local microphone, or an incoming programme, taken via landline from the Savoy Hill control-room. The pick-up input, fed through a filter, is connected through a two-way switch to the LS5B.

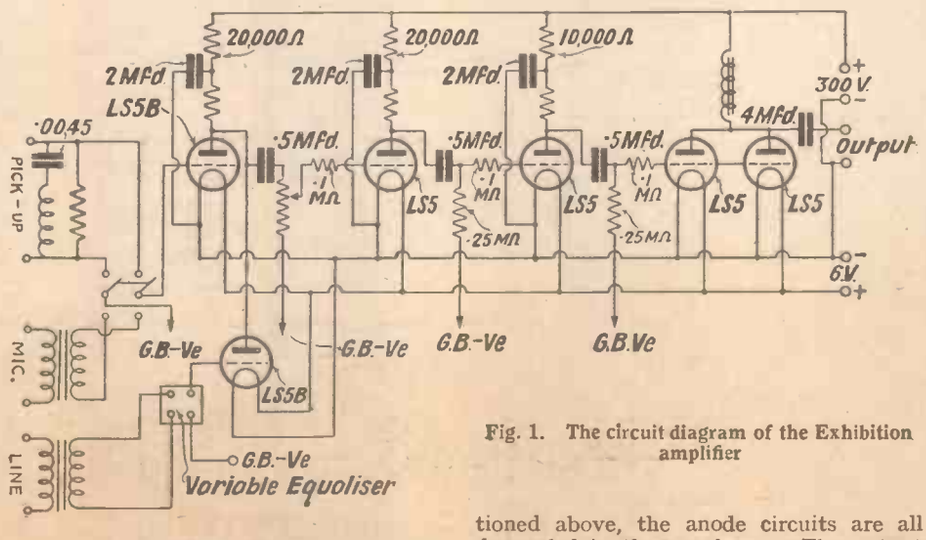



Fig. 1. The circuit diagram of the Exhibition amplifier

Throwing the switch to the second position connects the input transformer, used on local microphone work, to the LS5B. In connection with the microphone, a standard microphone amplifier, as used by the B.B.C. with the Reiss microphones, is made use of, the output being fed direct to the input transformer on the input amplifier. When using the landline programme the signals are taken via a specially designed "equaliser" to a second LS5B, the output of which is taken to the first LS5 of the chain. The equaliser is used to compensate for line-frequency distortion, and provides a stable and efficient way of matching the line impedances to the system.

### The Output Circuit

All the coupling condensers are 5 microfarads and all the grids have stabilising resistances of 100,000 ohms. The first grid leak is in the form of a potentiometer, providing a good volume control. As mentioned above, the anode circuits are all decoupled in the usual way. The output of this amplifier is taken via a choke and condenser to the input of the power amplifier. A simplified circuit diagram of this is given by Fig. 2. The input consists of a transformer, feeding the grids of two T250 valves, in push-pull. These are resistance-capacity coupled to two MT9L valves, which provide one of the two outputs. The second output circuit is provided by two more MT9L's, which are fed through their own grid stabilising resistances and compensating grid bias from the coupling condensers connected to the anodes of the T250's. The two outputs were found to be necessary, as this enables the load to be disposed more evenly. Two halves of the Exhibition were each fed by a separate output circuit. Each exhibitor had a small panel containing two terminals for the incoming signal, a series resistance, and two terminals for his loudspeakers.

Last year the output valves were arranged as two pairs of paralleled valves in push-pull. The single output circuit provided by the arrangement was taken through a distributing circuit to the exhibitors' stands, in such a way that the varying load on the amplifier from each section of the Exhibition could be compensated for. By this means it was possible to distribute the load fairly evenly. However, the method in use this year has better possibilities and is more trouble-proof.

The power amplifier is behind a glass panel in the centre of the floor. Behind, against the wall, can be seen the 300-volt bank of secondary cells used to supply the anodes of the input amplifier. Here is also to be found the 6-volt accumulator used for filament heating. On the right we find the machine used for supplying the anodes and filaments of the T250's and MT9L's. This is a three-unit motor generator set, the motor being a single phase A.C. induction motor, which is direct coupled to two D.C. generators, one giving 3,000 volts and the other 18 volts. The H.T. is fed through a smoothing circuit to eliminate ripple, and it is with this end in view that the H.T. negative is connected to the slider of a potentiometer (18 ohms resistance), joined across the filament supply. In this

(*Continued at foot of next page*)

# For the Newcomer to Wireless: Why Grid Bias is Necessary

WHY is it necessary to use grid bias?

You are referring, I take it, to the low-frequency valves of the receiving set?

Yes. Why should we have to give their grids a negative potential?

You know that when we connect up the high- and low-tension batteries to such a valve and switch on, a stream of electrons travels from the negative end of the high-tension battery to the filament and thence across the valve to the plate, and so back to the positive end of the battery?

Yes, I quite understand that.

This current has to pass through the meshes of the grid, which is interposed between the filament and the plate. If the grid is positively charged it exercises a pull on the electrons that leave the filament and increases the stream. If it is negatively charged, just the opposite effect occurs.

Well, I can't see why we should dam back the electron flow in a low-frequency valve by making the grid negative.

If you start with the grid at zero and then make it, volt by volt, more negative you will find that at first the current decreases in direct proportion to the grid voltage. But presently, as you go on increasing the negative bias, you come to a point at which each extra negative volt produces a smaller and smaller decline in current. If you care to plot what happens on a piece of paper you will find that the "curve" is a straight line to begin with and that it afterwards bends away. On the other hand, if you start once more with the grid at zero, and make it steadily more and more positive, two things will happen.

What are they?

First of all, the current will go on increasing until what is known as the saturation point is reached. Again, we have a straight-line part to begin with and then a bend in the opposite direction from the other.

What is the second thing?

As the grid becomes more positive it exercises such an attraction upon electrons from the filament that it actually succeeds in catching some of them. There is thus a flow of current inside the valve from filament to grid and outside it through the grid circuit from grid to filament. This is known as grid current. Now, suppose that we connect the grid at zero volts and an oscillation arrives upon it.

Well, I suppose that the positive half-cycle puts up the flow of current through the valve and the negative half-cycle cuts it down equally?

Not a bit of it. Owing to the flow of grid current when the positive half-cycle comes along the upper half of the corresponding wave in the plate circuit is flattened. In other words, the plate circuit does not give a true magnified copy of the oscillation reaching the grid circuit.

Then the important thing is to prevent a flow of grid current?

Yes, that is very important; and we can do so by giving the grid such a negative bias that the positive half-cycle of no oscillation reaching it will take it beyond zero volts.

Grid bias cuts down the H.T. current; so wouldn't it be economical in that case to keep the grid very strongly negative?

Certainly, but we must be careful that the bias is not so great that a negative half-cycle will take the working point down to the bottom bend.

Why is that?

Because when this happens the lower half of the corresponding wave in the plate circuit is mutilated, since partial rectification takes place.

I see, then, the whole point is to use just enough grid bias to prevent the working point from being taken up by a positive half-cycle into the grid-current area or taken down by a negative half-cycle on to the lower bend.

That's it exactly. When a valve is properly biased incoming oscillations move the working point up and down the straight portion of the characteristic that lies to the left of the zero line.

## "AN AMPLIFIER TO FEED 250 SPEAKERS"

*(Continued from preceding page)*

way, by adjusting the slider to the optimum point, all commutator ripple is avoided.

A Tungar rectifier is used for battery charging. Meters, including modulation meters and grid galvanometers, are connected at various points, and in the input amplifier a row of key switches on the top panel enables meters to be connected in the circuit at will.

In conclusion, it may be said that the apparatus used this year, though basically the same, is very different in appearance from that used last year. At the last Exhibition the gear was tucked away in a cupboard under the stairs and, although a model of efficiency, was hardly a show exhibit. This year, however, an effort has been made to give the apparatus some semblance of "show worthiness," with, it is generally conceded, considerable success.

Incidentally, while on the subject of last year's exhibition amplifier, it might be mentioned that the anode supply was provided by an H.T. transformer connected to the A.C. mains and by a bank of four or six rectifying valves. All filament-heating current was supplied by accumulators, of appropriate size, which were charged from the mains. However, the point about last year's amplifier, which is most vivid in the memory of the writer, is that, at the last moment, as everything was declared in shipshape order and finished, the L.C.C. authorities found fault with the fireproofing arrangements, and the majority of the apparatus had to be pulled down again while these were rectified! No sleep for anyone that night!

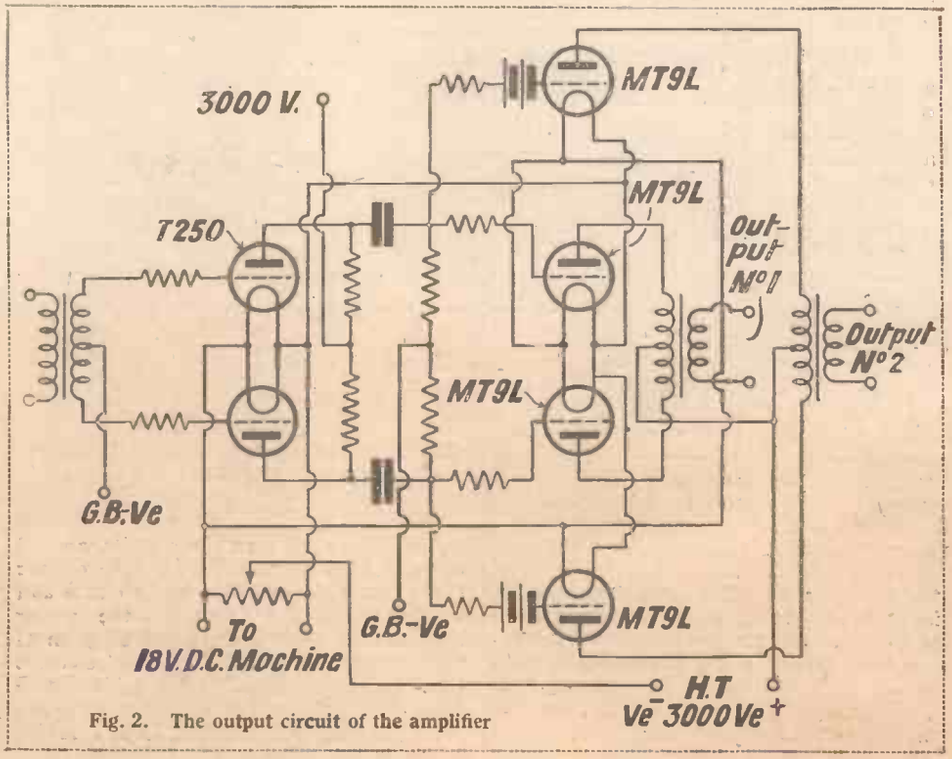



Fig. 2. The output circuit of the amplifier

*A Weekly Programme Criticism*—By SYDNEY A. MOSELEY.

# Without Fear or Favour


## "HIGH-CLASS" MUSIC

## WHERE IS THE "ALTERNATIVE"?

I AM inclined to sympathise with the non-musical correspondents who complain that there are too many outside transmissions of "high-class" musical programmes.

My correspondents really mean "good class"; but let that pass.

◆ ◆ ◆

Yet, with the interest of all listeners at heart, I admit I feel rather selfish about the thing. Either you have an ear and soul for music, or you have not.

The B.B.C. has done many things; it has, for example, done a good deal to increase our general musical education, *but it will never provide* musical souls.

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I understand there are impending changes in the Talks Department. And time, too!

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Simple Food Values by Mrs. Nelson Edwards is a good idea, although I do not happen to know Mrs. Edwards's qualifications for this important position of mentor to a million housewives.

◆ ◆ ◆

When in Berlin recently we were listening-in to Brussels; and a fine military concert it was, too!

"Ach!" said my charming host, "you talk against militarism, and yet all other countries still play stirring military marches."

What is the correct answer to that, O reader?

◆ ◆ ◆

It would be interesting to know when we are going to have really alternative programmes.

I have just had an example given me of how the lack of good alternative broadcast matter makes many a listener seek the solace of foreign programmes.

A friend of mine—who, although not a low-brow, is not always in the mood for classical music—was trying on a recent evening to find something light in the way of music. National was broadcasting Beethoven and Mozart from the Queen's Hall. Going over to London Regional, he found a heavy chamber music recital in progress.

◆ ◆ ◆

And another instance. This was the relay from Brussels of the Radio-Belgique Orchestra. This was a perfect relay, and the music was first-rate, but some provision might have been made for the countless listeners who do not like symphony music. As it was, National was relaying Brahms' compositions from Queen's Hall.

◆ ◆ ◆

P. G. Wodehouse's *Ordeal of Osbert Mulliner* was very funny. I found the broadcast version better than the original story. The only faults were that the characters were inclined to gabble, and there was not sufficient contrast between some of the voices.

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We get good light music from Reginald King's Orchestra. The other evening, during an hour and a half, they broadcast compositions by German, Strauss, Friml, Grieg, and Elgar. It was a diverting assortment.

◆ ◆ ◆

The new two-piano acts continue to flourish. All the duettists are undoubtedly clever, but it would be nice to hear some of them strike an original note. As it is, each act of this kind sounds more or less like all the others.

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*Through the Looking Glass* was a clever adaptation. Cecil Lewis is obviously not unacquainted with Lewis Carroll's work, and he brought out all that was best.

## A GOOD RELAY

## ODDS AND ENDS

One listener thinks that it was "scarcely the type of thing to serve up to the sophisticated listener of to-day. I think the children should have a chance to hear it. It was more for them than for the fathers and mothers."

It is a moot point, however, whether "Alice in Wonderland" is read more by adults than by children.

◆ ◆ ◆

I never tire of hearing the old songs again. In "Here's a Health," Charles Brewer produced one of his best efforts. He brought forth some of the most lively and rousing songs, had them sung and played in the best manner, and linked them up in a delightful way.

◆ ◆ ◆

Just before the show there was a musical-comedy programme, and the selections and songs from *The Belle of New York*, *Kissing Time*, and *Gipsy Love* were most acceptable. The excerpts from more modern comedies, such as *Good News* and *The Vagabond King*, were also good.

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The recent radio telephone experiments held over five days between Berlin and Tokio, conducted as a forerunner for the establishment of a regular service between the two countries, is reported to be a complete success.


**The Gotham Comedy Vocal Quartet in cartoon**

# THE LATEST D
# AND HOW YOU CAN TAK

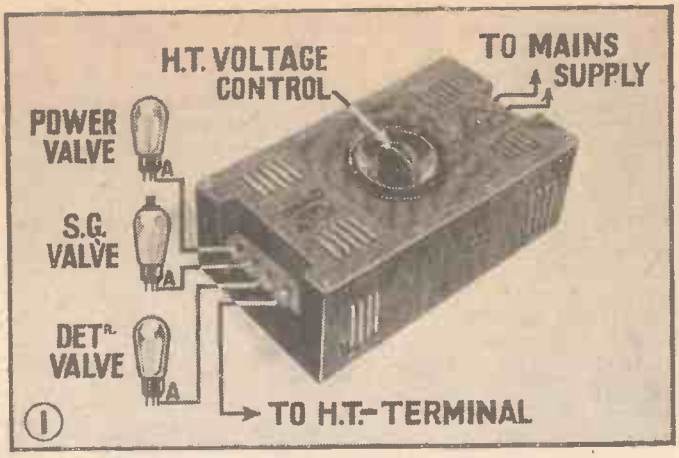
**NOW that the great Radio Exhibition is over the wireless enthusiasts' season is in full swing. From now on we shall be able to judge the practical value of the many radio developments disclosed at Olympia. Quite apart from complete sets and kits, this years' show was notable for the many new accessories and components.**

**All of these are calculated to effect improvement in the reception of broadcast programmes, but many readers are likely to want guidance in making**

### 1.—Mains Units for Portables

TO enable a battery-operated portable to be worked from electric-light supply, many firms are making medium-power units that fit into the space intended for the high-tension battery. The main idea is the provision of 120 volts high-tension supply for the power valve, with subsidiary supplies of lower voltage for the detector valve and for high-frequency valves of the three-electrode or screen-grid type. Some of the units also incorporate a low-tension trickle charger, so that, although the accumulator is retained in the portable, its maintenance worry is eliminated.

Fig. 1 shows the connections necessary for a typical portable mains unit. This R.I. model has a power output up to 20 milliamperes, a detector output giving a variation of voltage between 0 and 150 volts, and a screen-grid output giving 60 to 80 volts.




Essential connections of a typical mains portable unit

The use of such a unit can be recommended for most portable sets, but care should be taken to see that all the connections between the unit and the set are made with insulated wire. Another point: Make sure the unit is not overloaded.

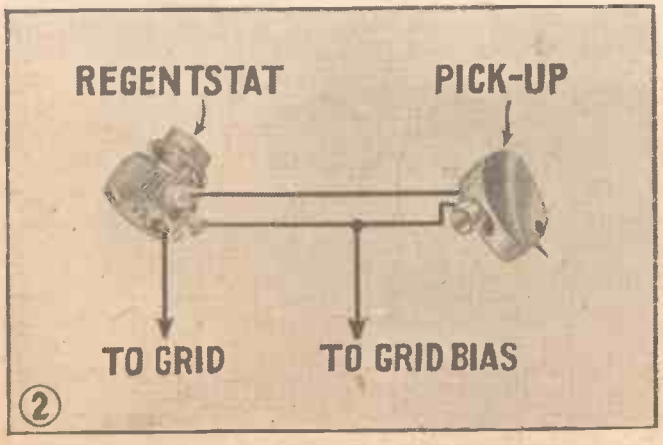
The total anode-current consumption should not exceed 20 milliamperes. This can be readily checked by inserting a milliameter between the high-tension negative socket of the unit and the high-tension negative lead of the receiver.

### 2 and 3.—Potentiometer Controls

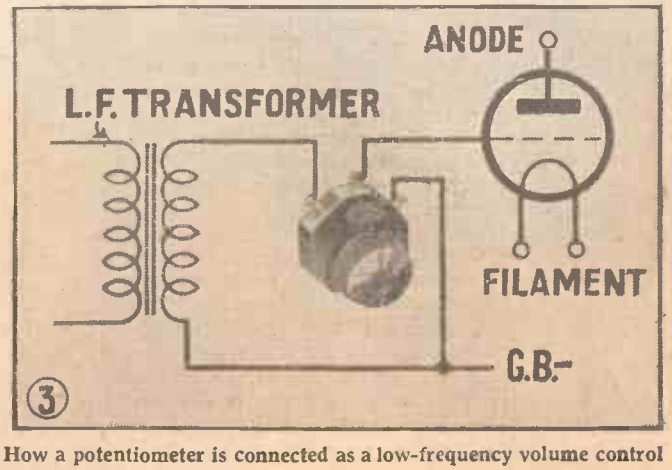
In many parts of a wireless circuit a potentiometer control is invaluable. For example, when a gramophone pick-up is connected straight across the grid and grid-bias terminals of a low-frequency-amplifying valve, the voltage developed by the pick-up may easily overload the valve. The resulting distortion can be entirely prevented by means of a potentiometer.

Several new models have now appeared on the market. Fig. 2 shows how a Regentstat can be connected as a volume control for a gramophone amplifier. The pick-up is connected across the two ends of the potentiometer, one end also going to grid bias. The slider connection goes to the grid of the valve. In this way the voltage applied to the grid can be diminished, if it is causing overloading or if the volume of sound is too great.

Another excellent method of utilising a potentiometer or volume control is shown by Fig. 3, where a new Varley model is connected between the secondary winding of a low-frequency transformer and the




How a potentiometer controls the volume from a pick-up




How a potentiometer is connected as a low-frequency volume control

# EVELOPMENTS
# KE ADVANTAGE OF THEM

**use of them. This article is intended as an indication of some of the practical applications of new components and accessories, although, because space is limited, we are able to deal with only a small percentage of the total array.**

**The diagrams are a combination of picture and circuit; they are not intended as the last word, but as an indication of the function of the particular component or accessory under discussion.**

power valve. The general principle is the same as with the pick-up; the two ends of the potentiometer are connected to the two ends of the secondary winding, one end also going to the grid bias.

The slider of the potentiometer is connected to the grid of the valve, so that as it approaches the end of the secondary winding remote from the grid bias, the voltage applied to the grid is increased. As the slider approaches the grid-bias end of the secondary winding the applied grid voltage decreases.

This method of controlling volume is very satisfactory. It has the advantage that, even when the volume is considerably decreased, the quality is not impaired.

### 4.—Electric Gramophone Motors

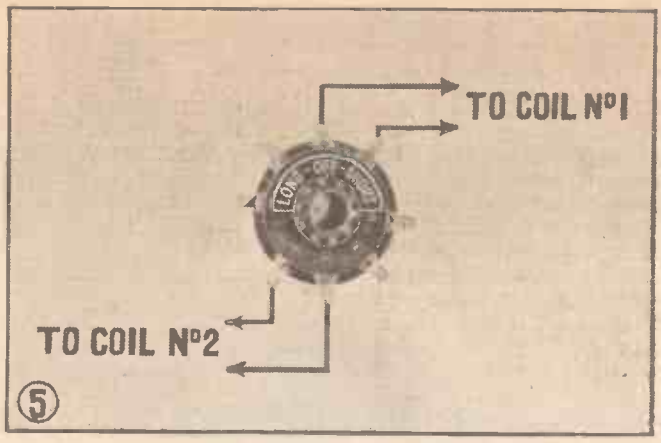
With the introduction of several new electric gramophone motors no one with an electric-light supply need labour at winding up a spring motor. The B.T.H. motor illustrated by Fig. 4 shows the general form of the electrically driven type. The makers remind us that we do not have to wind our wireless sets, so why laboriously wind a clockwork gramophone motor? The very moderate cost of such a motor should appeal to many gramo-radio enthusiasts.

It should be explained that an electric gramophone motor includes the record turntable as well as a mains switch. Most of the motors are self-contained, replacing the entire mechanical system.

A small high-speed motor, driven by A.C. or D.C. supplies, drives the turntable through a worm and worm wheel, which also incorporates a safety device preventing damage to the worm spindle when the turntable is moved by hand. Of course, the current consumption of such a motor is negligible. The B.T.H. is claimed to play 900 records for a unit of electricity.

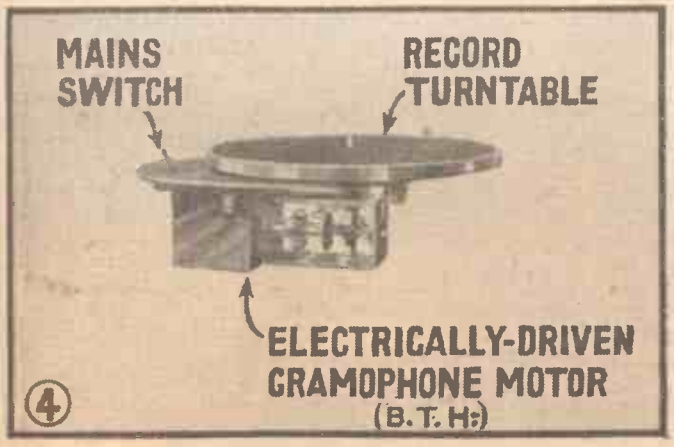
### 5.—Switching Technique Improves

This year's array of switches for wireless circuits offers the home constructor plenty of scope for experiment. Small compact switches with multiple contacts are now available. The new Benjamin double rotary switch is a good example. It consists of a rotating bakelite arm carrying spring-loaded phosphor-bronze balls. As the pointer is rotated the balls snick into gaps between the heavy-gauge contact strips, thereby forming a low-resistance connection.

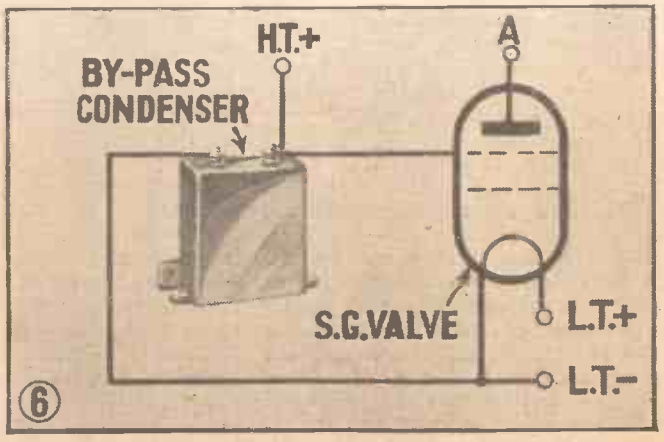



Rotary switch connections for coil switching

A special feature of this switch is the novel terminal, which screws down into a castellated base, gripping, if necessary,




A typical electric gramophone motor

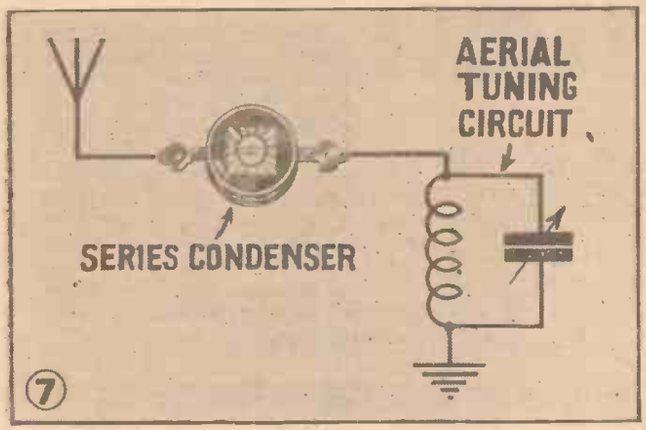



A non-inductive by-pass condenser in a screen-grid circuit

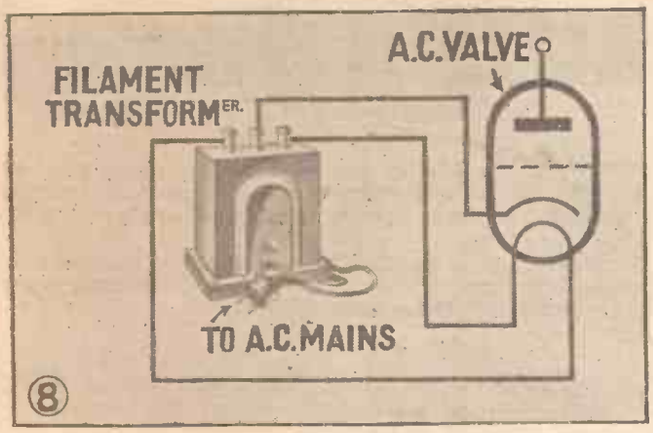
# "THE LATEST DEVELOPMENTS—And How You Can Take Advantage of Them" *(Continued)*

several wires at the same time. Soldering tags and contact strips are in one piece.

Such a switch, equivalent as it is to a double-pole change-over device, has many circuit applications. It can be used for combined filament and wavelength switching, or for switching the A.C. mains from trickle charger to high-tension eliminator; and Fig. 5 shows the switch connections for long- and short-wave switching on two coils simultaneously.




Series aerial condenser connection




How a filament transformer is used with an A.C. valve

**6 and 7.—Fixed Condenser Developments**

Even fixed condensers—staple diet of the home constructor!—offer something in development this year. One of the most interesting is the new T.C.C. non-inductive type. Fig. 6 shows how one of these condensers could be usefully employed in a screen-grid circuit. As most readers know, a by-pass condenser is needed between the screening grid of the screen-grid valve and earth, otherwise instability is prone to develop. But even with such a by-pass, trouble has sometimes been caused owing to its high impedance to small high-frequency currents.

The T.C.C. people state that, whereas the usual 1-microfarad condenser has a resonant point of about 600 metres, the non-inductive T.C.C. condenser has reduced the resonant point to 300 metres. These new non-inductive condensers should find ready application in modern screen-grid circuits. All capacities from .0005 microfarad to 2 microfarads are available.

An attempt has been made by the Formo Company to produce the lowest priced fixed condenser. The Mika-Densor in the .0001-microfarad capacity is only 6d.; the .001-microfarad is 8d. and the .002-microfarad is 10d.

These little condensers would be useful in many parts of a wireless circuit; where a semi-variable series aerial condenser is not needed, a Mika-Densor connected as shown by Fig. 7 would provide increased selectivity at very low cost. The .0001-microfarad capacity would be suitable for medium waves and the .0002-microfarad for long waves.

**8.—Mains Working**

Many constructors who have so far been satisfied with deriving the high-tension supply from the A.C. mains are now turning their attention to the problem of low-tension supply. Of the several possible ways of eliminating the accumulator, a change-over to A.C. valves is the most efficient.

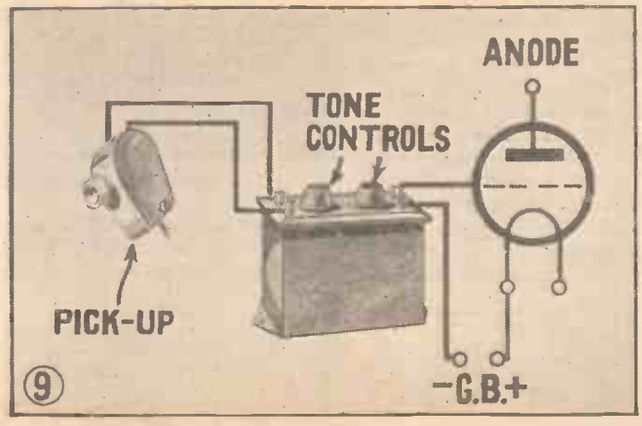
The latest A.C.-heated valves for high-frequency, low-frequency, and detector positions are remarkable for their enormous magnification factors. This efficiency is due to the generous size of filament possible when it is A.C. heated.

The standard A.C.-valve filament rating is 4 volts at 1 ampere. So a mains transformer with a 4-volt secondary winding is needed, preferably capable of supplying up to 5 amperes. Such an accessory is the Mullard PM filament transformer illustrated by Fig. 8.

At the electrical centre of the 4-volt secondary winding a tapping is made for connection to the cathode (corresponding to low-tension negative) of the A.C. valve. This centre tapping obviates the need for a centre-tapped potentiometer across the secondary. Six models of the particular transformer illustrated are available for various mains supply voltages.

**9.—Tone Control**

This year, control of tone will be just as important a consideration as control of volume. The Gambrell Novotone has already achieved fame as a means of improving the tone of gramophone-record reproduction. Another device is the Celestion Tiltatone, illustrated by Fig. 9. This is for insertion between the gramophone pick-up and the grid circuit of the amplifying valve. It allows the middle frequencies to be accentuated or subdued without affecting high or low notes.




Tone control between pick-up and valve



## AT THE QUEEN'S HALL

AN eagerly anticipated event last week was the first performance of Elgar's "Pomp and Circumstance" March No. 5. I had hoped for some development, but it breathes the same pre-war spirit as the other marches. It was vigorously played under Sir Henry Wood, and at least I prefer it to Wagner's "Kaiser March," (played on Monday).

On Tuesday Mahler's "Fourth Symphony" was well performed. There are some good passages in it, but it lacks coherence, and Mahler does not seem to have found the right form in which to express his thoughts.

The other concerts have been well up to the usual standard. The Bach programme on Wednesday, September 24, was under proof. Ethel Bartlett and Rae Robertson gave a fine performance of "Concerto No. 2," for two pianos and strings, and they were allowed an encore, which they played with dazzling virtuosity.

—L. R. J.

# IN MY WIRELESS DEN

WEEKLY TIPS—CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

### The Use of a Milliammeter

I HAVE on many occasions mentioned that some valves pass much greater current than normal valves of the same type.

This does not worry the amateur having a milliammeter, who can quickly adjust the grid bias for the best results.

But how does the user without instruments manage? A valve of the power type passing a heavier current than normal may soon make a difference in the life of a high-tension battery.

The best plan, in the absence of suitable instruments, is, I think, to experiment with the bias values. Commence with a value in excess of the normal, and find by experiment the greatest bias the valve will take with good results. One should be very careful about using too little bias, for the anode current may easily be considerable and quickly discharge a dry battery or harm a mains unit.

### Good New Accumulators

Some of the new types of accumulators being issued have very good characteristics. They will discharge at a slow rate over a period of, say, 100 hours and may be rapidly charged in, say, 8 hours.

Naturally, special plates are used, and they are carefully prepared. The capacity of a cell depends largely upon the time during which the load is connected. With some types the maximum ampere-hour capacity is obtained when the cell is discharged in 8 or 10 hours.

To have produced a cell having excellent characteristics and working at its best during discharge over fairly lengthy periods is something of an achievement.

The rating of cells has always been a difficult matter, especially for wireless work, but the new types are a great improvement.

### Harsh Sounds!

Harsh sounds from the speaker may be due to a fault in the set, but it often happens that the reproducer itself is faulty or perhaps the connecting cord is intermittent.

If the noises are produced when the cord is moved, the cord is probably faulty.

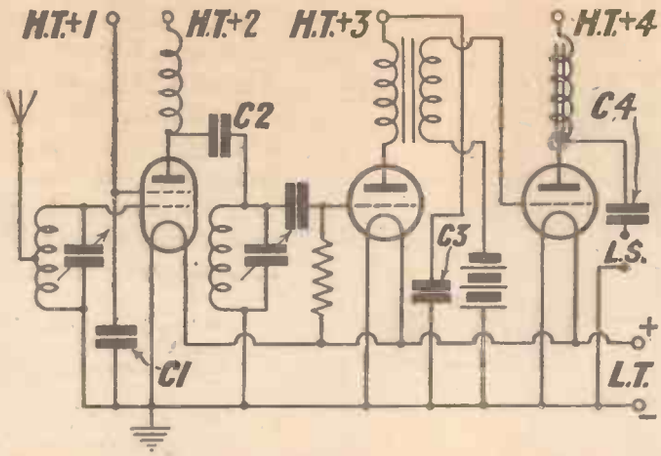
Dust is the cause of much noise. If allowed to collect about the movement, it will sooner or later cause trouble. Sometimes a few filings may be found between the armature and the pole pieces. They will, of course, restrict the movement of the armature and so cause distortion.

Filings are sometimes difficult to remove without dismantling the unit, and this is work needing careful attention.

### The Safety Factor

One hears now and again of faults which have developed in sets as the result of the application of too high anode circuit voltages or of the use of parts not able to deal with the normal voltages.

Particularly when mains units are used is it essential that suitable parts be used. Most condensers easily withstand the usual circuit voltages of the order of 120, but they are not all capable of working continuously with a much higher voltage.




This is the circuit referred to by Mr. W. James in the accompanying paragraph on "The Safety Factor"

The screen-grid by-pass condenser C1 in the accompanying circuit has usually to withstand a moderate voltage only, but the others have greater voltages. That at C2 has the full voltage, as a rule; C3 may have a little lower one, but condenser C4 has to withstand the largest strain of all.

Not only does this condenser have the anode circuit D.C. voltage across it, but it has also the speech-frequency voltages, with the result that a breakdown is more likely to occur here than elsewhere unless the condenser is a good one.

### These New Valves

New valves are, I notice, still being brought out. As a designer of sets, I have mixed feelings.

Some sets will be improved by the new valves and others may not. The valves are, of course, good; and so are the sets, for that matter.

The point is that sets are designed for certain types of valves, and when better valves are fitted troubles may be experienced. It would be a good thing were all new valves issued at a certain time, for then the sets could be designed to suit them.

As it is, the best is often not obtained from a new valve. On the other hand, I suppose, if we knew when to expect new types there would still be troubles. Everybody would wait for them.

### Push-pull Output Stages

A question frequently asked by those who want to use a push-pull output stage is: Are matched valves essential?

To this one can reply that in the smaller power valves exact matching is not necessary. Some care must be taken, however, as power valves do sometimes differ greatly from one another.

The point is that the results will not be so good with a pair of odd valves as when matched ones are used. Do not forget to employ 100,000-ohm grid leaks in the grids of the two valves, or you may find the push-pull stage to be a splendid oscillator.

One, or perhaps both, of the valves may become quite warm and the energy is coming from the high-tension battery. The grid leaks will stop self-oscillation, which, by the way, is much more prone to occur when the modern "steep" slope valves are used.

### Removing the Hum

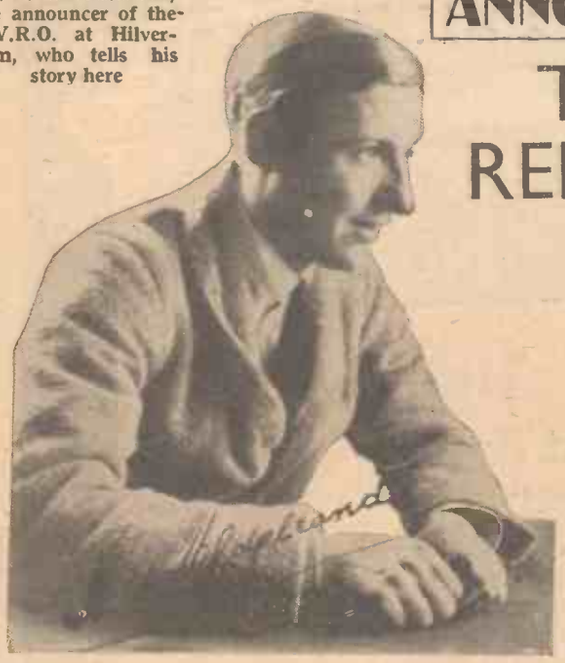
One of the easiest ways of preventing hum in a mains set is by connecting a low-resistance potentiometer across the heaters and taking the sliding contact to the cathodes.

By adjusting the contact the hum may often be obviated.

The fact is, that some heater transformers have a tap which is not at the electrical centre of the winding, with the result that hum is introduced. On the other hand, even when the hum which is heard is due to the design of the set as a whole, it appears possible partly, at all events, to neutralise it by using an adjustable potentiometer. A resistance of 40 ohms is enough for heater circuits.

## ANNOUNCERS TELL THEIR STORIES

# THE AFFAIR OF THE RED AND WHITE LIGHTS



Mr. A. D. Hildebrand, the announcer of the A.V.R.O. at Hilversum, who tells his story here

ABOUT two years ago—in December, 1928, to be exact—I read in one of the daily papers an advertisement: "Wanted, an announcer for Radio Hilversum." I went, I saw—and I was taken on.

For three days I practised before a "dead" microphone, and then came the fatal day when I had to make my first radio announcement. I shall never forget that occasion. It was when an orchestral programme was being given in the studio, and at the start of the evening I should have announced that the orchestra would be conducted by Nico Treep, but I was so nervous that I said Trico Neep.

"Never mind," said the station manager. "You are a bad announcer, but perhaps you will be able to learn——"

Needless to say, I *did* learn.

I understand that there is a certain amount of confusion in other countries about the broadcasting arrangements in Holland. To my mind, our system is very satisfactory. We have three main broadcasting organisations and several similar ones. The three main corporations are the A.V.R.O., meaning General Broadcast Society (for which I announce), the K.R.O. (Catholic Broadcast Society), and the V.A.R.A. (Labour Broadcast Society). Perhaps that will help to make matters clear.

But I digress. I know I have been asked to speak about the strange things in the studio.

Recently when a gramophone broadcast was in progress I read the title of one of the records and announced: "You will now hear an aria from *Tosca*, sung by . . ." This was exactly what the label said, but immediately the record started I realised that it was part of a suite by Ravel.

I switched off and made as polite an excuse as I could before the microphone—and next day I had quite a pile of letters telling me that I was very diplomatic! One listener said: "Of course you made a mistake and your explanation was glib; although no one will be so stupid as to believe it."

Another snag cropped up in a subsequent gramophone broadcast, when I made the mistake of putting on one record twice. As this was an occasion when it was probable that not many people would be listening I thought I would try to "pull the microphone's leg," and when the second playing was finished I announced that the composer of that particular potpourri had used, on both sides, all the various melodies twice, but with a slightly different arrangement.

I asked listeners if they could detect this difference. The very next day we received several letters from people who said they had noticed a difference!

And now about our signalling system and the business of the red and white lights. The communicating system between the studio and the transmitter is such that when a speaker is waiting in the studio we tell him to be at ease until a red light glows. Then he has to touch a switch and immediately a white light comes on. This indicates that the microphone is switched on and he may speak.

It has been my experience that the cleverest men before the microphone have been the hardest to initiate into the working of this system. Once when a famous professor was at the Hilversum microphone I patiently explained the whole thing to him and then I went back to the Control Room and watched the working of the switches.

We switched on the red light, but nothing happened, so I ran back to the studio and heard that he was already speaking. Again I explained the system to him and told him to touch the switch of the white light before beginning to speak. As I closed the studio door I saw the white light suddenly come on and the Professor, standing in the firing line of the microphone, said "Really I don't understand, and now the man has gone. Am I connected or not? It is very puzzling!"

Of course listeners could hear this, so I had hastily to switch off the microphone and for a third time initiate the professor into the, after all, very simple working of the switching system.

Another trouble that we announcers have with speakers is that some of them never seem to make an end to their introductions.

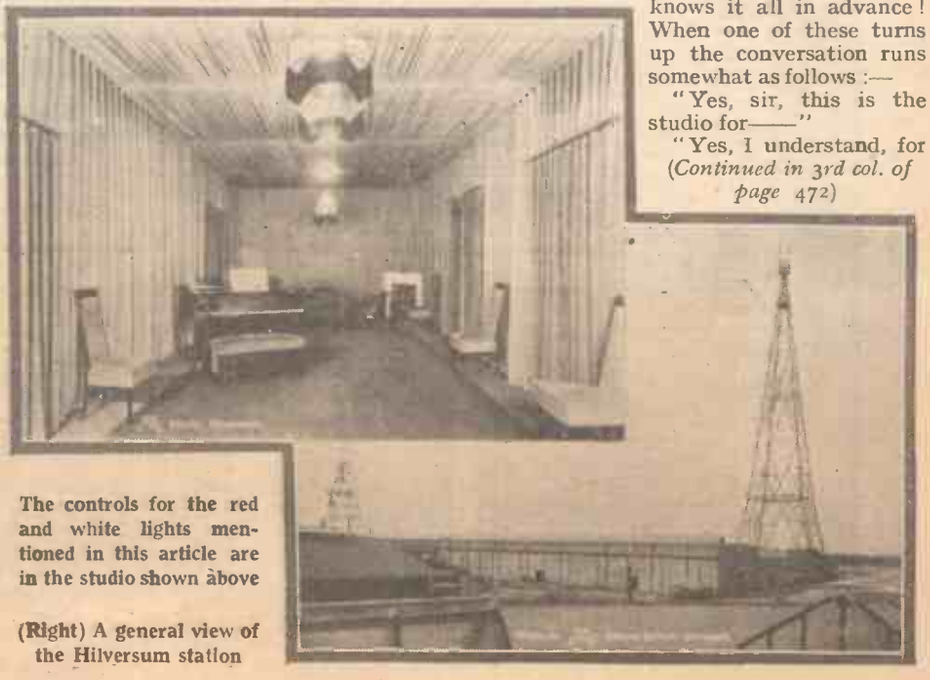
Most of them begin with a long delay about the pressure of time and they generally say something such as "As I have so little time it will be difficult for me to tell you all that you should know about this subject but I hope you will realise that in the space of ten minutes or so I cannot tell you . . ." By the time they have finished the lengthy introduction five or six minutes have already passed by.

Another amusing and just as irritating a person is the visitor to the station who knows it all in advance! When one of these turns up the conversation runs somewhat as follows:—

"Yes, sir, this is the studio for——"

"Yes, I understand, for

(*Continued in 3rd col. of page 472*)



The controls for the red and white lights mentioned in this article are in the studio shown above

(Right) A general view of the Hilversum station

# NEW RADIO FOR OLD

## WE WILL BUY YOUR OLD-RADIO-SET

How would you like an up-to-date 3-valve Receiver which will tune in to all wavelengths? Not an ordinary Receiver which tunes in only to the high and medium wavelengths, but one which will always receive the wonderfully efficient short wave stations of the World—stations you have probably never heard. These Short Wave Sets are so amazingly efficient that listeners who possess Short Wave Sets hear America and other far distant stations regularly. Pittsburgh—Schenectady—Manila—Bangkok—Eindhoven—New York—Sydney—Nairobi—these and many others come in clear, loud and free from interference. "World Radio" gives a list of over 70 Short Wave Stations—you can listen to them yourself with the "Empire Link" Receiver.

Imagine the finest Radio Receiver you have ever heard then add the advantages of Short Wave reception and you have some idea of the enjoyment you will get from the possession of an "Empire Link" Receiver.

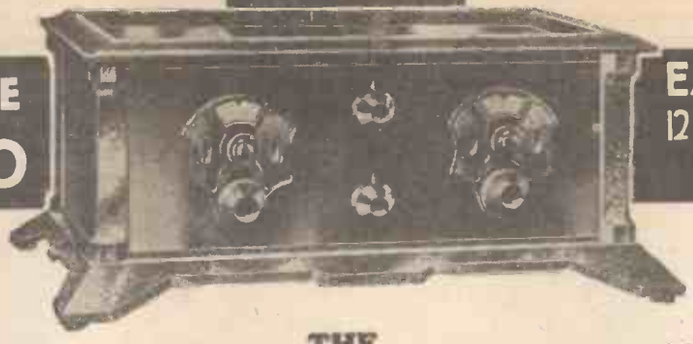
**NOW YOU CAN HAVE A NEW AND UP-TO-DATE "EMPIRE LINK" RADIO SET WHICH WILL TUNE IN TO EVERY BROADCASTING WAVELENGTH IN THE WORLD**

No need to wait—you can buy an "Empire Link" now, selling your old Receiver to us in part exchange. In order to make it still easier for you the "Empire Link" is supplied as a Kit of Parts so that you can build the Receiver yourself and save pounds. No technical knowledge is necessary—the Components almost fall into position, that's how easy it is to put together.

The "Empire Link" Short Wave Kit comprises every part necessary to build the complete Receiver .... Cabinet, Components, Valves and Coils for all wavelengths from 15 to 2,000 metres.

The cash price of the "Empire Link" Short Wave Kit complete is only 11 gns., and we will buy your old set in part exchange. Take advantage of this generous offer now of new radio for old. Or if you wish you can purchase your "Empire Link" by easy monthly payments of 21/-. Fill in and post the coupon now.

**CASH PRICE £11-11-0**



**EASY TERMS 12 Monthly Payments of 21/-**

THE

# "EMPIRE LINK" SHORT-WAVE KIT

Sole Distributors **Ready Radio**

**FORM A**

To Ready Radio (R.R. Ltd.), 159, Borough High St. London Bridge, S.E.1

A.W.

I wish to purchase one of your new 1931 "Empire Link" Short Wave Kits.

(a) Complete Kit 11 gns.

(b) Complete Kit (except for valves) £10 - 3 - 6

(CROSS OUT WHICHEVER DOES NOT APPLY)

NAME .....

ADDRESS .....

.....

*Fill in Form 'B' if you require particulars of our easy monthly payments or part exchange system.*

**FORM B**

To Ready Radio (R.R. Ltd.), 159, Borough High St., London Bridge, S.E.1

A.W.

Please send me full particulars of

(a) Your Part Exchange System

(b) Your Hire Purchase Terms

(CROSS OUT WHICHEVER DOES NOT APPLY)

NAME .....

ADDRESS .....

.....

*NOTE: Part Exchange does not apply to Hire Purchase System.*

*Fill in Form 'A' if you wish to purchase your receiver.*

## SETS OF DISTINCTION

# The VARLEY SENIOR 3

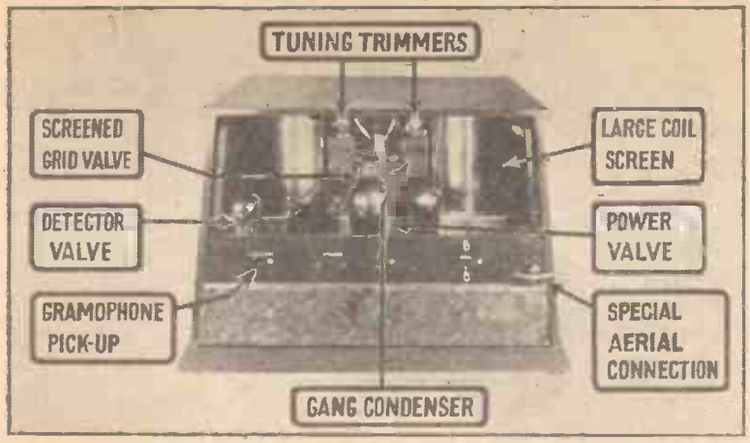
Maker : VARLEY, LIMITED

PRICE £26

JUST now I am revelling in tests of all the latest radio sets; and if they all come up to the performance of the new Varley three-valver, I am in for a delightful time. The Varley three-valve senior set is suitable for A.C. or D.C. mains supplies. The tests of which I now write were confined to the A.C. model.

It is a handsome-looking set. The cabinet is on the large side but that is not a fault, especially as the workmanship is really superb. This firm seems to have grasped the right idea about radio set cabinets. I have never seen a Varley set in anything but a really fine cabinet.

Anyway, there is a good reason for the large size of the cabinet, for inside it I noticed two large coil shields, one at each end of the metal chassis. The designer tells me he has taken a lot of trouble to make sure the two coils are accurately matched. As both coils are tuned by a gang condenser, operated by a single knob, one can understand the need for accuracy.




Back view of the Varley Senior 3. Note the metal chassis construction

There is an individuality about the interior of this Varley set, showing that the designer has ideas of his own. Well, I like his plan, because it has resulted in an exceptional performance both as regards sensitivity and selectivity.

With the new A.C.-heated screen-grid and detector valves, it is no mean achievement to get the best from them without sacrificing selectivity. In a three-valver with two such valves, their increased amplification has the effect of *decreasing* the selectivity of the two tuned circuits, unless they are very carefully designed.

That is where this Varley set scores. I have seldom tried a set that so admirably combines the twin assets of selectivity and sensitivity. I find it difficult to do the set justice merely by telling readers how many stations were picked up during tests. It would be much better if I could convey *how well* those stations were received.

Dozens of them came in, full-bodied loud-speaker signals, free from interference, and just by turning one dial. I started with the medium wavelengths.

Budapest was quite strong at 167 degrees, Vienna was good at 155 degrees and Milan at 149 degrees was excellent. Then came Midland Regional at 140 degrees. Below it I got Langenberg at 138 degrees. At 135 degrees Lyons was fine.

But between Lyons and Rome the ether seemed to be in a terribly chaotic state. Rome came in at 125 degrees, where it was as good as the Midland Regional, for strength and quality. Katowice at 112 degrees, Bucharest at 110 degrees, Frankfurt at 105 degrees, Toulouse at 102 degrees and Hamburg at 98 degrees were all very good.

Then the London Regional began to swamp the next few degrees on the scale coming in at full strength at 90 degrees. Between London Regional and London National, stations were so numerous that I lost count.

All these stations were tuned in at one sitting, with great ease of operation. The main control is a very brightly-lighted dial, worked by a large knob in the middle of the front panel. Just below this control is a very small auxiliary knob. For the medium wavelengths I did not have to touch this, so tuning was really a one-dial business.

### The Long Wavelengths

On the long wavelengths, where seven or eight high-power stations were received at excellent strength, a slight re-adjustment of the subsidiary tuner was found necessary. I like the way the volume and reaction controls work. They are mounted on the right and left respectively of a similar-shaped knob for changing the tuning from medium to long wavelengths.

The volume control works over the whole of its available range, gradually decreasing the strength from a terrific maximum down to a barely audible minimum. The reaction control also works well, especially in its constancy of application over the major portion of the tuning range.

### Selectivity

I have said little so far of the selective properties of this set. A good idea of its probable behaviour in districts covered by a B.B.C. regional station can be gathered from the following tests.

The London Regional, which came in at 90 degrees, entirely disappeared at 10 degrees below and 10 degrees above. The London National, which came in at 30 degrees, could not be heard at 45 degrees and 15 degrees.

In taking note of these figures, one must remember that, at their point of tune, both Regional and National stations are tremendously strong on the Varley set; so strong that a large moving-coil loud-speaker was loaded to the limit. To eliminate these stations over such a narrow segment of the dial is highly satisfactory, especially as the quality remains unimpaired by this good selectivity.

SET TESTER

"THE 'A.W.' CHALLENGE"
SEE OUR NEXT ISSUE

### "ANNOUNCERS TELL THEIR STORIES"

(*Continued from page 470*)

the orchestra——"

"No, not for the orchestra, but for——"

"Oh, yes, I understand, for the announcers——"

"No, not for the announcers, for the ——"

"And this is the microphone? Is this where you speak?"

"No, here——"

"I understand, this is not——"

"Now, here you see——"

"Ah! *Now* I understand. This microphone isn't really a microphone!"

"Yes, it is, but——"

After half an hour of this sort of thing the visitor eventually goes, and although he is still saying "Oh, now I understand" as he departs, he probably knows precious little about it.

And now may I make a suggestion? Every fortnight we have a Children's Hour, and the old familiar stories of dwarfs and giants are given over the microphone. If any English children would like to hear an English story told by a real "Dutch Uncle" they may do so if they care to write to me on the A.V.R.O., Keizersgracht 107, Amsterdam.

SOME NOTES ON PRESENT— DAY SHORT-WAVE CONDITIONS

# Around the Short-wave Dial

BY M. BARNETT

NOW that we are approaching winter again and the nights are getting longer, the longer wave stations on the short wavebands, that is, those around 40 to 60 metres, are coming in better. Some excellent reception has been had lately from W3XAL, the short-wave relay station of WJZ, at Bound Brook, New Jersey. No doubt many of the "old-timers" will remember WJZ as being one of the first American stations on the medium waveband to make itself heard over here. The short-wave relay operates on 49·18 metres and it generally makes itself heard in the evening and the early morning. Another station which is coming in very well at present is W8XK, the short-wave relay station of KDKA, on 48·86 metres. This station is, on the average, even better than W3XAL but does not appear to employ a particularly high percentage of modulation.

### Worth Noting

It is well worth while to make a search for these longer wave stations as they are sometimes at good strength when the 30 and 20 metres transatlantic stations are inaudible. They are at their best in the late autumn and winter. The only trouble is that, unless you have a calibrated wavemeter, they are rather hard to pick out because so many European amateurs seem to be working both above and below these stations and it is generally a case of "turn the dial until you hear an advertisement!" By the way, will Americans never grow tired of listening to Amos 'n' Andy? They seem to be on the air almost every night and they can generally be heard from KDKA via W8XK.

### Short-wave Relays

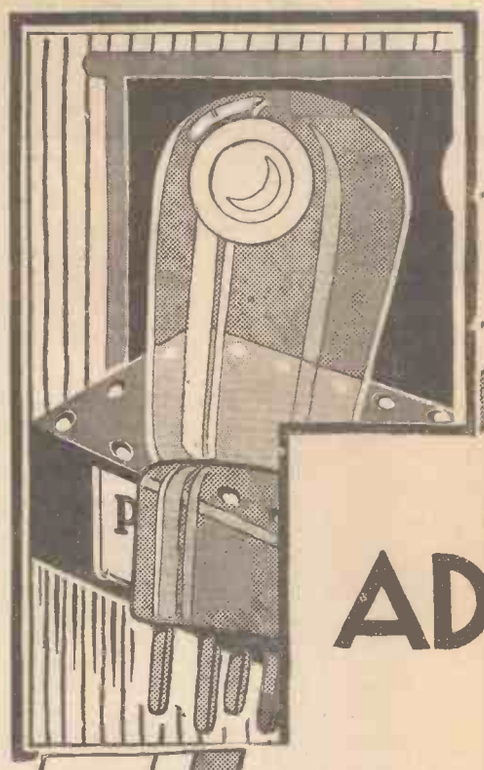
The recent Belgian National programme was relayed on the short waves by Zeesen and the reception from this station was excellent. PCJ's early Wednesday evening transmissions have also been coming in at great strength, although they generally fade out when darkness approaches. The cheery announcements are quite a tonic!

OXY at Lyngby, which relays the programmes from Copenhagen on about 31.5 metres, has improved lately and appears to be on the air more frequently now. Unfortunately, the transmissions suffer strong interference from Zeesen and PCJ at times.

### Aerials for Short-wave Reception

Frequently I have discovered that newcomers seem to be under the impression that very special types of aerials are necessary for good short-wave reception. As a matter of fact this is by no means the case and it can truthfully be said that an aerial which will give good results on the medium and long wavebands will almost certainly do likewise on the short waves. Very often an indoor aerial will give excellent results, but with short-wave receivers body capacity effects are apt to be rather troublesome, especially with the detector and 2 L.F. type of receiver, and the tuning will alter if one approaches even within one foot of the aerial wire. Well, this certainly isn't very nice and about the only remedy appears to be to add a tuned or untuned screen-grid valve.

With this, body effects become negligible, especially if the stage is untuned, and one can even take hold of the aerial wire itself without affecting tuning in the least.



# AS GOOD AS ADDING ANOTHER VALVE

That's how your radio set responds when you fit a Pertrix Non-sal-ammoniac Dry Battery. Instantly, you notice the wonderful improvement in reception, the bell-like clearness of every sound and entire absence of battery noise. And what is more, Pertrix Batteries keep up this wonderful performance throughout their amazingly long life.

Of course, there's a reason for it—Pertrix Dry Batteries are made by an improved process that prevents corrosion . . . that prevents deterioration when not in use . . . and that DOES lengthen life.

**PRICES:**

| Standard Capacity (12 m/a discharge) | | Super Capacity (20 m/a discharge) | |
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| 60 volt | 8/- | 60 volt | 13/- |
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**PERTRIX**

**NON-SAL-AMMONIAC DRY BATTERIES**

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BRITANNIA HOUSE, 233, SHAFTESBURY AVENUE, LONDON, W.C.2.
Works : Redditch.

*Get an Improved Pertrix Accumulator as well*

**PERTRIX ONCE — PERTRIX ALWAYS**

# WE TEST FOR YOU

*A weekly review of new components and tests of apparatus.*

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

### Varley Ni-core Transformer

IT is not always the transformer having the highest primary inductance that gives the best results under average conditions. Indeed, there are other factors in the design, such as the self capacity and D.C. resistance of the winding, etc., which have an important bearing on the performance. Even more is this the case in these days of high-power broadcasting stations, for there is a serious danger of overloading a high-impedance detector valve, and modern practice is tending more to the use of medium- or even low-impedance valves for detection.

The Varley Ni-core Two transformer is an inexpensive instrument having a medium-impedance primary winding, and a step-up ratio of 4 and 1: it is designed for use with the average valve, and has constants which give it an excellent performance under normal conditions.

Under operating conditions the primary winding, without polarising current, is 38 henries. This drops to 32 henries with 1 milliamp polarising current, 28 with 2 milliamps, and with 4 milliamps the inductance is 20 henries. It is advisable, therefore, to limit the anode current to 2 or 3 milliamps.

We have had experience of this component in a number of sets, and have been surprised that a transformer selling at only 15s. should be capable of such a good performance.

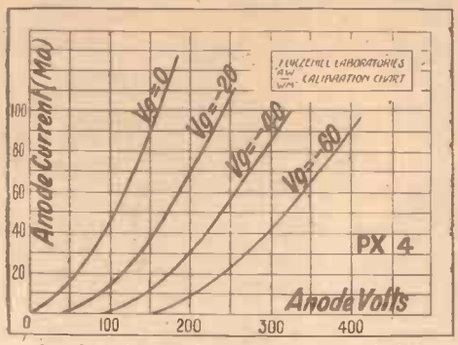
The Varley Ni-core low-frequency transformer

### Marconi PX4 Valve

ONE of the features of the new Marconi PX4 valve which is commendable is the fact that the anode volt-anode current characteristic is given with the valve.

A modern output valve needs to be suitably matched to the loud-speaker in order to obtain the maximum undistorted output, and in order to obtain the necessary data as to the best ratio of output transformer to use—or even to find whether an output transformer is necessary—the anode voltage-anode current characteristic is desirable.

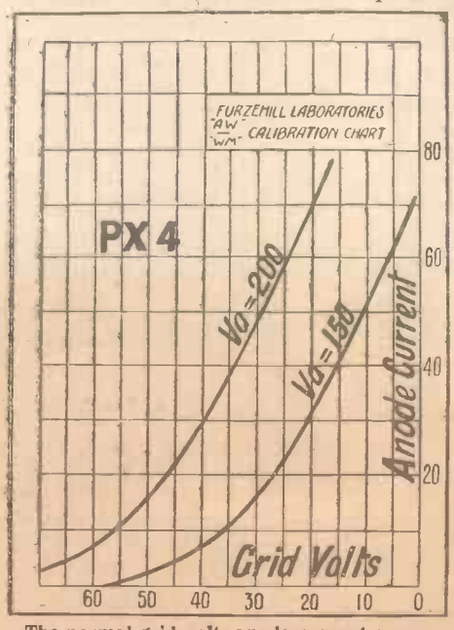
The usual form of characteristic showing




Anode-volts anode-current curve of the Marconi PX4

variation of anode current with grid voltage is not helpful for this purpose, and this is undoubtedly one step towards the better rating of output valves as a class.

The valve itself, as the name implies, is




The normal grid-volts anode-current curves of the PX4

one of the 4-volt series. The filament current is 0.6 ampere, so that it can be used quite satisfactorily in the output stage of an A.C. receiver with the filament directly heated from a 4-volt winding.

It will stand 200 volts on the anode, and will carry 50 milliamps when correctly biased at this voltage. The amplification factor is 3.5 and the internal resistance 1,050 ohms.

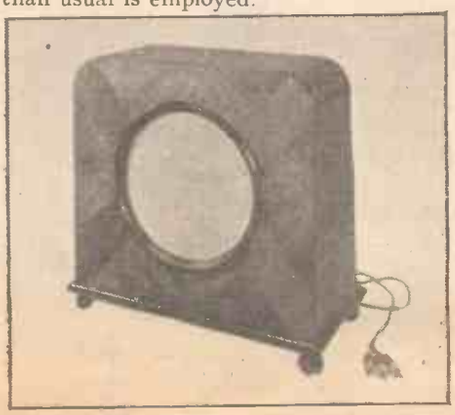
The output from this valve is well over 1,000 milliwatts, which is enough to drive a moving-coil loud-speaker at comfortable volume. The high anode current, of course, necessitates some form of output coupling, either by choke or transformer, but with the modern output valve this is almost invariably used in order to obtain the correct impedance.

### Hegra Magnet Dynamic Speaker

WE have just heard the new Hegra Magnet Dynamic speaker on test in the laboratory. This speaker makes use of a new balanced-armature unit, capable of handling great volume, without distortion or overloading.

The armature is so designed that it can move with complete freedom through the powerful magnetic field created by magnets of semi-circular shape.

Moreover, the special shape of the magnets prevents the armature from striking the pole pieces. As a result of the general principle involved, a much smaller air gap than usual is employed.



A new Hegra speaker—the Magnet Dynamic

In effect, the magnetic field is greatly strengthened. Constancy in the strength of the magnetic field through which the armature moves is one of the most important claims made.

From our tests we are of the opinion that the Hegra speaker justifies its maker's claims. Quality of reproduction, as noted by connecting the Hegra Magnet Dynamic speaker to the output terminals of a good quality gramo-radio outfit, very nearly approached what one expects from a moving-coil speaker.

# THE FORTHCOMING SYMPHONY CONCERTS

THERE are some good things in store in the forthcoming symphony concerts at the Queen's Hall, starting on October 22. Conductors in the series, which runs on to May 6, include Dr. Adrian Boult, Albert Coates, Sir Landon Ronald, Sir Henry Wood, Ernest Ansermet, Oskar Fried, and Hermann Scherchen.

At the first concert Adrian Boult will make his initial appearance as a conductor for the B.B.C. since his appointment as music director. Guilhelmina Suggia, the 'cellist, will be the soloist.

The conductors who are participating during the season have been invited to take control of the orchestra for a period, in most cases of three weeks; and during each conductor's period the whole orchestral organisation will be at his disposal for popular programmes from the studio, as well as for symphony concerts from Queen's Hall.

Groups of concerts will be in the hands of Sir Henry Wood, Ernest Ansermet, Oskar Fried, and Hermann Scherchen, whilst single concerts are to be conducted by Albert Coates and Sir Landon Ronald.

Every endeavour has been made to secure a representative list of outstanding soloists for the series. These include Casals, Cortot, Stravinsky, Bartok, Backhaus, Dohnanyi, Gieseking, Rubinstein, Myra Hess, Moiseiwitsch, Solomon, Lamond, Szigeti, Busch, Catterall, Sammons, and Wanda Landowska. The singers include Elisabeth Schumann, Maria Olozewska, Goeta Ljungberg, and Fritz Wolff.

Lovers of choral music will be catered for by revivals of Handel's *Israel in Egypt*, Beethoven's *Missa Solemnis*, Vaughan Williams's *Sea Symphony*, and Bliss's new choral work, *Morning Heroes*. The National Chorus and the Philharmonic Choir will be heard in these works.

The programmes cover a wide field among the masterpieces of both classical and modern musical literature. The six Brandenburg Concertos of Bach; the Third, Fourth, Fifth, Eighth, and Ninth (the Choral) Symphonies, the Violin Concerto, and the Third, Fourth, and Fifth Piano Concertos of Beethoven; the Fourth Symphony and both Piano Concertos of Brahms; Schubert's great C Major; Schumann's Fourth; Berlioz's Fantastic Symphony; Tchaikovski No. 4; César Franck; and Borodin No. 2. One concert will be devoted to the works of Wagner. Strauss and Mahler will be represented. Works by Schonberg, Stravinsky, and Bartok will figure among the modern masterpieces.

British composers will be well represented, Elgar by his Second Symphony, Violin Concerto, and "Enigma" Variations; Bax by his Second Symphony and *November Woods*; Vaughan Williams by his *Sea Symphony* and *Tallis Fantasia*. Holst's *Planets* will be given complete; and Bliss's *Morning Heroes* will receive its first performance in London.

The whole series should provide some good listening, but it must not be overlooked that the symphony concerts also provide a good opportunity for Londoners to hear first-class music in comfort and at low cost in the Queen's Hall itself. Particulars and prices of admission and season tickets may be obtained from the B.B.C.

K. U.

## DO YOU KNOW—

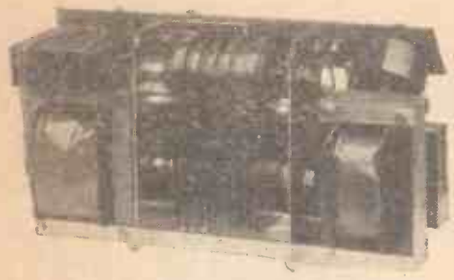
**that a new receiver has been designed for the Science Museum at South Kensington, and is now being installed? The old set has been scrapped and an entirely new circuit is used.**

**that you must take care of the fuse on the low-tension side of your set, particularly if this is fitted close to the accumulator terminals? Unless the fuse is enclosed, which it should be, the corrosive effect of the acid fumes may cause a poor connection after a time, and this will result in crackling noises.**

# JUNIT MAINS UNIT

DESIGNED to occupy as little space as a 100-volt high-tension battery, the Junit mains unit measures 9 in. by 5 in. by 3½ in. It provides an output sufficient for all modern multi-valve sets, whether portable or table cabinet models. Every Junit mains unit will work on supplies from 200 to 240 volts, and they incorporate Westinghouse metal rectifiers.

The following three types are available: Type 150/4AC provides 150 volts at 25 milliamps. Tappings: one variable, 0-150 volts; one fixed, 150; one fixed for screen-grid valve. This incorporates a



The chassis of the Junit mains unit

4-volt centre-tapped winding for supplying filament current for indirectly-heated valves. The price is £5.

Type 120 provides 120 volts at 20 milliamps. Tappings: one variable, 0-120; one fixed, 120; and one for screen-grid. The price is £4 7s. 6d.

Type 120/TC also provides 120 volts at 20 milliamps. Tappings: one variable, 0-120 and one fixed, 120, one fixed for screen-grid. Contains trickle-charger for 2-, 4-, or 6-volt accumulators. The price of this is £5 12s. 6d.

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It is unofficially stated that Radio Paris will start experimenting with its new 60-kilowatt transmitter towards the end of October.

# RADIOGRAMS

THE Nottingham Goose Fair has been in existence for almost a thousand years, and on October 2, when this year's opening ceremony takes place, Midland Regional listeners are to hear the official opening by the Chief Magistrate. The wording of this has remained unchanged throughout the centuries.

The first of an interesting series of talks entitled *The World and Ourselves* will be given on October 2. They will take the form of a discussion between Englishmen and representatives of other countries. Among the Englishmen to be heard are Lord Lothian, Mr. Oliver Stanley, the Hon. Harold Nicolson, Mr. John Loder and Professor Arthur Toynbee. Germany will be represented by Count Gottfried Bismark, Russia by Maurice Hindus and Turkey by Holide Edib Hanum. The latter was the first woman in Turkey to discard the national costume and take up an independent career.

The number of listeners' licences issued in Italy on June 1 last showed an increase of over 200 per cent., as compared with the number issued up to January 1, 1929.

Part of the Wagner concert, including Act 3, Scene 1, of *The Meistersingers*, to be given in the Assembly Room, City Hall, Cardiff, will be heard by listeners to this station on October 11. The artistes will be May Blyth, Walter Widdop and Keith Falkner.

Thirty per cent. of the hotels in the United States have radio installations. With about 25,000 hotels, this estimate means that 7,500 are fitted out.

## FOR THE CONSTRUCTOR

**HERE is a suggestion that will give your panel a touch of originality, and will make a wooden or old panel look really artistic.**

**Ask your local upholsterer for a spare piece of Rexine or American leather the size of your panel, plus a couple of inches each way, and in any colour that takes your fancy. Brown or blue will look excellent. This should cost only a few coppers.**

**Remove the knobs, dials, etc., from the front of your set, pushing the protruding parts to the back of the panel so that they hold themselves in place without any damage. If you can do this there is no need to touch the wiring.**

**After cutting the Rexine to the panel size, plus a margin all round of about ¾ in., cover the back of the cloth with a coating of any good liquid glue and press on the panel when the glue is really tacky. Smooth down with a cloth, stretching from the centre outwards and pressing firmly at the front edges.**

**The edges of the cloth should be snipped ½ in. deep and at intervals of 1 or 2 inches. When the front is in place turn over the edges and press the snipped parts to the back of the panel.**

**When the glue has dried thoroughly, the holes for the components can be roughly cut out with a pair of scissors, the knobs, etc., hiding any blemishes. The Rexine can be polished with furniture cream, etc., before replacing the knobs and dials.**

**When the job is complete you will have a very attractive panel, toned to suit its surroundings.**

A further Conrad novel has been adapted for the "mike"; the play is *Romance*. It will be presented to Regional listeners on October 9 and broadcast through the National transmitters on the following evening.

On the occasion of the League of Nations dinner at the Guildhall, London, on October 30, the Prince of Wales' speech will be included in the National programme.

The third of *The Ridgeway Parade* series will be offered to National listeners on October 6.

A further series of relays from the stage of the London Palladium is to be revived from October 9; towards the end of the month the first of the new *Diversions* programmes will be broadcast. In future they will be given once monthly instead of every week, as was the case in the first series.

For October 31 the B.B.C. dramatic department is staging a revival of Oscar Wilde's popular comedy, *The Importance of Being Earnest*, with a strong cast.

Set in a framework of original music, a number of cameos by P. Morton Howard will be broadcast from Midland Regional on October 13; this feature is entitled "Seaside Snapshots."

Six beam telephony transmitters are to be installed in the island of Sicily. They will be erected at Catania, Viagrande, Alcantara, Roccalumera, Camaro, and Archi. The scheme calls for a power not exceeding 10 watts in the aerial and the stations will work on wavelengths between 1,200 and 1,500 metres.

The second of Russia's new high-power transmitters erected at Kolpino, some fifteen miles to the south-east of Leningrad, is reported to be testing. It is a 75-kilowatter.

A super-power transmitter to feed Central Russia now under construction at Bogorodsk will shortly operate on a power of 100 kilowatts. It will relay the Moscow main wireless programmes.

A carillon consisting of thirty bells destined for the Buenos Aires Town Hall was recently completed at Bockenem (Germany). In order to give the Argentine authorities an opportunity of hearing a test recital, a relay carried out by Hamburg was passed on to the Königswusterhausen short-wave transmitter, and broadcast to Buenos Aires via Monte Grande.

The Copenhagen (Denmark) programmes are relayed daily from 7 p.m. B.S.T. to Lyngby and re-broadcast by the experimental short-wave station on 31.51 metres. The power is 500 watts in the aerial.

## MORE RADIOGRAMS

It is stated that wireless beacons are to be established for the safety of shipping at three of the most dangerous points on the Scottish coasts. They are intended to supplement existing lights and fog sirens. The three points are May Island, Firth of Forth; North Ronaldshay, Orkney; and the Mull of Kintyre.

There are in the United States to-day about fifty-four broadcasting stations rated as "educational stations"—approximately 9 per cent. of the stations of the country.

Of the numerous portable stations that were licensed to the Byrd Antarctic Expedition, the highest power was 500 watts. Most of the dog-sledge transmitters were of 50 watts and several of only 7½ watts.

In Bavaria, telephone subscribers who do not require any other wireless programmes but those offered by the Munich broadcasting station may receive these on payment of roughly four shillings monthly. No radio receiver is required, the postal authorities providing a small technical installation to be coupled to the telephone instrument.

As a test of pictorial detail obtained in television reception, the Jenkins Television Corporation of Jersey City announce a radiovision identification contest. Pictures of prominent persons are to be identified by those tuning in the signals. The signals will be sent out from W2XCR on a wavelength of 107 metres. Ten pictures will be transmitted each evening for two weeks, each being on the air for a period of about four minutes. The prize will be a television receiving set.

## IMPROVING SPEAKER PERFORMANCE

IT is well known that with many of the new very efficient cone units it is not possible to get plenty of bass unless the opening of the cone is in a baffle so that the low-note power cannot "leak" from one side of the diaphragm to the other.

Effective one-piece baffle boards which not only mprove the performance of the speaker, but are attractively finished and form a pleasing piece of furniture, are manufactured by C. Borst & Sons, 306-308 Euston Road, London, N.W.1. A baffle with an oxidised silver finish is shown by the accompanying photograph.

The Borst one-piece speaker baffle

It should be noted that, while the price of the copper-finished fittings for converting this type of baffle into a screen are 5s. 3d. per set, the silver-finished fittings are sold at 6s. 6d.

# BROADCAST TELEPHONY

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

| Metres | Kilocycles | Station and Call Sign | Power (Kw.) |
|---|---|---|---|
| **GREAT BRITAIN** | | | |
| 25.53 | 11,751 | Chelmsford (5SW) | 15.0 |
| 200 | 1,500 | Leeds | 0.16 |
| 242 | 1,238 | Belfast | 1.2 |
| 261 | 1,148 | London Nat. | 68.0 |
| 288.5 | 1,040 | Newcastle | 1.2 |
| 288.5 | 1,040 | Swansea | 0.16 |
| 288.5 | 1,040 | Stoke-on-Trent | 0.16 |
| 288.5 | 1,040 | Sheffield | 0.16 |
| 288.5 | 1,040 | Plymouth | 0.16 |
| 288.5 | 1,040 | Liverpool | 0.16 |
| 288.5 | 1,040 | Hull | 0.16 |
| 288.5 | 1,040 | Edinburgh | 0.4 |
| 288.5 | 1,040 | Dundee | 0.16 |
| 288.5 | 1,040 | Bournemouth | 1.2 |
| 288.5 | 1,040 | Bradford | 0.16 |
| 301 | 995 | Aberdeen | 1.2 |
| 309.9 | 968 | Cardiff | 1.2 |
| 356 | 842 | London Reg. | 45.0 |
| 376.4 | 797 | Manchester | 1.2 |
| 398.9 | 752 | Glasgow | 1.2 |
| 479 | 626 | Midland Reg. | 38.0 |
| 1,554 | 193 | Daventry (Nat.) | 35.0 |
| **AUSTRIA** | | | |
| 246 | 1,220 | Linz | 0.6 |
| 283 | 1,058 | Innsbruck | 0.6 |
| 352 | 851 | Graz | 9.5 |
| 453 | 666 | Klagenfurt | 0.6 |
| 517 | 578.5 | Vienna | 20.0 |
| **BELGIUM** | | | |
| 206 | 1,460 | Antwerp | 0.4 |
| 212 | 1,415 | Binche | 0.2 |
| 217.1 | 1,382 | Chatelineau | 0.25 |
| 216 | 1,391 | Brussels (Conference) | 0.25 |
| 243 | 1,235 | Courtrai | 0.1 |
| 244.7 | 1,226 | Ghent | 0.25 |
| 250.8 | 1,196 | Schaerbeek | 0.5 |
| 338.2 | 887 | Forest | 3.0 |
| 509 | 590 | Brussels (No. 1) | 1.2 |
| **CZECHO-SLOVAKIA** | | | |
| 263 | 1,139 | Moravska-Ostrava | 11.0 |
| 279 | 1,076 | Bratislava | 14.0 |
| 293 | 1,022 | Kosice | 2.5 |
| 342 | 878 | Brunn (Brno) | 3.0 |
| 487 | 617 | Prague (Praha) | 5.5 |
| **DENMARK** | | | |
| 281 | 1,067 | Copenhagen | 1.0 |
| 1,153 | 260 | Kalundborg | 10 0 |
| **ESTONIA** | | | |
| 401 | 748 | Reval (Tallinn) | 0.7 |
| **FINLAND** | | | |
| 221 | 1,355 | Helsinki | 15.0 |
| 291 | 1,031 | Viborg | 15.0 |
| 1,796 | 167 | Lahti | 54.0 |
| **FRANCE** | | | |
| 210 | 1,430 | Radio Touraine | 0.2 |
| 214 | 1,401 | Fécamp | 0.7 |
| 235.1 | 1,275 | Nimes | 1.0 |
| 240.4 | 1,248 | Béziers | 0.3 |
| 249.5 | 1,202 | Juan-les-Pins | 0.5 |
| 256 | 1,171 | Toulouse (PTT) | 1.0 |
| 265 | 1,130 | Lille (PTT) | 1.0 |
| 272 | 1,103 | Rennes (PTT) | 1.2 |
| 286 | 1,049 | Montpellier | 1.2 |
| 287.2 | 1,044.6 | Radio Lyons | 0.5 |
| 295 | 1,016 | Limoges (PTT) | 0.08 |
| 304 | 988 | Bordeaux (PTT) | 1.0 |
| 308.9 | 971 | (Vitus) Paris | 1.0 |
| 316 | 950 | Marseilles (PTT) | 1.5 |
| 328.2 | 914 | Grenoble (PTT) | 1.2 |
| 329 | 911.8 | Poste Parisien | 1.2 |
| 345.2 | 869 | Strasbourg (testing shortly) | 15.0 |
| 370.4 | 810 | Radio LL (Paris) | 0.5 |
| 385 | 779 | Radio Toulouse | 8.0 |
| 447 | 671 | Paris (PTT) | 1.0 |
| 466 | 644 | Lyons (PTT) | 2.3 |
| 1,446 | 207 | Eiffel Tower | 15.0 |
| 1,725 | 174 | Radio Paris | 17.0 |
| **GERMANY** | | | |
| 31.38 | 9,560 | Zeesen | 15.0 |
| *218 | 1,373 | Flensburg | 0.6 |
| *227 | 1,319 | Cologne | 1.7 |
| *227 | 1,319 | Münster | 0.6 |
| *227 | 1,319 | Aachen | 0.31 |
| 232.2 | 1,292 | Kiel | 0.3 |
| *239 | 1,256 | Nürnberg | 2.3 |
| 246 | 1,220 | Cassel | 0.3 |
| 253.4 | 1,184 | Leipzig | 2.3 |
| 259.3 | 1,157 | Gleiwitz | 5.6 |
| *270 | 1,112 | Kaiserslautern | 0.25 |
| *276 | 1,085 | Königsberg | 1.7 |
| 283.6 | 1,058 | Magdeburg | 0.6 |
| 283.6 | 1,058 | Berlin (E) | 0.6 |
| 283.6 | 1,058 | Stettin | 0.6 |
| 316.6 | 947.6 | Bremen | 0.3 |
| 318.8 | 941 | Dresden | 0.3 |
| *325 | 923 | Breslau | 1.7 |
| *360 | 833 | Stuttgart | 1.7 |
| *372 | 806 | Hamburg | 1.7 |
| *390 | 770 | Frankfurt | 1.7 |
| 419 | 716 | Berlin | 1.7 |
| 452.1 | 662 | Danzig | 0.25 |
| *473 | 635 | Langenberg | 17.0 |
| *533 | 563 | Munich | 1.7 |
| 560 | 536 | Augsburg | 0.3 |
| *566 | 529 | Hanover | 0.35 |
| 576.1 | 520.7 | Freiburg | 0.3 |
| *1,635 | 183.5 | Zeesen | 35.0 |
| 1,635 | 183.5 | Norddeich | 10.0 |
| **HOLLAND** | | | |
| 31.28 | 9,599 | Eindhoven (PCJ) | 30.0 |
| 299 | 1,004 | Huizen (between 11.40 a.m. and 5.40 p.m. B.S.T.) | 8.5 |
| 1,071 | 280 | Huizen | 8.5 |
| 1,071 | 280 | Scheveningen-Haven | 5.0 |
| 1,875 | 160 | Hilversum | 8.5 |
| **HUNGARY** | | | |
| 210 | 1,430 | Budapest (Csepel) | 1.0 |
| 550 | 545 | Budapest | 23.0 |
| **ICELAND** | | | |
| 1,200 | 250 | Reykjavik (shortly testing) | 16.0 |
| **IRISH FREE STATE** | | | |
| 224.4 | 1,337 | Cork (1FS) | 1.5 |
| 413 | 725 | Dublin (2RN) | 1.5 |
| **ITALY** | | | |
| 25.4 and 80 | | Rome (3RO) | 9.0 |
| 247.7 | 1,211 | Trieste (testing) | 3.0 |
| 273.2 | 1,098 | Turin (Torino) | 8.5 |
| 332 | 905 | Naples (Napoli) | 1.7 |
| 379.5 | 790 | Genoa (Genova) | 1.5 |
| 441 | 680 | Rome (Roma) | 75.0 |
| 453 | 662 | Bolzano (1BZ) | 0.2 |
| 501 | 599 | Milan (Milauo) | 8.5 |
| **LATVIA** | | | |
| 525 | 572 | Riga | 12.0 |
| **LITHUANIA** | | | |
| 1,935 | 155 | Kaunas | 7.0 |
| **NORTH AFRICA** | | | |
| 365.4 | 821 | Algiers (PTT) | 13.0 |
| 416 | 721 | Radio Maroc (Rabat) | 10.0 |
| 1,350 | 222.2 | Tunis Kasbah | 0.6 |
| **NORWAY** | | | |
| 364 | 824 | Bergen | 1.0 |
| 369 | 813 | Frederiksstad | 0.7 |
| 453 | 662 | Nidaros | 1.2 |
| 455 | 659.3 | Porsgrund | 1.5 |
| 495.8 | 605.7 | Oslo | 0.5 |
| **POLAND** | | | |
| 214.2 | 1,400 | Warsaw (2) | 1.9 |
| 234 | 1,283 | Lodz | 2.2 |
| 244 | 1,229 | Cracow | 1.5 |
| 313 | 959 | Wilno | 0.5 |
| 335 | 896 | Poznan | 1.9 |
| 381 | 788 | Lvov | 2.2 |
| 408 | 734 | Katowice | 16.0 |
| 1,411 | 212.5 | Warsaw | 14.0 |
| **PORTUGAL** | | | |
| 240 | 1,247 | Oporto | 0.25 |
| 320 | 937.6 | Lisbon (CTIAA) | 0.25 |
| **ROMANIA** | | | |
| 394 | 761 | Bucharest | 16.0 |
| **RUSSIA** | | | |
| 720 | 416.6 | Moscow (PTT) | 20.0 |
| 800 | 375 | Kiev | 20.0 |
| 824 | 364 | Sverdlovsk | 25.0 |
| 1,000 | 300 | Leningrad | 20.0 |
| 1,060 | 283 | Tiflis | 10.0 |
| 1,103 | 272 | Moscow Popoff | 40.0 |
| 1,200 | 250 | Kharkov | 25.0 |
| 1,304 | 230 | Moscow-Stchelkovo (C.C.S.P.) | 100.0 |
| 1,380 | 217.5 | Bakou | 10.0 |
| 1,481 | 202.5 | Moscow | 20.0 |
| **SPAIN** | | | |
| 251 | 1,193 | Barcelona (EAJ15) | 0.5 |
| 266.7 | 1,125 | Barcelona (EAJ13) | 10.0 |
| 349 | 860 | Barcelona (EAJ1) | 8.0 |
| 368 | 815 | Seville (EAJ5) | 1.5 |
| 407 | 737 | Madrid (España) | 1.0 |
| 424 | 707 | Madrid (EAJ7) | 2.0 |
| 460 | 652 | San Sebastian (EAJ8) | 0.5 |
| **SWEDEN** | | | |
| 135 | 2,222 | Motala | 30.0 |
| 231 | 1,301 | Malmo | 0.75 |
| 257 | 1,166 | Hörby | 15.0 |
| 299.3 | 1,002 | Falun | 0.65 |
| 322 | 932 | Göteborg | 15.0 |
| 436 | 689 | Stockholm | 75.0 |
| 542 | 554 | Sundsvall | 15.0 |
| 770 | 389 | Ostersund | 0.75 |
| 1,223.5 | 244 | Boden | 0.75 |
| 1,348 | 222.5 | Motala | 40.0 |
| **SWITZERLAND** | | | |
| 318.8 | 943 | Basle | 0.65 |
| 403 | 743 | Berne | 1.1 |
| 459 | 653 | Zurich | 0.75 |
| 680 | 442 | Lausanne | 0.6 |
| 760 | 395 | Geneva | 1.5 |
| 1,010 | 297 | Basle | 0.25 |
| **TURKEY** | | | |
| 1,200 | 250 | Istanbul | 5.0 |
| 1,961 | 153 | Ankara | 7.0 |
| **YUGOSLAVIA** | | | |
| 306.8 | 977.8 | Zagreb (Agram) | 0.7 |
| 430.7 | 696.5 | Belgrade | 3.0 |
| 574.7 | 522 | Ljubljana | 2.8 |

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



## COMING EVENTS

THE opening of the new Northern Regional station, radiating a twin-wave programme alternative to that from Brookmans Park, will certainly increase the difficulty of receiving European programmes. In the first place there will be a large wipe-out area around the new station in which distant reception will be practically impossible upon any but ultra-selective sets. In this connection, listeners in the vicinity of north London will no doubt extend their sympathies to their fellow-sufferers in the north. On the other hand, the additional northern programmes should provide further variety at home, and thus tend to equalise matters all round.

M. A. L.

## D.F. BEACONS

ONE of the handicaps to accurate direction-finding by radio is the existence of the so-called "night-error," which is caused by changes in the polarisation of the horizontal components of the radiated energy. Experiments are now being carried out with a rotating beacon so designed that only the vertical wires are effective, radiation from the ordinary horizontal wires of the loop aerial being suppressed.

With this type of aerial it is hoped to supply wireless bearings over a range of 500 miles with an accuracy adequate to the needs of both aerial and marine navigation.

B. A. R.

# Postcard Radio Literature

***"Everlasting" Eliminators***

VALVES in mains eliminators burn out in due course and then owners of eliminators fitted with metal rectifiers see the advantage they have, for metal rectifiers are practically everlasting. Tannoy eliminators use the Westinghouse rectifier for L.T. work and a novel type of electrolitic rectifier in the H.T. units. Mains users can get full particulars of these. **58**

***Indoor Aerials***

People living anywhere near a main station now are dispensing with their outdoor wires and are putting up indoor aerials. Why not get from the Ridged Cone Co. a leaflet describing the new R.C. portable indoor aerials? **59**

***For Television Enthusiasts***

Are you making up your home televisor? If you are, then you should get in touch with E. Paroussi, the Parex people, with regard to the new television scanning discs which are being made. There is also a new Parex drum dial on the market. **60**

***Well Worth Having***

Peto-Scott's have just brought out something which every amateur ought to have—the Pilot Radio Chart. This gives in clear tabular form the specifications and prices of parts for all the latest AMATEUR WIRELESS and *Wireless Magazine* receivers. If you are a home constructor you should make sure of getting this. There are also some valuable hints and tips of general radio interest. **61**

***New Short-wave Coils***

Eddystone short-wave sets are famous as also are the short-wave coils of this make. Some new and very well made short-wave coils have just been produced which are described in a leaflet at hand. **62**

***A Good Cabinet***

Have you met the Waverley radio gramophone cabinet, a new Camco "box." This was on show at Olympia but you can get literature describing it. OBSERVER. **63**

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, London, E.C.4. "Observer" will see that you get all the literature you desire.*

# NEW IGRANIC ELKON METAL RECTIFIERS

MAINS-USERS will be interested in the new series of Igranic Elkon metal rectifiers, models of which are obtainable for high-tension, low-tension and grid-bias supply. These new metal rectifiers have many advantages in the way of a big safety factor for overloading and a tendency to "heal" if the rectifying elements are broken down.

The units are obtainable, in the high-tension range, with a handy valve-pin type base, which makes for easy connection and also enables one of these units to replace a valve in a thermionic-type rectifier. A complete H.T. unit made up with these rectifiers is available.

**One of the new Igranic-Elkon metal rectifiers—the E120/20**

The smallest separate rectifier for high tension is the type E120/20 which, as the code number shows, delivers a D.C. output of 120 volts at a normal current flow of 20 milliamperes—quite suitable for the average receiver. The price of this unit is 15s. A grid bias supply can be obtained from the EGB unit selling also at 15s. Low tension can be obtained by means of several low-voltage Igranic Elkon rectifiers available, and these also are very low-priced.

Amateurs who are making up their own mains units incorporating these rectifiers should see the new Igranic power transformers and smoothing chokes, which have been redesigned, and, while low in price, have a high degree of efficiency.

The small high-tension unit, type E120/20, gives a remarkably constant performance and even if the high-tension current is forced up to 30 milliamperes the voltage does not seriously drop. The low-tension unit, in the same way, is capable of standing up to heavy overloading without serious overheating.

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The first official Esperanto short-wave broadcasting station has been opened at Melbourne; its call sign is VK3CA.

## *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.**

# DETAIL IN TELEVISION

TELEVISION, for the time being at any rate, is perforce being confined to the transmission of very simple subjects. Excellent images of faces, head and shoulders and so on, can be transmitted, but no one would argue at the moment that a complicated subject like a ballet scene at a theatre or a crowd at a football match could be televised.

Early writers on picture telegraphy have, perhaps too frequently, compared the process with that of a half-tone illustration. The photographs, for example, in AMATEUR WIRELESS if examined with a magnifying glass, are seen to consist of innumerable small dots in different sizes, the diameter of the dots giving the tones in the picture.

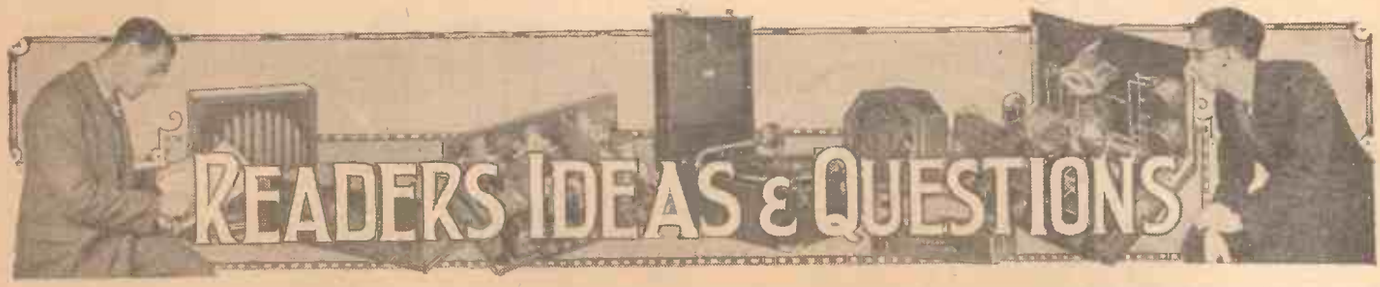
It is often argued that television cannot be considered on the same lines, and that the fact that a complicated newspaper illustration requires tens of thousands more of these little dots than does a simple head and shoulders, has no relation to the subject of television.

It may surprise many readers to know that the early half-tone reproductions of photographs were not made with dots, but were made with lines or stripes of varying width, and that the cross line screen which gives rise to the present-day half-tone dots was a subsequent advance.

Now the effect of the scanning disc is to sweep over the subject in a series of concentric lines; these lines are continuous, they do not vary in width like the lines of the early half-tone images, but they vary (at a constant width) in intensity as the light reflected from the face is bright or dim. This, indeed, is exactly what happens in one of the systems of picture telegraphy employed by the Bell Telephone Laboratory in America.

A little thought will make it clear that if we are going to see twenty people in a television image with the same clearness and distinctness with which we now see one face, the scanning will have to be twenty times as elaborate. Under present methods of research this can only be done by making the width of the scanned strip twenty times finer, and thus the problem boils down to very much the same thing as the consideration of a half-tone photograph in line.

No matter how a picture is built up, its details can only be analysed by regarding it as made up of an infinite number of little pieces, like a mammoth jigsaw puzzle, and whether these are reproduced by a series of stripes of light of varying intensity, or by a rebuilding of the little units, one necessity remains the same. This necessity is that we have got to get a greater number of variations in the light intensity and a greater number of apertures on the spiral periphery of the scanning disc, or some mechanism equivalent of the latter.




### Improving Reproduction

SIR,—My receiver gives every satisfaction in respect of the number of stations it receives but reception on the speaker seems to be rather high-pitched and inclined to be "tinny." The circuit embraces a stage of R.C. coupling, followed by transformer coupling and the components used are by reputable makers. The speaker is a home-made cone type using a well-known and much advertised unit. This speaker has been tried on a friend's set and gives better reproduction than on my set. This leads me to think that the speaker is not to blame. Can you, from these particulars, assist me to get a lower pitch of reproduction from my receiving apparatus?—J. G. (Manchester).

It appears that the whole design of the amplifying part of your receiver conduces to the high-pitched reproduction you experience. A different make of L.F. transformer or different values of resistance in your R.C. unit would rectify the trouble but this would entail experimenting and expense. A simple way of dealing with the matter is to try connecting fixed condensers across the primary of the L.F. transformer and also across the terminals of the speaker. We would suggest a value of anything from .0003 to .001-mfd. capacity across the primary of the transformer and a value of anything from .002 to .008 microfarads across the speaker terminals. By slightly reducing the amplification of the high notes in this way, you will, in practical effect, lower the pitch of the reproduction.—ED.

### A Speaker Suggestion

SIR,—Apropos of your answer to B.C. (Middlesex). In the case of a push-pull output transformer, I have found splendid results by connecting the two plates of the output valves, each of them through a 2-microfarad condenser, to the two terminals of the Blue Spot speaker. The result is just what is wanted; that is, the volume of the latter is reduced sufficiently to work at the same time as the moving coil (B.T.H.), while it does not interfere with it in the slightest. Theoretically, it seems all wrong, but practically it is splendid. Of course, the impedance of the two speakers is entirely different. My moving coil needs a 25-1 step-down transformer with P625 valves, which was quite hopeless for the Blue Spot. The moving coil is connected in the usual place.

C. G. B. (Hull).

### "Safety First" with Mains Sets

SIR,—I have a home-built receiver which derives its H.T. from the mains. I have also a linen-diaphragm speaker. Recently I had occasion to readjust the diaphragm of the speaker and only switched off the set by means of the L.T. switch. When I switched on again, the receiver had stopped working. On testing through as best I could, I discovered that a screen-grid valve filament had burnt out. I had a spare valve, and this has enabled me to continue to use the receiver. My trouble is, what was it that caused the valve to burn out?

We experienced a very similar happening some little time ago and failed to discover a definite practical cause. We are of the opinion, however, that the occurrence calls for a revival of rather an old rule in regard to valve sets in general. That is, the filament supply to all sets that are mains operated (not A.C. mains valves) should be controlled by a master rheostat. Before switching off the receiver, the

(*Continued on next page*)

filaments should be "dimmed" by means of the rheostat, then the H.T. current should be switched off and, finally, the filaments switched completely off. The reverse procedure should be adopted when switching on the set. The filaments should be slightly heated by partly turning on the rheostat, the H.T. should then be switched on and, finally, the filaments should be brought up to the fullest "brilliancy" by completely turning on the rheostat. This procedure prevents surging currents in the receiver circuits and eliminates strain on the components and accessories.—ED.

### A Modified "Ether Searcher"

SIR,—Having used the original "Ether Searcher Three" since its publication with such good results, I considered that a similar circuit, minus coil and aerial changing, would be acceptable and advantageous in various ways.

Being a believer in plug-in coils, I set out to see what I could do and still keep the efficiency of the original set. This I did about three months ago, and waited for the dark evenings before making final comparisons.

Now I think I can claim the same results, with advantages of no coil-changing and aerial-changing—the series condenser being switched with the coils for the medium waves.

H. BURNS (Huddersfield).

### Suburban Broadcasts

SIR,—Mr. Moseley's lengthy criticism of the Grand Orchestra at the Commodore Theatre, Hammersmith, so astounded me that I made inquiries in order to ascertain the general impression created. It was no surprise to me that on my round I met with nothing but enthusiastic appreciation of this orchestra and its weekly programme of music.

It is time it was realised that suburban entertainment is now practically on a par with that provided by the West End, and in many cases it is infinitely greater value for money. Accordingly, the newer theatres are usually equipped with orchestras that are easily the equal of those employed in hotels.

After all, what does it matter from whence the music is broadcast so long as it affords pleasure to ordinary listeners, even if it is supplied by a theatre of which you have never heard?

A. O'CALLAGHAN (London, W.12).

### James "Quality Five"

SIR,—I have built a James "Quality Five" receiver and whilst I am satisfied that this set will give me any number of stations, I cannot get the distant stations at anything like speaker strength. My H.T. supply is from the largest-capacity H.T. accumulators and my power valve is a Marconi P2. The speaker is a well-known make and has been tested. In trying to discover the cause of my poor results, I have gone through each valve plate circuit with a milliammeter. All valves are working with correct anode current, except the power valve. This valve only passes 8 milliamperes, when it should be passing 17 milliamperes at 150 volts. My accumulators have been to be charged and still I cannot get the last valve to take more than 8 milliamperes. Can you help me please, as the makers assure me that the valve is in good working order.

It seems that you are using your speaker connected directly in the plate circuit of the last valve. The fine wire with which the magnet coils of the speaker is wound can only pass up to 8 milliamperes. This prevents more current getting through to your last valve. If you will refer once more to Mr. James's notes relating to the theoretical considerations of the circuit, you will see that he makes a point of mentioning that "no output filter circuit is fitted, as readers who make the set no doubt have a filter or transformer of the right type, etc."

### From Marseille

SIR,—Three years ago you gave details of the "Hartley DX One"—in my opinion, the most efficient one-valver ever brought before the notice of the public. It is a generally accepted thing in Marseille that unless a "super" six-valver is used it is impossible to receive clearly and without interruption any other station than the local. I know that this is not the case, and intend to construct the "Hartley DX One" to prove my point to about twenty ardent fans!

It may interest you to know that the Marseille station works as follows: Wavelength, 315 metres; power, 1 kilowatt; Call sign, *"Allo allo! Ici Marseille Provence, ici Marseille!"*; interval call, two bells, two tone—ding, dong, ding.

The announcements are often made in the Provençale dialect, which is very apt to confuse listeners.

LAWRENCE PARKER (Marseille, France).

## CAR SETS

SOME interesting observations by Mr. Paul O. Farnham on receiving sets suitable for cars appeared in a recent issue of the proceedings of the Institute of Radio Engineers. The interference caused by the ignition system is emphasised, and from various experiments which have been made of ignition shielding it would appear that the best results are to be obtained by using copper shields for the high-tension leads, the high-tension coil (where this is used), the distributor, spark plugs, and the low-tension leads. It was found most important to shield the low-tension leads running up to the dashboard.

With complete shielding of this kind the ignition noise is practically inaudible.

A capacity aerial is more suitable than a loop, owing to the directional effects and volume occupied by the loop. Mr. Farnham found that a capacity aerial of about one metre high was all that was needed. A small but useful point was the use of 6-volt valves in order to employ the lighting battery of the car and so save additional weight.

One of the principal drawbacks has been found to be signal fluctuation, and here is an opportunity for a really good type of automatic volume control suitable for the motorist's portable set. T. B.

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

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



## FULL-SIZE BLUEPRINTS

When ordering, please send Postal Order, NOT STAMPS

### CRYSTAL SETS (6d. each)

| | |
|---|---|
| B.B.C. Brookman's Park Set | AW206 |
| Regional Crystal Set | WM176 |

### ONE-VALVE SETS (1s. each)

| | |
|---|---|
| B.B.C. Official One | AW208 |
| Hartley Single-valver | WM198 |

### TWO-VALVE SETS (1s. each)

| | |
|---|---|
| Talisman Two (D, Trans) | AW194 |
| Wavelets Two (D, Trans) | AW229 |
| No-battery A.C. Mains Two (D, Trans) | AW230 |
| No-battery Gramo-radio 2 (D, Trans) | AW238 |
| 1930 Talisman 2 (D, Trans) | AW239 |
| Easy Tune Short-wave 2 (D, Trans) | AW242 |
| Searcher Two (D, Trans) | AW245 |
| Brookman's Two (D, Trans) | WM168 |
| New Crusader (D, Trans) | WM182 |
| Radio-Record Two (SG, D) | WM187 |
| Gleaner Two (D, Trans) | WM201 |
| Music Monitor (D, Trans) | WM208 |

### THREE-VALVE SETS (1s. each)

| | |
|---|---|
| All-wave High-mag. Three (D, 2 Trans) | AW199 |
| Knife-edge Three (D, RC, Trans) | AW201 |
| Talisman Two-three (D, RC, Trans) | AW203A |
| Wide World Short-wave Three (HF, D, Trans) | AW207 |
| Everybody's Three (SG, D, Trans) | AW209 |
| 1930 Ether Searcher (SG, D, Trans) | AW211 |
| New All-Britain Three (HF, D, Trans) | AW214 |
| Best-by-Ballot Three (SG, D, Trans) Price 4d. free with copy of "A.W." | AW217 |
| Brookman's By-pass Three (D, 2 Trans) | AW220 |
| Everybody's All-electric Three (SG, D, Trans)—A.C. | AW221 |
| 1930 Clarion Three (SG, D, Trans) | AW223 |
| Beginner's Regional Three (D, 2LF) | AW233 |
| Britain's Favourite Three 1930 (D, 2 Trans) | AW243 |
| Car Three (D. R.C. Trans) | AW244 |
| The "A.W." Exhibition 3 | AW247 |
| Standard Coil Three (HF, D, Trans) | WM117 |
| Brookman's Three (SG, D, Trans) | WM161 |
| Community Three (D, RC, Trans) | WM164 |
| Brookman's Push-Pull Three (SG, D, Trans) 1/6 | WM170 |
| All-nations Three (D, 2 Trans) | WM178 |
| Inceptordyne (SG, D, Pentode) | WM179 |
| Brookman's A.C. Three (SG, D, Trans) 1/6 | WM184 |
| Music Marshal (D, 2 Trans) | WM190 |
| Gramo-Radio D.C. Three (SG D Trans) | WM196 |
| Concert Three (D, 2 Trans) | WM199 |
| New Lodestone Three (HF, D, Trans) | WM205 |
| De-Luxe Three (D, RC, Trans) | WM209 |

### FOUR-VALVE SETS (1s. 6d. each)

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|---|---|
| Clarion All-electric Three (SG, D, Trans—A.C. Rectifier) | AW200 |
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| Music-Lover's Gramo-radio (Loud-speaker) 1s. | AW202B |
| Horizon Four (SG, D, 2 Trans) | AW237 |
| 1930 Monodial (2SG, D, Trans) | WM158 |
| Electric Four (All A.C.—SG, D, RC, Trans) | WM162 |
| Brookman's Four (2SG, D, Trans) | WM174 |
| Transportable Four (SG, D, 2 RC) | WM180 |
| Super Q (SG, D, 2 Trans) | WM189 |
| Lodestone Four (HF, D, RC, Trans) | WM193 |
| Searcher's Four (SG, D, RC, Trans) | WM194 |
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### FIVE-VALVE SETS (1s. 6d. each)

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|---|---|
| James Quality Five (2SG, D, RC, Trans) | AW227 |
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| 1930 Five (2HF, D, RC, Trans) | WM171 |
| Dual-screen Five (2SG, D, RC, Trans) | WM185 |
| Radio-Record Five (SG, D, Trans-parallel) | WM188 |
| Overseas Five (3SG, D, Trans) | WM191 |

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| | |
|---|---|
| "A.W." Gramophone Amplifier | AW205 |
| Brookman's Separator (HF Unit) | AW212 |
| Two-valve Amplifier | AW216 |
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| Radio-Record Amplifier (DC Mains) | WM183 |
| Selecto Amplifier (HF, Unit) | WM210 |

### MISCELLANEOUS (1s. each)

| | |
|---|---|
| Short-wave Adaptor (1 v.) | AW183 |
| Simplest H.T. Unit | AW197 |
| By-pass Unit (Wavetrap) with copy "A.W."—4d. | AW218 |
| "Twin" Brookman's By-pass (6d.) | AW222 |
| "A.W." Paper Loud-speaker | AW231 |
| James H. T. and L.T. Charging Unit | AW232 |
| Simplest H.T. Eliminator for D.C. Mains | AW234 |
| Simplest H.T. Eliminator for A.C. Mains | AW236 |
| Choke Output Unit | AW240 |
| Simple Tester Unit (6d.) | AW246 |
| A.C. Mains Amplifier | WM149 |
| H.T. Unit for A.C. Mains | WM159 |
| "W.M." Linen-diaphragm | WM172 |
| Brookman's "Wipe-outs" | WM186 |
| Short-wave adaptor for Overseas Five | WM192 |
| Staminator Unit for A.C. Mains | WM202 |
| Universal Push-pull Amplifier | WM204 |
| Outspan Short-wave Adaptor | WM207 |

### PORTABLE SETS

| | | |
|---|---|---|
| Music Leader (SG, D, RC, Trans) with copy "A.W." | AW203 | -/4 |
| Sunshine Three (SG.HF.SG.D, Trans) | AW235 | 1/- |
| Continental Portable (SG, D, Trans) | AW241 | 1/- |
| Pedlar Portable Two (D, Trans) | WM195 | 1/- |
| Pedlar Portable Three (D, 2 Trans) | WM197 | 1/- |
| James Portable SG3 (SG, D, Trans) | WM203 | 1/- |
| Foursome Portable (SG, D, 2 Trans) | WM206 | 1/- |

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

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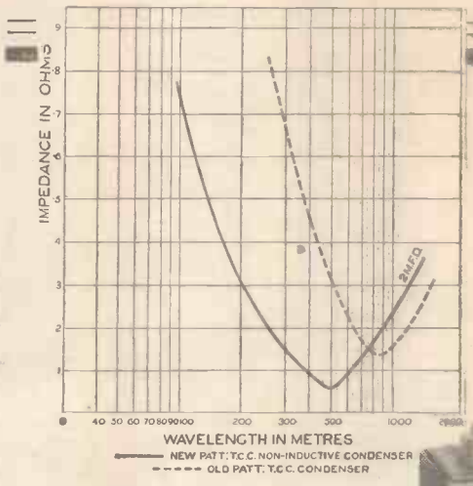
# Non-inductive Condensers

## *the Latest* T·C·C *Development*




Here's the latest T.C.C. development — a Non-Inductive Condenser at no extra cost. The advent of the Screened Grid Valve has emphasized the need for a condenser having the minimum of impedance in order that small high frequency currents may be readily passed. How the new T.C.C. Non-Inductive Condenser achieves this result is shown on the curve above. The ordinary 1 mfd. condenser has a resonant point at about 900 metres whereas in the new T.C.C. Non-Inductive Condenser this has been reduced to nearly 500 metres. Be wise: always use

*Available in all capacities from ·005 mfd. to 2 mfds. from all wireless shops.*

*The above illustration shows the T.C.C. 2 mfds. Non-Inductive Condenser in moulded case 3/10.*

Telegraph Condenser Co., Ltd., N. Acton, W.3

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***Always ahead in Condenser Design***

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## for any set standard or portable

**This wonderful combined Eliminator and Trickle Charger is the finest All-mains Unit yet produced and is as simple to connect and as compact as an H.T. Battery and every bit as safe.**

**It has no moving parts or valves, incorporates the Westinghouse Metal Rectifier and is fully guaranteed for 12 months. Small enough to fit the battery space in portable and cabinet receivers, it provides smooth and constant High- and Low-tension current entirely free from hum.**

There are two variable tappings of 0/100 and 0/120 volts respectively and one fixed of 150 volts. Output 25 m/a at 150 volts —the highest of any unit designed for portables. The Trickle Charger caters for 2-, 4- and 6-volt L.T. Accumulators.

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## ALL-MAINS UNIT A.C.188

H. CLARKE & CO. (M/CR), LTD., OLD TRAFFORD MANCHESTER

Printed in England. Published by Bernard Jones Publications, Ltd., 58/61 Fetter Lane, London, E.C.4
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Amateur Wireless
October 11, 1930

BUILD A TWO-VALVE SET FOR 45/-

HOW I WOULD CURE DISTORTION—by W. JAMES

# Amateur Wireless

Every Thursday 3d

and Radiovision

Vol. XVII. No. 435 Saturday, October 11, 1930

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FULL DETAILS IN THIS ISSUE

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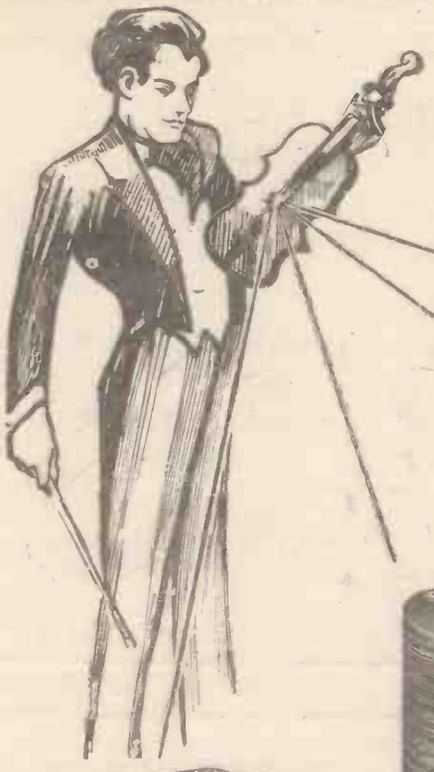
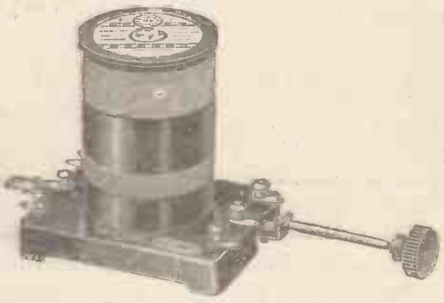



**LEWCOS H.F. CHOKE**

The terminals are arranged, one at the top and the other at the base of this choke to eliminate the risk of additional self capacity in the wiring of the receiver.

**Price 7/9 each**

Write for leaflet Ref. 33



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Wave-band ranges 235/550 m. and 1,000/2,000 m. Aerial Coil Ref. D.W.A. Screened Grid Coil

**Price 15/- each**

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**THE LEWCOS L.F.T.3**

Has a constant inductance for different values of anode current.

**Type 22. Price 20/-**

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**THE LEWCOS L.F. CHOKE, Ref. L.F.C.**

Inductance, 30 henries. Limiting current, 30 milliamps. D.C. resistance 570 ohms. Weight, 2 lb. 8¾ oz. Over-all dimensions 3⅝" × 2¼" × 2⅜".

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# LEWCOS

Regd.

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Many of the most successful receivers in the past depended in a large measure on the superlative qualities of Lewcos Radio Products.

Any one or all of the LEWCOS components illustrated above would improve your receiver to an astonishing degree.

"Perfection in every detail" is the keynote of the Lewcos Factory where these components are constructed.

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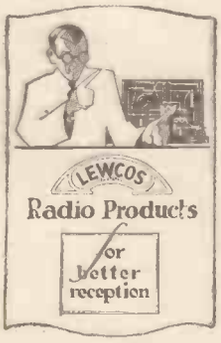


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## —due to its abnormally low inter-electrode capacity

The effective H.F. amplification per stage that can be obtained in any Screened Grid Set is largely controlled by the inter-electrode capacity of the S.G. Valve. It is well known that the lower the self capacity of the valve the greater its effective stage amplification. Important features in its design and construction permit the inter-electrode capacity of the new Cossor 215 S.G. to be reduced to the order of .001 micro microfarads. This is substantially lower than the self capacity of any other Screened Grid Valve on the market. It follows, therefore, that this new valve permits a big increase in effective amplification. In fact, results are obtained which, a year ago, would have been considered quite impracticable.

Cossor 215 S.G. 2 volts, ·15 amp. Impedance 300,000. Amplification Factor 330. Mutual Conductance 1·1 m.a/v. Normal working Anode Volts 120. Positive Voltage on Screen approx.) 60. Price **20/-**

## THE NEW COSSOR 215 S.G.

**GREATEST EFFECTIVE STAGE GAIN**

A. C. Cossor Ltd., Highbury Grove, London, N.5.

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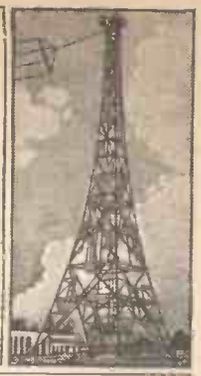
*Don't Forget to Say That You Saw it in "A.W."*

No. 435. Vol. XVII. OCTOBER 11, 1930

# Amateur Wireless and Radiovision



EDITOR: BERNARD E. JONES.
TECHNICAL EDITOR: J.H. REYNER, B.Sc., A.M.I.E.E.
THE LEADING RADIO WEEKLY FOR THE CONSTRUCTOR, LISTENER & EXPERIMENTER.
RESEARCH CONSULTANT: W. JAMES.
ASSISTANT EDITOR: H. CORBISHLEY.

## NEWS · & · GOSSIP · OF THE · WEEK

### THE NORTHERN SHOW

THE Manchester Radio Exhibition opened yesterday, October 8, and is now in full swing. All Northern and Midland AMATEUR WIRELESS readers who were unable to visit Olympia should make an attempt to visit the City Hall Show some time from now till October 18, for there are just the same good things there as there were at Olympia.

### EARLIER FAT-STOCK PRICES

AS from October 6, those tedious fat-stock prices and Stock Exchange reports will be read at 6.35 p.m. instead of at the end of the second General News Bulletin. This means that only early listeners will be bored, while the bulk of listeners tuning in the main evening programme will enjoy five minutes less rigmarole. The betting results are to continue; apparently there are still backers in the backwoods who want to know how much they have lost through the B.B.C. news instead of through a racing edition of a newspaper.

### WHEN RADIO PARIS "GOES UP",

THERE is every probability that when the new Paris station is ready, or even when Radio Paris puts up its power to 50 kilowatts, the Eiffel Tower transmitter will cease broadcasting programmes. It will then be used for official communications only and will be under the control of General Ferrie. Still, there are plenty of other good stations to be had when the long-wave switch is "in action."

### A "MAYOR'S" NEST!

THE fact that broadcasting can be as much use to criminals as to the police was recently shown by a gang of American bootleggers. They broadcast an SOS stating that a steamer with the Mayor of New York on board was in distress, and while the police boats were searching they calmly disembarked and discharged their cargo!

The Frenchman's Olympia. A glimpse of the Paris Radio Exhibition held in the Boulevard Raspail Show Hall last week

### PRINCIPAL CONTENTS



### WHAT ABOUT YOUR AERIAL?

EVERYBODY seems to be of the opinion that it is not worth while putting up a huge or high aerial. Nor is it so necessary now to use thick-gauge wire to get that "efficiency" so beloved of too-technical folk, which nowadays is a mild curse, for it results in wipe-out from the local stations.

### "DEMODE"!

THE time is nearly here when outdoor aerials will be quite *démodé*—to use a phrase of the fashion papers—and indoor wires around the picture rails will be *le dernier cri*! But why aren't frames more fashionable? The selectivity they give is very useful now that the stations crowd in one on top of the other.

### RIDGEWAY AGAIN

MR. PHILIP RIDGEWAY keeps cropping up in the news. It was he, you know, who started "pre-broadcasting jazzing" for artistes, to get them into form, and now he has adopted the novel idea of dressing all his artistes in red and blue pierrot costumes, believing that performers before the microphone, while not visible

# NEWS & GOSSIP OF THE WEEK—*Continued*

to their audience, require some assistance in counteracting the lack of "atmosphere" peculiar to the broadcasting studio.

### AS AN ARTISTE

HE is again taking part in the broadcasts as artiste as well as producer. This is in response to the requests of some listeners who heard the first of the "Parades" recently. Half-way through the programme he decided to give a turn, and he went to the microphone and gave realistic impersonations of an announcer, of Janet Gaynor, and of Maurice Chevalier. He has now agreed to broadcast in each of the future "Parades," although it is fifteen years since he forsook the rôle of actor for that of producer. The B.B.C. seems to be getting plenty of work out of Ridgeway, and he seems to be pretty versatile.

### B.B.C. VERSATILITY

THERE are some other versatile people, too, connected with the B.B.C. Charles Brewer, for example. On October 11 another of Charles Brewer's radiophonic revues, *You're Through*, an entertainment in "ten wrong numbers" (so the B.B.C. says), is to be broadcast from Midland Regional. Charles Brewer, of the Birmingham studio, is a prolific writer of light features for broadcasting. This year he has been responsible for thirty-four such features and sixteen one-act plays. His postbag regularly includes appreciative letters from listeners in France, Belgium, Sweden, the Rhine, and Egypt. It is clear that he has an extensive audience. One show alone—namely, *Cabaradio*—brought 869 letters.

### PCJ's BEAM AERIAL

THE Philips short-waver, PCJ, is now experimenting with a beam aerial in addition to the normal aerial which is still in use. Listeners will be notified which aerial is being used, aerial A or aerial B, and they are invited to send critical reports of their reception on both aerials. The PCJ transmitting schedule is as follows, on a wavelength of 30.2 metres: Wednesday, 16 to 20 G.M.T. (special transmission for India); Thursday, 18 to 20 and 23 to 0 G.M.T.; Friday, 0 to 3 and 18 to 20 G.M.T.; Saturday, 0 to 6 G.M.T.

### THAT SHY VOICE

THE shy voice of the lady pianist at Savoy Hill who provides many of the musical interludes, belongs to Miss Cecil Dixon, or "Auntie Sophie," as she used to be called in the days when the Children's Hour was sustained entirely by Wireless Aunts and Uncles. The Birmingham studios have an admirable counterpart of Miss Dixon in the person of Margaret Ablethorpe. At odd times, when Midland Regional listeners are waiting for a concert to begin, or when the announcer has said: "That concludes the Midland news for to-night," Miss Ablethorpe's gentle Chopin Preludes or little modern pieces by Debussy are heard. This sort of material well fills in the gaps in the programmes.

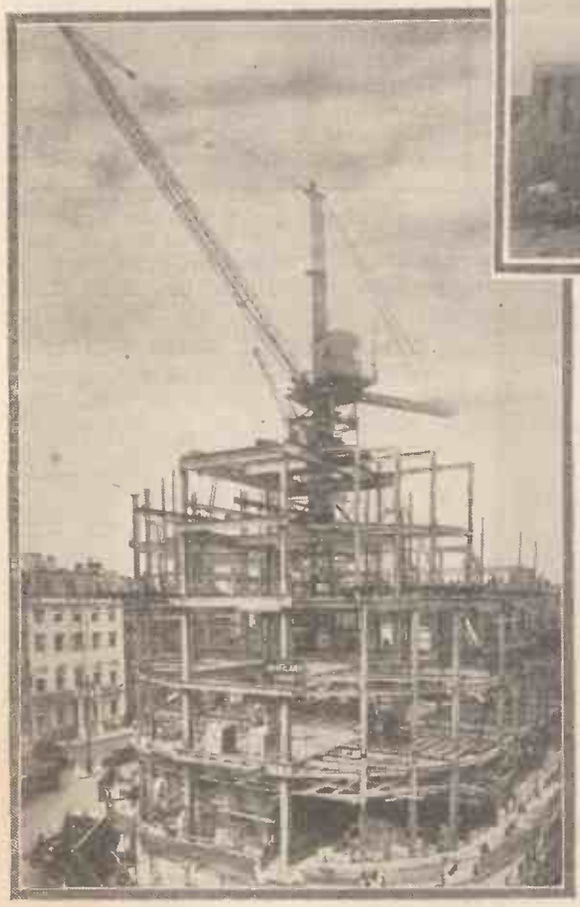
### THE HAMILTON HARTY "AFFAIR"

AS you doubtless saw in the papers, Sir Hamilton Harty has been slating the B.B.C. again. He said some forceful things at a Hallé Concerts Co. meeting. "The Hallé Orchestra is in serious danger. . . . The British Broadcasting Corporation has raised the market against us," he said. "The B.B.C. has now established an orchestra in London which is subsidised to the extent of some £100,000 a year. Whether this orchestra will ever realise the claims that it will be one of the greatest in the world must, of course, remain in doubt for some considerable time. It is the emergence of the B.B.C. from its studios into our public concert halls that I regard with doubt."

### DX VISITORS!

HARKING back to the Show for a moment, there is one really friendly thing about the thousands who pass through the "clicking turnstiles," to use a phrase from newspaperdom. Every year "A.W." is able to renew acquaintance with many old readers (they all like to style themselves "From Number One"), and some of them come a considerable distance. This year, for instance, "A.W." readers from Cornwall, Wales and Scotland made their pilgrimage to the Show, and they came to Stand Number One to see the sets in the making. And *now* there is Manchester for those who could not come down to Olympia. At Manchester visit the "A.W." stand, Number Eleven.

**DO NOT MISS THE SPECIAL GIFT ANNOUNCEMENT ON PAGE 510**



**B.B.C. progress. The new London headquarters, Broadcasting House, is rapidly growing, as you can see from the photo on the left. This is the steel framework of the imposing corner of the building, and you can see the shape of the central studio "tower." Slaithwaite is growing, too, and the present degree of completion of the building can be seen from the photograph above**

## INTERNATIONAL BROADCASTING

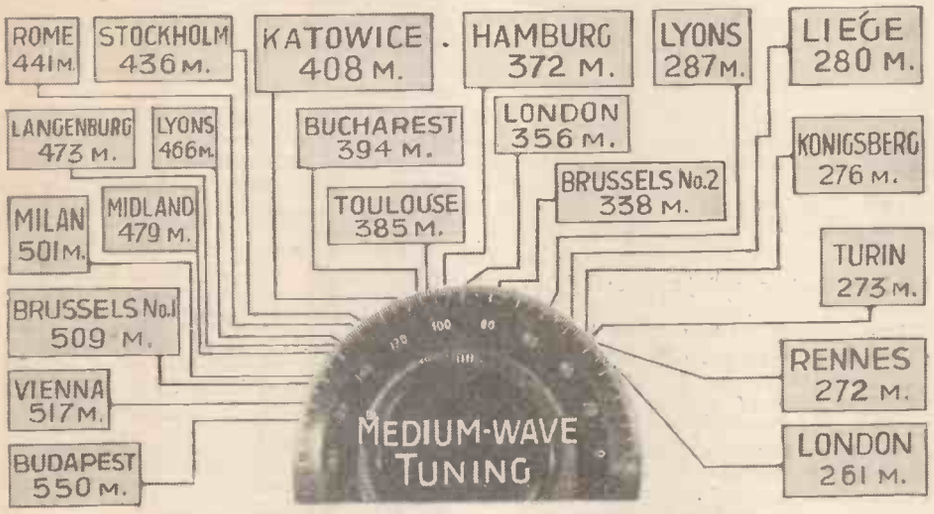
THE time is not far distant when the owner of the simplest type of valve-receiver should be able to hear operas produced in Vienna and other well-known Continental centres. The programmes will be relayed to the National transmitter, not through the ether, but over existing telephone trunk-lines, which are being specially loaded and improved for this purpose. This far-reaching development is mainly due to the work done by the International Broadcasting Committee which sits at Geneva and whose secretary is Mr. Arthur Burrows—famous as "Uncle Arthur" in the early days of the B.B.C.

*How many stations can you log in the course of the evening? Here are explained the several difficulties in getting good DX results, and an idea of average performance is given*

# WHAT YOUR SET SHOULD DO

OF the one hundred and fifty odd broadcasting stations in Europe, how many can be expected on a new set? That is a "searching" question, which I propose to answer in a way that may not be corroborative evidence for slick salesmen, but that will, I hope, enlighten the listener facing his first radio season.

Here and now let me enumerate a few things the set, new or old, cannot do.




**All the stations shown in this pictorial diagram were obtained at loud-speaker strength on a recent Sunday evening with a three-valve set**

Firstly, it cannot alter the ratio of signal strength to extraneous atmospheric interference. A two-valve set will, under favourable conditions, pick up Toulouse, for example, at fair loud-speaker strength. Suppose Toulouse is troubled with a faint background of crackles, etheric moans and groans and other disturbances that all distant signals are heir to; will a three-valver make Toulouse better—and a four-valver still better?

On the contrary, it is more than likely that the interference will sound unbearable when increased in volume. That is the trouble, we cannot increase the signal without increasing the interference in the same proportion. But there is a consolation; the ratio of signal to interference *can* be increased, by raising the power of the transmitter. Many of the big European stations are greatly increasing their power, so plenty of good, strong, interference-free signals can be expected this winter—on every set.

There is another thing no set can do—receive the same distant stations every night at individually constant strength. One night a given station will be very strong, the next night quite weak, in spite of the fact that the set presumably remains up to concert pitch all the time.

A third limitation, bound up with that just mentioned, is that no set can get distant medium-wave stations nearly so well during daylight as at night. In fact, many signals received at full loud-speaker strength at night are inaudible during the day.

The Heaviside layer is responsible; yet without it we should not be able to get *any* very distant stations, so we ought to be tolerant of its variability. This ionised layer of gas, miles high in the atmosphere, reflects wireless waves in the way a mirror reflects light waves. But whereas a mirror is constant in its reflecting properties, the Heaviside Layer varies in the degree of its ionisation, so that sometimes it absorbs the waves instead of reflecting them—rather like a cracked mirror letting through the light!

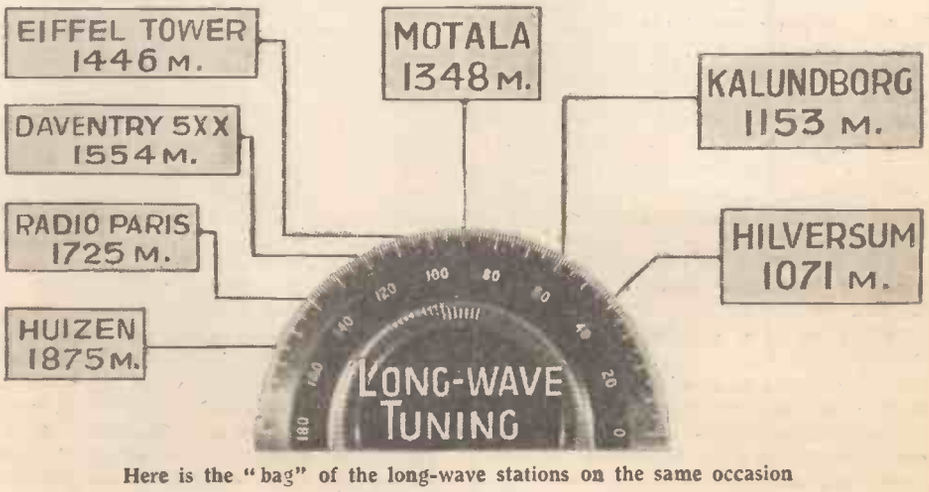
I *know* you can get thirty stations on almost any good set, provided that you choose your time and wavelength band correctly. With that encouragement the owner of a new set will ask how to do the trick. Well, here are some of the things every good set should be able to do. Firstly, it should be able to get all stations clear of other stations above and below, provided that the stipulated separation of 9 kilocycles is being adhered to by the transmitters. The slightest deviation from wavelength allocation usually causes a whistling background that no ordinary set can separate from the two stations involved. So when this continuous heterodyne whistle is heard, try another station.

Secondly, a good set should get distant stations free from the local stations. This calls for greater selective properties than the separation of two distant stations, but a good set should rise to the occasion.

Thirdly, distant stations, while varying in strength and freedom from interference, should come in at the same dial readings night after night.

I start on the long wavelength band; it is Sunday night, so the ether should be full of stations. From 180 I have to come down to 155 before hearing a sound; there I find the Dutch station Huizen, at full loud-speaker strength. Carrying on, I get to 140 before hearing anything else; there is Radio Paris, again full loud-speaker strength and clear of Daventry, which comes in at 120.

*(Continued at the foot of next page)*

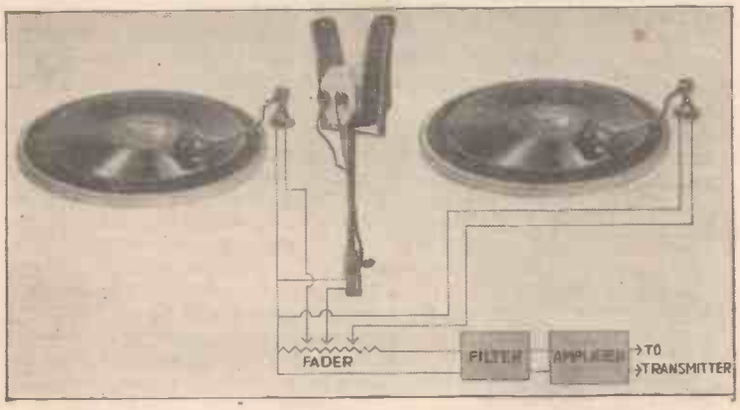



**Here is the "bag" of the long-wave stations on the same occasion**

# RECORDS OR RADIO?

**The B.B.C. claims that its new gramophone record broadcasting apparatus gives practically perfect results. With the aid of the curve given below, which shows the characteristics of the pick-ups used, you can carry out the interesting experiment of comparing the tone balance of your gramophone with that of the B.B.C. record broadcasts.**

THE B.B.C. has recently overhauled its method of broadcasting gramophone records and now it is claimed that the new transmissions represent a greater degree of perfection than is present in the average commercial gramophone.




**How the two pick-ups and the microphone on the new B.B.C. console are connected through a "fader" to the resistance-coupled amplifier and scratch filter**

The accompanying curve shows the volts-frequency characteristic of the pick-ups used, and this will give listeners some idea of the degree of accuracy of reproduction. A new gramophone turntable has been built, incorporating two spring-driven turntables and an announcer's desk with a microphone above it. Thus the man in charge can, by means of a potentiometer in front of him, rapidly connect up one or other of the turntables and make announcements when required.

This new apparatus replaces the old double-turntable arrangement of somewhat similar design, but the better quality of the gramophone broadcasts now obtaining has been the result of this new pick-up, and also the incorporation of a scratch filter circuit. Previously no scratch filter was used.

It is claimed that this pick-up, which is of the needle-armature type, and therefore has extreme lightness of weight of its moving parts, can follow a record groove down with perfect silence to 25.5 cycles, which the gramophone manufacturers say is the lowest frequency recorded. Many pick-ups tend to chatter and jump the groove at about 100 cycles.

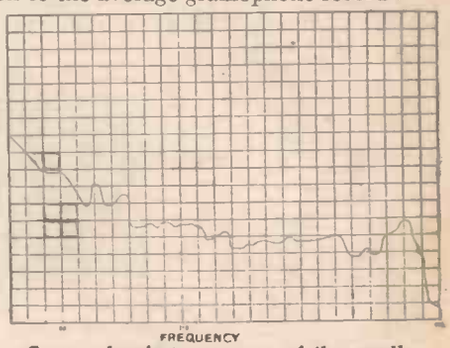
It is interesting to note that the curve shown here has been obtained with pick-ups as used by the B.B.C. and on the H.M.V. standard frequency records. It will be seen that there is a good response down at the 50-cycle region and a slight rising of the curve towards the 5,000-cycle end provides the necessary harmonics to fundamental frequencies below 3,000 cycles.

No automatic compensation is made for tracking error in the mounting of the pick-ups used, but a curved arm is fitted, and this gives a maximum tracking error of not more than 2½ degrees.

The average output of the pick-ups is 0.1 volts R.M.S., which is rather below the average run of pick-ups, but nevertheless is still greater than that of the B.B.C. microphones. Therefore, a compensating device has to be used, so that when the change-over is made from an "announce" to "gramophone" the amplifiers are not overloaded.

Both resistance and transformer-coupled amplifiers are used following the pick-ups, both of which are shunted by resistances to alter the characteristics to suit those of the standard B.B.C. amplifiers.

The engineers are at present working on a new idea, a moving-coil pick-up. It is understood that an experimental model has been made up at Savoy Hill and with this it is hoped to get even nearer to perfection in gramophone reproduction. Even at present, the engineers claim, the B.B.C. gramophone transmissions cover a wider frequency range better than is actually put on to the average gramophone record!




**Curve showing response of the needle-armature pick-ups now used by the B.B.C. for record transmission**

## "WHAT YOUR NEW SET SHOULD DO"

*(Continued from preceding page)*

In between 140 and 120, at 130, I could hear Zeesen, but only with chaotic interference from Radio Paris and Daventry. Down to 105, where I find Eiffel Tower, at full loud-speaker strength. At 90 I am halfway round the dial and there is Motala.

Next I get Kalundborg at 60 degrees, with nothing in between worth logging. This station is stronger than Motala, but still not so strong as the others. Lastly, I find Hilversum at 42 degrees, full loud-speaker strength and a really fine signal.

With such a reliable selection, why bother with the shorter waves? One evening at the dial is sufficient answer to such a heretical question. Where the long waves showed gaps of 20 degrees, the medium waves offer a station for nearly every degree.

Before I switch over to the medium waves, let me remind readers that the set in use down South would probably behave somewhat differently up North. The French stations would be weaker, whereas the Dutch and Scandinavian stations would probably be stronger.

Now to try our luck on the medium waveband, stopping to identify a station only when it is giving pleasant reception. Starting at 180 degrees again, I travel down to 165 before anything is heard; there I find Budapest, at good strength. Several signals are passed over until I identify Milan at 150, a full loud-speaker signal. Retracing my steps, I log Brussels No. 1 at 152, not so good. And there is Vienna at 160, but not very strong.

Next on the dial comes Midland Regional at 140, with 10 degrees in between quite blank. As this is a selective set, I get Langenberg at 138, quite clear of the Midland Regional and at good strength. At 135 I get Lyons La Doua, which seems extraordinarily good considering its low power and distance. Down to 128, where Rome seems as strong as the Midland Regional.

At 125 I get the new Stockholm station, but not at the colossal strength attributed to it by many writers. Skipping a few non-identifiable stations, 102 stands out as a landmark—it is Toulouse. Going back I find Bucharest at 105 and Katowice at 110, both rather "mushy." Between Toulouse, which is amazingly strong at 102, and London Regional at 90, I can get only Hamburg at 96, quite strong.

Between the London Regional at 90 and the London National at 30 is a happy hunting ground where I usually find considerable chaos. Working up from the National I get Rennes at 40 very strongly, but very poor quality. Then Turin at 43 at terrific strength. Almost as strong at 45 is Kônigsburg. Then Liége at 50 comes in at good strength. At 60 Lyons is very strong also. Between 60 and 90 I get mostly chaos. This evening only Brussels No. 2 at 78 can be definitely logged.

Readers will find these stations on their dial in the same *relative* positions as they are logged on the dials illustrated. Of course, the actual degree readings will differ, but I think the diagrams will serve as a useful guide.

# W. JAMES EXPLAINS THE REASON OF THAT DISTORTION

*A helpful article detailing many little points of which you may not be aware*

IT is surprising how much of the distortion usually heard is due to the receiver and the way it is used, rather than to the loud-speaker. With a bad loud-speaker nothing can be accomplished, but given a fair loud-speaker, good reproduction can be obtained, provided the set is suitable.

Now what are the chief reasons for distortion?

First, I would place lack of anode circuit power. Many people overload the valves in an effort to obtain strong signals. This is a bad fault and would be avoided if ample

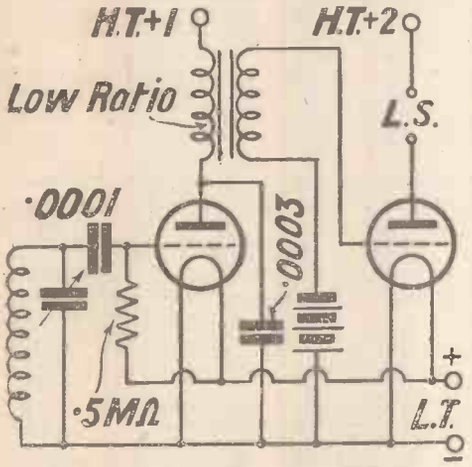



Fig. 1. Usual transformer connections

high tension were used, with a power valve of reasonable size.

This need not be a large one. Many listeners are satisfied with the amount of the volume to be obtained from an ordinary power valve having the maximum anode circuit voltage applied to it.

It is, I know, an unfortunate fact that power costs money, but those having a mains supply can usually obtain all the power that is needed at a fairly low annual cost.

A second common cause of distortion is overloading of the detector. The usual values of grid condenser and leak are .0003 microfarad and 2 megohms. Distortion occurs in the grid circuit with these values, the higher notes being reduced in strength rather seriously. When a pentode output valve is used, the overall result may not be too bad.

In order to improve the quality, the grid condenser must be reduced in size, and so must the grid leak. Better values would be .0002 and .5 megohm, but a condenser of .0001 microfarad, with a grid leak of .5 or .25 megohm, would be better still.

Overloading of the detector itself is hardly likely to occur when the latter values are used and the distortion will be the minimum.

A further fault often met with is that of using too little anode voltage on the detector. With valves of the moderate impedance class, such as 20,000 ohms, the high tension ought to be 90 volts at least, the higher the better. When the anode circuit coupling is a transformer, the capacity of the valve to deal with moderately strong signals will not be improved by using too high a voltage and there is a chance that so much current will flow through the primary coil of the transformer that this will distort badly.

Fig. 1 shows the usual connections when the coupling is a transformer. The modern practice of using a high-ratio component here only adds to the difficulties when the valves are being pushed to their limits. What happens is that when grid current flows there is a large drop in the voltage of the signal, the drop being relatively greater than when a lower ratio is used.

## Quality with Power

For the best quality, and when a big power valve is used, a high-ratio transformer ought not to be used. There are, I know, 6-1 ratio transformers having good characteristics and they are good when properly used. But their *overload* characteristics are poor, and in small sets overloading is likely to occur every time there is a loud passage of music.

In a set having a detector of the grid-leak type and a transformer coupling (most three-valve S.G. sets have), the points to look out for are, therefore, the values of the grid condenser and leak and the characteristics of the transformer. When reception from distant stations is the chief requirement, the most sensitive arrangement will naturally be used, but for the best quality of reproduction the points mentioned above should receive attention.

Some sets have a resistance coupling from the detector, as indicated in Fig. 2. As a fairly high voltage on the anode of the detector is essential if distortion of strong signals is to be avoided, it will be seen that great care must be taken.

A fairly low anode resistance must be

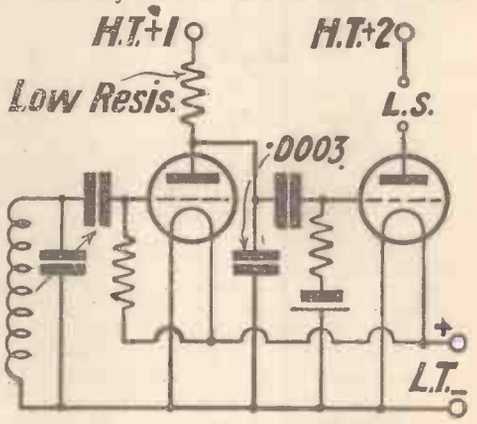



Fig. 2. Diagram of resistance coupling

used and the maximum voltage, or the detector will overload easily. A good value of resistance would be between 50,000 and 100,000 ohms, with a valve of moderate impedance. The magnification is a little less when the lower value is used, but this is generally of no account. Besides, it allows us to fit a fairly large by-pass condenser to the detector. This condenser is, strictly speaking, essential.

Most sets have too small a by-pass condenser, with the result that the efficiency of the detector is too low. Often, however, a larger condenser cannot be fitted for fear of reducing the high notes or upsetting the reaction.

In a set built for good quality, however, the range-getting properties must, if necessary, be sacrificed. Alternatively, a further valve must be added.

The sources of distortion mentioned are the chief ones only; but I should refer to back-coupling.

When a supply with considerable resistance is used, back-coupling and distortion

(*Continued in third column of next page*)

### FOR THE CONSTRUCTOR

**Rather than use your handkerchief for cleaning the dust from your variable condensers, keep a packet of wire pipe cleaners in your tool box. With these it is a very simple matter to clean the vanes, as the pipe cleaners are just the right thickness to remove all the dust and can be bent to get into odd corners.**

. . . . . .

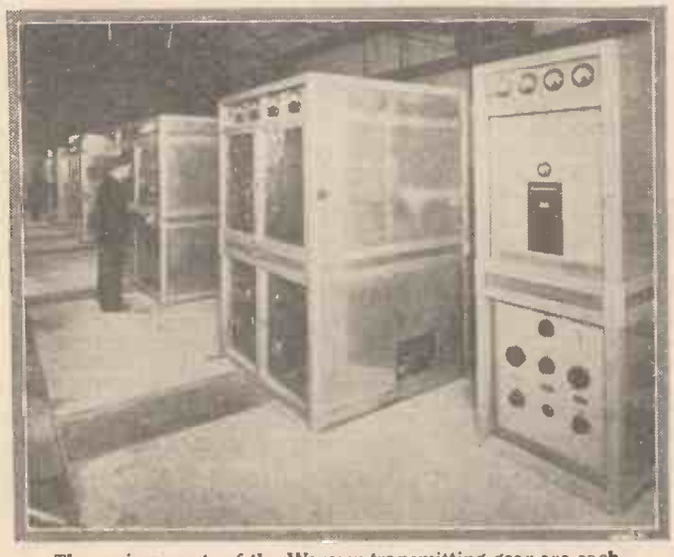
**Have you ever struggled for hours to get a simple bit of wire to stick firmly to a "crocodile" clip? Next time, take out the screw in the end of the clip and thread a flexible wire a couple of times through the hole, leaving an inch or so of wire. Twist this end and the main wire together and you will have a connection that won't fly off at odd moments.**

# A NEW BROADCASTING GIANT

## A 120-KILOWATT STATION FOR WARSAW!

Described by KENNETH ULLYETT

THE race for supremacy in the European ether is getting keener, and the new Warsaw station which will soon be "on the air" will be practically the most powerful station available under the Hague Convention. This will have a power of 120 kilowatts in the aerial and will undoubtedly be very well heard in this country.



The various parts of the Warsaw transmitting gear are each contained in a glass and aluminium cabinet

It is something of which British radio enthusiasts should be very proud in that Marconi's have been asked to build the whole transmitter, and it is now undergoing its final test at Chelmsford. It will be erected at Rasin, about 15 miles from Warsaw.

The power of the new station can be understood from a comparison with Daventry 5XX, which has a power of 25 kilowatts in the aerial, and with the Swedish station at Motala which has a power of 30 kilowatts in the aerial.

Those who went to the Show and saw the B.B.C. exhibit—the original 2LO transmitter—will be interested to know that Warsaw will be more than 150 times as powerful as the first 2LO which delivered about 700 watts to the aerial, and was rated at 1½ kilowatts.

The aerial at Rasin will be of the half-wave type terminating in a feeder house underneath the aerial. Feeder lines from the transmitting station to the feeder house will convey the power to the aerial, carried on two masts 600 ft. high and 750 ft. apart. These will be the highest masts in use at any of the European broadcasting stations.

The station will operate on 1,411 metres.

The various parts of the transmitter are contained in aluminium and glass panels, completely screened from one another to prevent interaction. In the main or last-stage magnifier, eight 100-kilowatt valves will deliver the modulated power to the aerial which, at 80 per cent. modulation, will amount to 158 kilowatts. Normally, six of these huge valves will be used. The total primary energy required to operate the whole of the equipment amounts to 700 kilowatts.

The modulation has a straight line characteristic throughout a frequency of from 30 to 10,000 cycles, and will, therefore, give very good quality.

A valve drive of absolute precision is provided in order to ensure that the station will remain accurately on its allotted wavelength and to prevent it from interfering with other transmissions on neighbouring wavelengths. Crystal control is not used for various reasons.

The three-phase power supply will be rectified by a Brown-Boveri mercury arc rectifier of 550 kilowatt capacity, delivering rectified current at from 8,000 to 16,000 volts. The rectifying equipment is duplicated so that more than 1,000 kilowatts rectified A.C. current will be available.

Special land-line gear of the latest type has been manufactured to link up with the studios, which will be situated in Warsaw itself. Land-line apparatus for simultaneously operating the high-power station at Warsaw and the other broadcasting stations at Lwow and Wilno is also being provided.

The fact that this immense power of 120 kilowatts will be put out on 1,411 metres is bound to affect general long-wave reception in this country. It is, of course, common knowledge that Radio Paris intends putting up its power of 17 kilowatts to 60 kilowatts, an event to take place in the near future.

It looks as though 5XX will have some keen competition, and selectivity on the long waves will be more than ever important.

Adjusting the aerial tuning of the 120-kilowatts

### "THE REASON OF THAT DISTORTION"

(*Continued from preceding page*)

is sure to occur. Obviously, the current in the anode circuit should vary according to the voltages applied to the grid, and this cannot happen when the supply is restricted in any way. Large by-pass condensers help, as a rule.

Too much capacity can hardly be used. Pay particular attention to the detector circuit and to the last stage, as this stage, in particular, must be fed with adequate current. Mains units generally have motor-boat stoppers or anode circuit filters. These

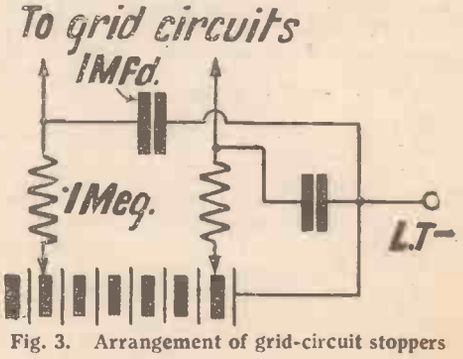



Fig. 3. Arrangement of grid-circuit stoppers

help to prevent inter-circuit coupling, but once again, when in doubt, connect more capacity to the different outputs.

Do not overlook grid circuits. When one grid-bias battery is used for several circuits it is possible that the circuits will be coupled in such a way that distortion is introduced. Grid-circuit stoppers ought to be fitted when in doubt, a grid leak of 100,000 ohms and a condenser of 1 microfarad being connected in the grid-bias wires, as indicated in Fig. 3. These filters will effectually stop couplings and may be used in mains sets as well as when a battery is employed.

# On Your Wavelength!

## THE SEASON OF CHANGE

WE are at the moment of writing just in the transition period between late summer and early autumn conditions for long-distance wireless. This period is always a very interesting one, for it is never quite alike in any two years, as any reader who cares to turn up his old logs will find. Sometimes there is a gradual improvement in signal strength, so slight that it may be almost imperceptible, which begins at the end of July and the early days of August, and continues almost unchecked until shorter days and longer nights bring the wireless season to its height.

A more frequent type of transition, though, is one in which the progress towards bigger signal strength and a larger bag of stations takes the form of sudden jumps. Thus signal strength all round may continue at more or less summer level until August is well under way. Then one night you discover that most stations are coming in far more strongly than they were. Nothing much happens for perhaps ten days or more; then there is another very noticeable increase in strength. A transition period of this kind is not infrequently accompanied by brief periods of a day or two during which signal strength falls off, only to achieve a remarkable increase a little later.

## A STRANGE YEAR

THIS year the transition period has been of a rather curious kind, for it has been a mixture of both types. Some weeks ago a big improvement was noticed. This was a typical "jump." Since then conditions have varied enormously. There have been no further jumps. Progress towards better reception has, in fact, been of the most gradual kind, and it has been varied by poor periods of comparatively long duration. It is rash to prophesy, but what I expect to see is a sudden very marked improvement before the middle of October, and within a short time conditions should be excellent. We are bound to be able to receive a very large number of foreign stations this winter, for so many of them have increased their power of late.

## A WONDERFUL SET

I WAS privileged recently to hear and to work the latest simplified model of the Stenode which has been designed specially with a view to the reception of broadcasting. It does not employ a crystal gate, but the tuning is sharp enough, for all that, there being a clean-cut separation of stations working on channels 5 kilocycles apart. There were those who said that with such selectivity good quality must be absolutely unobtainable. I can assure them that I have never heard more perfect reproduction from any wireless set than that which this new Stenode provides. My own apparatus was constructed and designed with pretty considerable care, and I thought that it was right up to the mark as regards quality. But I came away from the Stenode laboratory rather sad at heart, for I realised that better quality than I am getting is possible.

One of the most interesting experiments was the playing, by means of a pick-up, of special gramophone records on which a short individual passage by every instrument of an orchestra is recorded. These include the drums, the cymbals, the big brass instruments, the organ, the double bass, the 'cello, the piano, the violin, the clarinet, and the flute. The range covered thus extends from the highest to the lowest musical frequencies. Every instrument was reproduced to perfection.

## OFF TO AMERICA

DR. ROBINSON tells me, by the way, that he is just off to America with various Stenode models and that he is to give his first demonstration in the States at the Chicago Wireless Exhibition on October 20. The Stenode is already attracting enormous attention in the States, for, owing to the huge number of stations at work upon the medium wave-band (there are no long-wave American stations), selectivity is essential, and American users have lately been loud in their complaints that their own sets don't seem able to combine selectivity with quality. It would, indeed, be a feather in our cap if a British inventor solves America's greatest broadcasting problem.

## A HUGE SUCCESS

ANYONE who went to the Exhibition could have been in no doubt about its being a big success, and now that some figures are available it is evident that all records have been broken. During the eight days that it was open over 160,000 people visited the show and business to the value of something like £3,000,000 was done. Several firms booked sufficient orders to keep their factories going at full speed for the rest of the season. One very striking thing was the number of visitors from overseas. They came from all over the world, and there is no question that as a result of this year's Exhibition British radio can claim world supremacy. From any number of salesmen on the stands I heard that they had been surprised at the number of absolute newcomers to wireless who came to buy sets. I have seen it prophesied that the number of wireless licences will reach the five-million mark before next year's Olympia opens. I don't know about that, but I am pretty sure that it will go to over four millions.

## AN ASTONISHING DAY

THE most amazing day was the final Saturday of the Exhibition, when before the doors opened the queue was so vast that both foot and mounted police had to be rushed up to control it. All the world and his wife and his sons and his daughters appeared to have turned up for the final day. And, as if the queue were not big enough, a fleet of 'buses arrived bearing some hundreds of excursionists that had come down from the north expecially for the Exhibition. It was one of the most wonderful days in the history of wireless, for it gave proof of the most convincing kind of the enormous interest taken in the greatest of all hobbies by people of all classes living in every part of the country. This year the Exhibition was greatly enlarged by the taking over of the first floor of the New Hall. It is pretty certain that for next year's Exhibition the whole of Olympia will have to be used, and if that isn't a cheering thought—well, I don't know what is.

## PIG-TAIL PLAITING

NO, this is not a beauty hint for flappers who are renouncing the shingle and growing their hair long again. It refers to the more useful business of making up battery leads. It is exceedingly convenient to make up all your leads into a pig-tail, and the result is very neat, for it does away with all trailing wires. The business is quite easy if you set about it in the right way, and here is how I make my own. For most multi-valve sets nowadays six leads are needed—three for high-tension positive, one for high-tension negative, one for low-tension positive, and one for low-tension negative. I go to a wireless shop and buy one yard of red and black double flex, one yard of white, one yard of green, one yard of yellow, and one yard of blue. The colours of my leads are: Black, L.T.—; red, L.T.+; white, H.T.—; green, H.T.+; blue, H.T.+2; yellow, H T.+3. I begin by separating the twin leads of the white, green, yellow, and blue. Be careful when you do this not to straighten out the kinks in them, for these are most valuable. The red and black twin flex is left untwisted. And now comes the process of making up a pig-tail. Lay one end of a white lead against that of the twin red and black, and tie the three together. Fasten them to the back of a chair, a door knob, or anything handy. Then proceed to lay the white evenly between the red and the black. You will find that its kinks make this easy and that it goes almost by itself into place. Having got down to the other end, fasten the leads with a piece of string to prevent them from untwisting. Now take a green lead, tie its end as before, and lay it evenly between, say, the black and the white. The other two follow in the same way.

## HAVE YOU HEARD HIM?

OLD wireless hands who date from the pre-broadcasting era will remember what a stand-by Croydon was to us in the early days of the hobby when there was so

## On Your Wavelength! (continued)

little in the way of telephony as could be picked up. But probably not many people hear him nowadays when he is using his ordinary 900-metre wavelength, for this comes just in the gap between the ranges covered by the medium- and the long-wave coils. Myself, though, I often listen to him, and I find Croydon and other air stations extraordinarily useful when I am testing out the daylight powers of a new receiving set. The other night I was surprised to hear the voice of Croydon right down towards the bottom of the broadcast band. As a matter of fact, the wavelength was just over 200 metres. Signal strength was fairly good and speech was clear enough for every word to be heard distinctly. It cannot have been a harmonic, for no whole number divided into 900 gives just over 200 metres, and the wavelength was certainly under 225 metres, which would be the third harmonic. I have not heard him since that one night, though this may have been because I don't often tune right down to 200 metres. Have any readers picked him up and can anyone say whether he makes regular use of this very short wavelength?

### WORTH TRYING

IF, by the way, your set will tune to 900 metres you can spend a very interesting time at almost any hour of the day with Croydon, Le Bourget, Lympne, St. Inglevert, Antwerp, Cologne, and other air stations. A very fine test for a big set is to catch Croydon calling a pilot and then to see whether you can pick up the reply from the 'plane. If you live anywhere near the cross-Channel route you may be able to do this quite easily, but should you be as far inland as I am you will realize that it takes some doing, except when the 'plane is pretty near Croydon. Some time ago, using two screen-grid valves, I was able to follow a 'plane during a large part of its trip to Antwerp, and it was most interesting with a map on the table to trace his course as he gave his position at frequent intervals. I can strongly recommend 'plane hunting as an interesting daytime amusement for anybody who possesses a sensitive receiving set with plenty of H.F. amplification.

### DIRECTLY OR INDIRECTLY HEATED?

I NOTICE with some interest the appearance of a new series of directly-heated A.C. valves designed for power amplification. There is such a tendency nowadays to complicate things inside the bulb that a move, however small, towards simplification is welcome—provided, of course, that one gets the same efficiency. An indirectly-heated S.G. valve, for instance, contains plate, screening grid, control grid, cathode, and heater—five electrodes in all. The directly-heated type, however, has no separate heater, the raw A.C. being applied directly to the cathode. Somehow or other, the original "Point Eight" valves do not seem to have caught on, possibly because of the difficulty in designing a supply transformer which will "step down" the mains voltage to so low a value as .8 volt. At this voltage the cathode takes .8 amp. In the new valves I notice that the cathode is supplied at 4 volts, a much more practical figure for transformer design. The current consumption is 1 ampere.

### THE QUESTION OF COST

THIS leads me to suggest that it is time the manufacturers "tempered the wind to the shorn lamb" in the matter of mains-fed valves generally. In spite of the recent reduction in the price of ordinary valves, the simplest A.C. type still costs 15s. Most of us are agreed that the set of the future will be mains driven, but meanwhile a few shillings off the price of A.C. valves would, I imagine, make more practical converts than any other form of argument. Since the directly-heated valve has one electrode less than the indirectly-heated type, it should cost less to make and may perhaps lead the way to a welcome reduction.

### A QUEER INCIDENT

I CAME across a very strange form of battery the other day. The average H.T. battery starts off with a goodly punch, and gradually drops in voltage as it becomes exhausted. This particular battery had been in use for some considerable time, and therefore I somewhat expected it to be down. I knew that a similar battery which had been in service for much the same period was giving about 70 volts instead of 100; therefore, I assumed that this battery was doing much about the same. One of my high-tension tappings was relatively low down on the battery, at about 40 or 50 volts, and I assumed that I was getting perhaps 30 volts instead of the rated value.

Somehow or other, the set refused to function properly, and in the end I got the voltmeter out and started measuring the voltages at different points of the set. To my surprise, I found that the detector voltage was reversed, and instead of obtaining about 30 volts, as I expected, I was obtaining —10 volts., i.e., 10 volts in the wrong direction. Considerably puzzled, I traced down all the connections and found everything was in order and that the detector voltage was really connected to a point on the battery marked 45, and was the right way round. However, in order to make quite sure, I measured the voltage between these two points on the battery, and found, to my surprise, that the voltmeter read in the reverse direction.

### AN ISOLATED CASE?

ON changing over the leads, I found that this part of the battery was actually giving —10 volts. It had not only become exhausted, but had in some curious mysterious way reversed its potential and was giving perfectly good voltage the wrong way round. I have never come across this peculiar effect before, and it would be interesting to know if any other reader has ever experienced it. Naturally, the whole voltage on the battery was about 40 volts instead of 100, being made up of the remaining good portion of the battery from 35 volts onwards —10 volts due to the bad portion. What the internal resistance was I did not trouble to measure. The battery went straight into the dustbin before it led me up the loop again.

### A WAR PROBLEM

HAVE you ever thought what an astonishing situation would arise if we had —as Heaven forbid that we should— another great war? In these days of portable sets and indoor aerials it would be a matter almost of impossibility to ensure that all wireless receiving gear was out of use. And, anyhow, you can make a crystal set which will allow good reception to be obtained from a high-power station at a pretty hefty distance from such simple materials as a few yards of wire and an old cigarette tin. Propaganda played an enormous part in the Great War and, owing to the existence of wireless as a popular hobby in every country, it would play a far larger one in any future war.

Each of the belligerent countries would, I suppose, try to shout the others down by the use of terrific power. But it would take some doing to jam all possible wavelengths, particularly when you consider the number of channels that are available on the short waves and the remarkable distances to which quite a small output will carry on them. In war-time, even now it would be a simple business for spies to transmit information from any part of the world to any other. It is quite likely that, owing to wireless, the element of secrecy, which is so important in warfare, will disappear—if, indeed, it has not already done so.

### FOR EFFICIENCY

IF you really want efficiency with an indoor aerial, keep your wires as far away from walls as you possibly can. Should it be necessary to bring the down lead through a doorway, by far the best tip is to bore one small clean hole through the woodwork in the jamb and pass the wire through an ebonite tube. Don't try to make it inconspicuous by stapling it to the contours of the moulding. The bad effects upon signal strength produced by an incorrectly arranged down lead are clearly demonstrated in one house that I know. This contains two indoor aerials, and both are suspended in different rooms on the same floor. One goes direct to a crystal set owned by the son of the house, the down lead being kept short and right away from walls. The youngster obtains excellent crystal reception from both Brookmans Park stations, as well as from the Daventry pair. The second aerial serves the big set belonging to paterfamilias. This set is on the ground floor and the down lead for a matter of several yards comes close to walls. On this aerial signal strength with a crystal set is minute, and even a big four-valver wants far too much reaction to enable it to bring in any of the foreign stations that would be within its range with a better aerial.

THERMION.

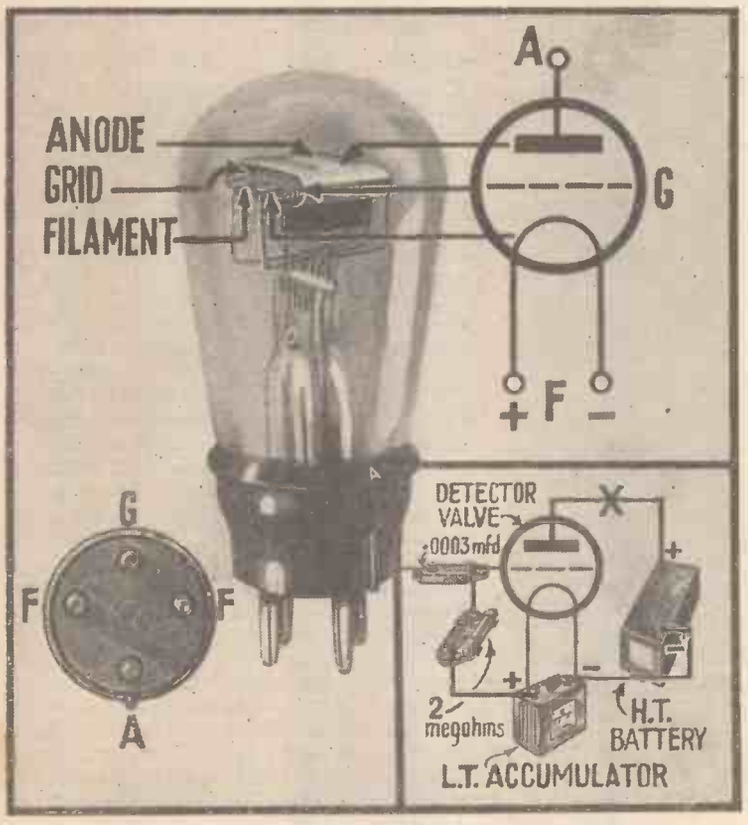
## THE HOW AND WHY OF RADIO

# IV—HOW THE DETECTOR WORKS

***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***

MOST valve detectors work in conjunction with a grid leak and a grid condenser, providing what is known as leaky-grid-condenser rectification. This method of making wireless waves operate the sound-reproducing end of the set is the most efficient known, so I will concentrate on its particular action.

The general form of a detector valve is illustrated. It is known as a three-electrode valve. The filament is one electrode, the grid is another, and the anode is the third. In the smaller diagram, on the right, are shown the essential detector connections.




A typical detector valve and (right) a simple detector circuit

Before a wireless wave from the broadcasting station arrives at the detector valve we might examine what is going on in preparation for the event. Firstly, the filament is heated by the accumulator. We used to say "lighted," but modern filaments are so efficient that we can obtain an adequate heating effect at a very low temperature.

The filament is heated to make it emit electrons, which for this article must be simply designated as negative charges—constituent in every electric current. The purpose of the anode is to attract these electrons, which it does by virtue of the strong positive charge conferred upon it by the high-tension battery.

So far, all is clear; electrons are being emitted by the filament and are flowing over in an unending stream to the anode, thence through the high-tension battery and back to the filament.

Now between the filament and the anode is the grid, which up to the present does not interfere with the filament-to-anode electron stream, because it is constructed as a fine wire mesh, through which the minute electrons have no difficulty in passing.

Let us look at this grid a little more, since it is the key to the whole process of detection. The grid is connected to one side of a fixed condenser, the other side going to the tuning arrangement of the set. This condenser, while offering practically no barrier to a high-frequency alternating current, such as a wireless wave, is absolutely impassable by a direct current. This distinction must be thoroughly grasped before we can go any further.

But the grid is not entirely isolated from the filament, since it is connected to it through a very high resistance called the grid leak. The end of the grid leak not connected to the grid goes to the positive side of the filament. So, if anything, the grid is slightly positive, with respect to the negative end of the filament.

The stage is set for the arrival of the wireless wave; from last week the beginner will remember that a broadcast wireless wave is a very high-frequency alternation, bearing the imprint of the much lower frequencies corresponding to speech and music. The detector's job is to separate the low frequencies of speech and music from the high frequencies of wireless transmission, which are by-passed by the detector and thus have no effect on the rest of the set.

Very well, then; the desired wireless signal arrives at the aerial, is differentiated from the hundreds of other wireless waves in the ether by the process of tuning and is confronted with the detector.

### *What a Wireless Wave Is*

We must try to conceive a wireless wave as an alternation, becoming alternately positive and negative, millions of times a second. The complete sequence from zero to positive, positive to zero, zero to negative, and negative back to zero is called a cycle. In a wireless wave of 300 metres length there are 1,000,000 cycles per second.

Each half cycle, either positive or negative, is so momentary that it could no more affect the grid of the detector valve than it could affect the diaphragm of the loud-speaker. But a detector, arranged as shown, exhibits a cumulative action, dependant upon not on one cycle, but on millions. This can be grasped by following the process cycle by cycle.

The first positive half cycle of the wireless wave arrives on the grid via the grid condenser. Momentarily, the grid becomes positively charged; as such, it has the same sort of attraction for electrons on their way to the anode as has the positively-charged anode itself. In fact the grid becomes, momentarily, a miniature anode.

### *Grid Changes*

The electrons attracted to the grid give it a small negative charge, not momentarily, but so long as the charge is prevented from leaking away. Remember, the grid is practically isolated, except for the high-resistance grid leak connected back to the filament.

So far, we see the effect of a positive half cycle of a wireless wave is to cause a small negative charge to be left on the grid. It is left there because, unlike the wireless wave, it cannot get back through the grid condenser; nor can it speedily get back to the filament owing to the high resistance of the grid leak.

Then comes the negative half cycle of the wireless wave; what is its effect on the grid? Practically nothing, for while it;

(*Continued in third column of next page*)

**NEXT WEEK: V—WHY AMPLIFICATION IS NEEDED**

# THE KOLSTER BRANDES "PUP"

## A SET OF DISTINCTION

Price £3 5s. (without valves). Makers: Kolster Brandes, Ltd.

AFTER enthusing over multi-valve sets worked from the mains, you might think it difficult to write glowingly of a humble two-valve battery set; that would be because you had not tried the "K.B. Pup," which has been delighting me over the week-end. This little two-valver staggered me when I put it on test in south-west London.

Let me explain why: the set has a detector and a transformer-coupled power valve, with reaction on the detector. Such a simple circuit depends for good results on an efficient aerial and batteries in good condition: but my aerial was only an indoor one and the battery was only a 100-volt standard-capacity unit.

What results I got were, therefore, due to the set and not to super accessories. At the time of the first test there were no British stations "on the air," so I diffidently tried for a powerful foreign station. My diffidence was most uncalled for, because Toulouse came in at really good strength at 74 degrees.

The strength was so great for a two-valver that I at once assumed this station had increased its power. But the real truth dawned on me when I got Rome at 110 degrees even more strongly. Then came Langenberg at 130 degrees, followed by Turin at 5 degrees, and Louvain at 60 degrees.

### Good Range

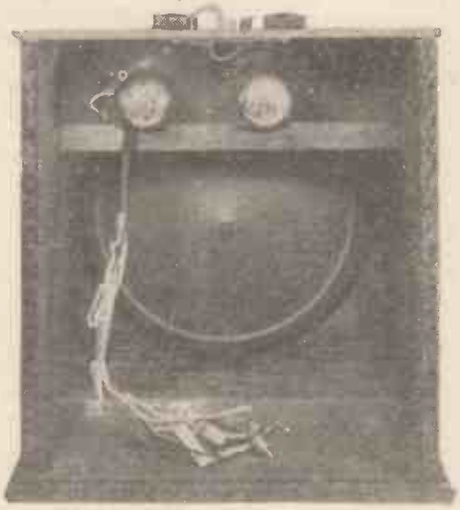
Without doubt the set was good that evening. For the long waves were just as lucrative. There was Radio Paris at 62 degrees, a good loud-speaker signal; and Huizen could be enjoyed at 82 degrees. Eiffel Tower at 25 degrees was very strong

That completed the first test, proving that the "Pup" could reach far beyond the confines of the B.B.C. service area, for which it was presumably designed. At this sitting I measured the anode current; as expected, it was quite moderate, being just over 8 milliamperes. This reading was with the two Mullard valves specified, a PM1HF and a PM2.

### Selectivity

My next test of the "Pup" was the following evening. It proved something else about the set: that it could cope with the proximity of powerful regional stations. Here I should explain that on top of the "Pup" is an aerial and earth terminal board, with two aerial sockets, an earth socket, and a shorting arrangement for changing from medium to long wavelengths.

The readings already referred to relate to the connection of the aerial lead to socket A1. In this way the London Regional came in at 58 degrees, the Midlands coming in at 136 degrees. The National station could not be tuned in with this aerial connection, so A2 was used. This shifted up the whole tuning, bringing in the National at 30 degrees, the London Regional at



The interior construction of the K.B. "Pup" is particularly compact

80 degrees, and the Midland Regional at 165 degrees.

Note the space in between these powerful stations; there was no "spreading" of the London Regional, while the other two were knife edge in tuning. I counted fourteen good strong carrier waves between the Midland and London Regional stations; surely that proves the remarkable powers of this little set.

I must say something about the quality of the reproduction. The little self contained cone loud speaker handles the full output of the PM2 without the slightest "dither." The tone is pleasantly free from any pronounced resonance; in fact, I was really well satisfied with the overall reproduction.

### Smooth Reaction

Well, what is the secret of the "Pup"? That is a natural question, in view of my praise. I think the smooth reaction has a lot to do with it. The makers must have spent a long time with the coil winding. You can go right up to the edge of oscillation and then gently slide into oscillation if necessary.

SET TESTER.

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## "HOW THE DETECTOR WORKS"

(*Continued from preceding page*)

momentarily increases the negative charge on the grid, it thereby repels any further electrons from the grid; so at the end of the negative half cycle the grid is in roughly the same condition that it was at the end of the first positive half cycle, that is, slightly negatively charged.

The next positive half cycle again charges the grid a little positively, so that, anode-like, it attracts more electrons to it, thereby increasing the small negative grid charge. At the end of a complete train of wireless waves the grid has become appreciably negative. But as the signal voltage drops, so does this negative grid voltage; for the value of the grid leak is so chosen that, while acting as a stopper during each train of oscillations, it does not prevent the accumulated negative charge from leaking away to the filament between successive trains, thus restoring the grid to its normal zero, or slightly positive, potential.

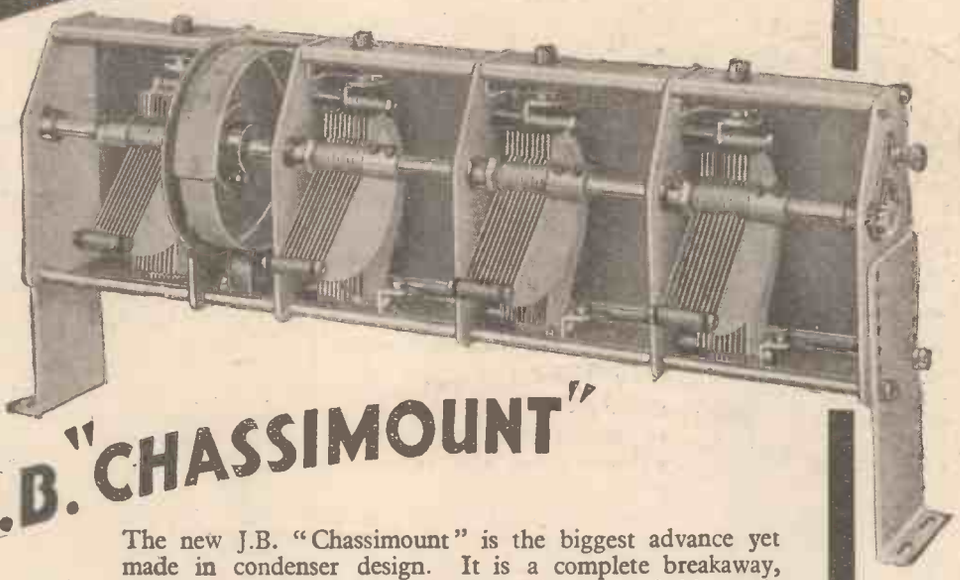
The frequency with which successive trains of oscillations rise and fall depends upon the speech of music broadcast. In effect, the grid follows the rise and fall of the microphone currents. The significance of this is only realised when I explain that the rise and fall of grid voltage causes a corresponding fall and rise in anode current.

For as the grid becomes appreciably negative, not through one cycle, but through a succession of cycles, so the anode current decreases, because electrons on their way from the anode to the filament are more and more repelled and prevented from reaching the anode by the intervening grid accumulating a greater and greater negative charge.

The current operated device inserted at the point X in the diagram, whether phones or loud speaker, responds to this slow change in anode current, which is an exact replica of the current change caused in the microphone by speech or music. In this fashion are wireless waves detected, that is to say, made to operate the loud speaker.

HOTSPOT.

# RADIO'S NEWEST TUNING DEVICE



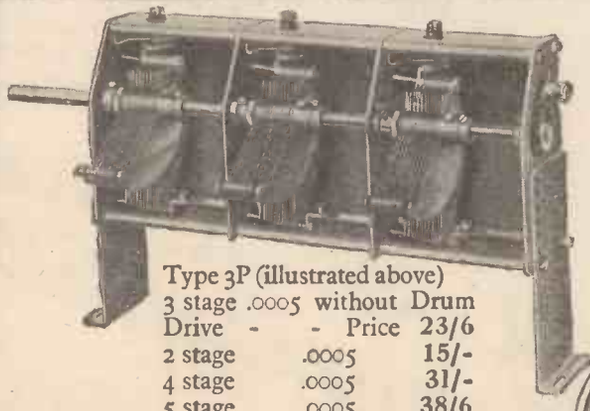
# The NEW J.B. "CHASSIMOUNT"

The new J.B. "Chassimount" is the biggest advance yet made in condenser design. It is a complete breakaway, throws open new fields, and will be the basis of this year's popular circuits.

Two, three, even six tuned circuits—one knob controls them all, keeps them perfectly in tune, and brings in station after station.

Once again J.B. lead the way. J.B. precision has made the "Chassimount" possible and ensured the various condenser units matching over the whole range.

The J.B. "Chassimount" is built and designed as a unit. Each stage is adequately screened and has a special device which balances out all stray capacities. AND IT COSTS LESS THAN SEPARATE CONDENSERS.



Type 3P (illustrated above)
3 stage .0005 without Drum Drive - - Price 23/6

| | | |
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| 2 stage | .0005 | 15/- |
| 4 stage | .0005 | 31/- |
| 5 stage | .0005 | 38/6 |
| 6 stage | .0005 | 46/- |

Type D4 (Illustrated above)
4 stage .0005 with Drum Drive
Price - 42/6

| | | |
|---|---|---|
| 2 stage | .0005 | 26/6 |
| 3 stage | .0005 | 35/- |
| 5 stage | .0005 | 50/- |
| 6 stage | .0005 | 57/6 |

*Advertisement of Jackson Brothers, 72, St. Thomas' Street, London, S.E.1. Telephone: Hop 1837.*

# THE MANCHESTER EXHIBITION

## CITY HALL, DEANSGATE

Wednesday, October 8th, to
Saturday, October 18th, 1930

The City Exhibition Hall, Manchester

## WHAT YOU SHOULD SEE

A HANDY means of converting your battery-driven set to mains operation by means of the ingenious conversion units shown on the Stand of Six-Sixty Radio, Ltd.

A simple device for increasing the selectivity of portable sets, shown by L. McMichael, Ltd.

The new mains-driven sets on the Stand of Varley (Oliver Pell Control) Ltd.

The new Ferranti receivers having fabric-covered cases and very futuristic designs.

The Pye twin-triple portable, which is housed in a modern style cabinet.

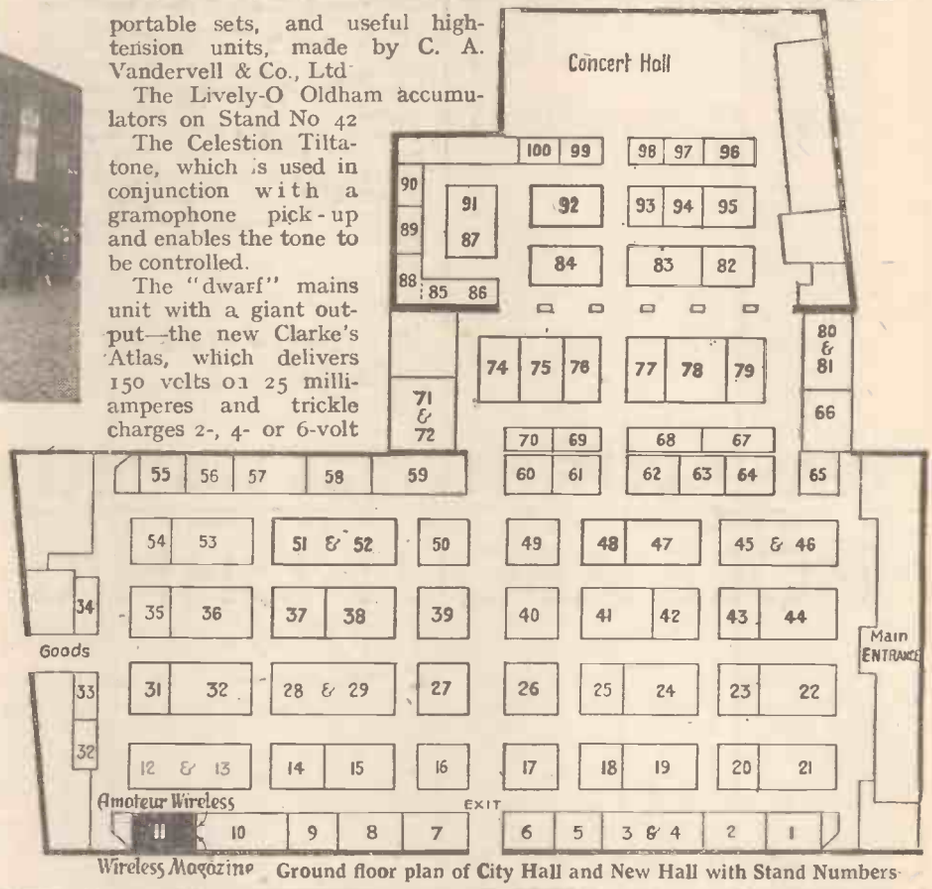
A wide range of the latest Igranic-Elkon metal rectifiers for high-tension, low-tension and grid bias, shown by the Igranic Electric Co., Ltd.

portable sets, and useful high-tension units, made by C. A. Vandervell & Co., Ltd.

The Lively-O Oldham accumulators on Stand No 42

The Celestion Tiltatone, which is used in conjunction with a gramophone pick-up and enables the tone to be controlled.

The "dwarf" mains unit with a giant output—the new Clarke's Atlas, which delivers 150 volts 01 25 milliamperes and trickle charges 2-, 4- or 6-volt




Ground floor plan of City Hall and New Hall with Stand Numbers

### List of Exhibitors with Stand Numbers as Indicated on Plan

| Stand No. | Name |
|---|---|
| 1. | Trader Publishing Co., Ltd. |
| 2. | Bearsdsall. |
| 3 & 4. | Allied Newspapers, Ltd. |
| 5. | Watmel Wireless Co., Ltd. |
| 6. | Selectors, Ltd. |
| 7. | Belling & Lee, Ltd. |
| 8. | J. Moores & Co., |
| 9. | Fonteyn & Co., Ltd. |
| 10. | S. Kalisky (Aldgate), Ltd. |
| 11. | Bernard Jones Publications, Ltd., "Amateur Wireless" and "Wireless Magazine." |
| 12 & 13. | Lissen, Ltd. |
| 14. | Tutills, Ltd. |
| 15. | Dubiller Condenser Co. (1925), Ltd. |
| 16. | Ward & Goldstone, Ltd. |
| 17. | Burndept, Ltd. |
| 18. | Ever Ready Co. (Gt. Britain), Ltd. |
| 19 & 20. | Philips Lamps, Ltd. |
| 21. | Kolster-Brandes, Ltd. |
| 22. | Iliffe & Sons, Ltd. |
| 23. | Partridge, Wilson & Co. |
| 24. | Graham Amplion, Ltd. |
| 25. | Garnett Whiteley & Co., Ltd. |
| 26. | H. C. Rawson, Ltd. |
| 27. | Chloride Electrical Storage Co., Ltd. |
| 28 & 29. | Edison Swan Electric Co., Ltd. |
| 30. | A. C. Cossor, Ltd. |
| 31. | Telsen Electric Co., Ltd. |
| 32. | Formo Co. |
| 33. | Redfern's Rubber Works, Ltd. |
| 34. | Wright & Weaire, Ltd. |
| 35. | Tungsram Electric Lamp Works (Gt. Britain), Ltd. |
| 36. | Pertrix, Ltd. |
| 37. | Brownie Wireless Co., of Great Britain, Ltd. |
| 38. | Marconiphone Co., Ltd. |
| 39. | S. G. Brown, Ltd. |
| 40. | H. Clarke & Co. (Manchester), Ltd. |
| 41. | Celestion, Ltd. |
| 42. | Oldham & Son, Ltd. |
| 43. | C. A. Vandervell & Co., Ltd. |
| 44. | E. K. Cole, Ltd. |
| 45 & 46. | Mullard Wireless Service Co., Ltd. |
| 47. | General Electric Co., Ltd. |
| 48. | Hardman. |
| 49. | Igranic Electric Co., Ltd. |
| 50 | Pye Radio, Ltd. |
| 51 & 52. | Ferranti, Ltd. |
| 53. | L. McMichael, Ltd. |
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| 67. | Concerton Radio & Electrical Co., Ltd. |
| 68. | London Electric Wire Co. & Smiths, Ltd. |
| 69. | Junit Manufacturing Co., Ltd. |
| 70. | Coranto Cabinet Co. |
| 71 & 72. | Competitions. |
| 74. | Ultra Electric, Ltd. |
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| 82. | J. C. White. |
| 83. | Radio Instruments, Ltd. |
| 84. | Continuous Gramophones, Ltd. |
| 85 & 86. | Universal Electric Supply. |
| 87. | Universal Gramophone & Radio Co. |
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| 89. | Broadcaster. |
| 90. | Mainten Mfg. Co., Ltd. |
| 91. | Camille Espir. |
| 92. | National Accumulator Co., Ltd. |
| 93. | Umello. |
| 94. | Majestic. |
| 95. | Hobday Bros., Ltd. |
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A new four-valver with simple control, the Mullard Orgola Four. This is just the thing for home constructors.

The new Ekco sets which work from the mains, shown by E. K. Cole, Ltd.

Non-spill low-tension accumulators for accumulators at 1½-amperes. Altogether a most creditable performance.

New valves and some new mains-operated receivers on the Marconiphone Stand.

(*Continued on page* 530)

**STAND No. 11**
**AMATEUR WIRELESS AND WIRELESS MAGAZINE**

# OUR BIGGEST & BEST BLUEPRINT GIFT

TWO LARGE BLUEPRINTS

READERS know the quality of our Blueprints. These are not small reproductions, but absolutely full-size layouts, drilling templates, and working guides, showing the position of every component and its connections. They are the very best of their kind, and I think our gift next week will prove the best of a long series. It is a

## DOUBLE BLUEPRINT

two blueprints on one sheet measuring not less than about 22 in. by 31 in. and possessing a feature of real novelty. The double blueprint shows the

## A.W. "CHALLENGE FOUR"

a set specially designed by W. James, who has some of the finest and best-known receivers to his credit. Let me tell you that he himself is delighted with his latest achievement and has smilingly told me of the wonderful results he has been able to obtain with this set. You will note the name of the set—"The Challenge." It is a challenge we issue with confidence—the set is a real winner.

Some further particulars of the set are given on page 520 of this issue.

## NOW FOR THE NOVELTY

We realise that in 30 per cent. or so of the homes of England A.C. electric power is available and that in those homes there is sure to be a tendency to look favourably upon the mains-operated set. In the great majority of other homes batteries will be used. Our two blueprints given free with next week's issue will meet the requirements of both sections of our readers. Firstly, there is an absolutely full-size working drawing of the "A.W." "Challenge" Battery Set; then beneath it is a second blueprint showing at half-scale the A.C.-mains version of the same set—not essentially a different set, you will appreciate, but the "Challenge" with slightly altered wiring and the inclusion of extra components to fit it for mains operation.

Personally I am delighted with the job; both set and blueprint give me pleasure as, I am sure, they will you.

Some readers may cavil at that fourth valve.

## WHY FOUR?

Why not three? Well, this is Mr. James's successful attempt to give you something as good as anything you can find on the market—a set that will do everything you require of it; that will be critically selective; that will be of beautiful quality and splendid volume; and that will possess a really efficient volume control. That fourth valve must not deter you. Valves are cheap.

## YOU WILL LIKE THE PANEL

immediately you see it—a fine, simple job, modern, smart and as neat as that of the most expensive of manufactured sets.

Now you will see, without further words, just what I am presenting next week—two blueprints making possible, with the help of the explanatory article in the issue itself, the construction of a high-grade, absolutely tip-top battery set or A.C.-mains set—at your own sweet will.

AMATEUR WIRELESS next week (usual price 3d.) will sell like

## HOT CAKES

so please order your copy at once and also do me the great kindness of passing on the news to your friends. Every keen listener is looking out for a set of the sort which Mr. James will present, through us, next week.

THE EDITOR.

## TWO BLUEPRINTS FREE WITH NEXT WEEK'S "A.W."

# MORE ABOUT OHMIC COUPLING

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

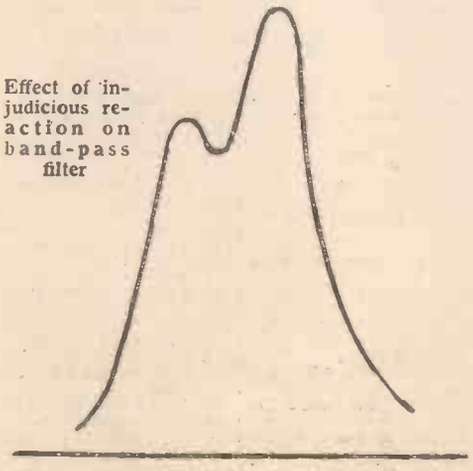
AS I rather expected, my articles on ohmic coupling have been accorded a mixed reception. The pundits have gravely informed me that the system is quite wrong and cannot work. The only answer is to show them the circuit working or refer them to someone who has heard it. The arrangement is, in fact, one of those simple systems which one hesitates to try because it appears at first sight to be contrary to theory, yet when one does try the system the results meet the requirements in an admirable manner.

### A Straightforward System

I do not wish to suggest that the ordinary band-pass arrangement will not give satisfactory results. It is possible to obtain good results, by somewhat careful design, with more orthodox methods, but my experience showed that to obtain the results desired precautions had to be taken which were, to my mind, impracticable to the home constructor. There are so many factors which can cause variation that a circuit which seems under some conditions to be very promising turns out to be quite the reverse when tested under different circumstances. The ohmic-coupled principle, on the other hand, is a simple and straightforward arrangement, which can easily be made up without special precaution, and which works every time.

### An Important Advantage

The presence of the resistance undoubtedly introduces some extra loss into the circuit, but, as I pointed out in the previous articles, the greater part of this can be made up with reaction, without any critical adjustment and the system has the following important advantage. If reaction is applied to the ordinary band-pass filter, one or other of the resonant peaks is



Effect of injudicious reaction on band-pass filter

increased in sharpness and in strength, giving a lop-sided arrangement as shown in the diagram. This difficulty can be overcome by certain precautions, but in this case both peaks are sharp, and the station tunes in two places.

Now, however nice an arrangement may appear on paper, the ultimate test is the handling in practice, and I found in my preliminary experiments that this double-tune was somewhat disturbing. The use of resistance coupling in the ohmic-coupled system obviates the double-tune altogether, so that one obtains the extra selectivity, due to the two tuned circuits, without the double hump. The station merely appears to have a broad tune extending over a degree or two, and it is fairly easy to adjust the receiver to the optimum point, by the usual methods of rotating the dial until the loudest signals are heard. Thus the arrangement is handled in exactly the same manner as an ordinary circuit, and this, to my mind, is one of its principal advantages.

### Using Plug-in Coils

Several readers have asked whether the system can be used with ordinary standard plug-in coils. Experiments are proceeding on this point at the present time. As far as the circuit itself is concerned there is no difficulty, but there may be some trouble with the ganging of the two tunes. If the tests that are being conducted on standard plug-in coils show that a reasonable good gang control can still be obtained, there is no reason why they should not be used, as plug-in coils give every satisfaction. Should the experiments not prove successful, however, the circuit can still be used with individual tuning.

*A Weekly Programme Criticism*—By SYDNEY A. MOSELEY.

# Without Fear or Favour


***FILM CRITICISM***

***"PROM." PROGRAMMES***

***TALK TITLES***

IT really seems as if some trouble were blowing up about the film criticism, and the movement for an official inquiry is growing.

It is in such circumstances as these that we cannot help asking whether a monopoly is good, after all. Many of my friends at Savoy Hill sneer at mere journalists; but would any reputable newspaper have made such a hash of this big problem as the Talks Department appears to have made?

◆ ◆ ◆

With the impending end of the Promenade Concerts, the question will be asked whether in future the listener should be given such a surfeit of transmissions, which, after all, only appeal to real music lovers.

A medium course, I think, would be better and broadcast only the most popular of the concerts. The last two I heard could hardly be said to be fair meat for *all* kinds of stomachs.

◆ ◆ ◆

Notice the attempt to simplify the titles of talks, as I have again and again recommended on this page. The talk on English, for instance, instead of being headed "Etymology, Syntax, Supertax, and Tintax," is merely referred to as "English Speech. Letters and Sounds are Quite Different."

They are, brother; as any foreign friend will tell you.

◆ ◆ ◆

What some of you ordinary working people miss: 10.45 to 11 a.m., "The Trials of a Family," (4) Danger Signals, by Mrs. St. Aubyn. The trials are not so bad. It is the sentences beginning "Unless you——" that I did not like. But Mrs. St. Aubyn forgot to mention this.

◆ ◆ ◆

I do not often refer to the earlier programmes because I take it most of my readers never hear them. But they are certainly worth listening to, if you can manage to fall ill or attend Granny's funeral. But you must be prepared to listen to readings—from Dickens, for instance, or from Grimm (in German!)—or Market Prices.

◆ ◆ ◆

What *is* a "Great" composer? This question occurred to me in listening to the new series on "The Music of Some Great Composers." Hadn't "Programmes" better be careful of its superlatives?

◆ ◆ ◆

*R.U.R.*, announced as "the play of the week," undoubtedly deserved that description. The acting was realistic, the production polished, and the incidental music effective. Capek's play made an ideal theme and Cecil Lewis made the most of it.

The players merited high praise, especially Robert Loraine. The only fault, to my mind, was the fact that, at the very end, when only one human was supposed to be left, it was rather difficult to identify him. Many people thought it was "Domain," whereas it was "Alquist." This, of course, was confusing; but the fault pales into insignificance before the general excellence of the play.

◆ ◆ ◆

A correspondent in Wallington writes somewhat feelingly on the matter of laughter in the studio. After asking, "Can't you do something to stop those giggling idiots in the studio?" he writes: "One of the best turns in the vaudeville concert on Tuesday would have been Gillie Potter, but every time, just as he was coming to the point of a joke, the giggling in the studio drowned his voice and the joke was lost to listeners. If they are his friends, they're very bad friends, because they ruin his act; and, in any case, they ought not to be allowed in. A week or two ago there was a double act—two people supposed to be speaking to each other on the telephone. When we were allowed to hear what they were saying it was really amusing, but more often than not, just as we were waiting for the second man's reply, the people in the studio giggled at what the first one had said and we couldn't hear the reply at all. I use the word 'giggle' because it is always such a silly laugh."

**Mr. Whitaker-Wilson, the "Wireless Magazine" gramophone critic, in cartoon**

***THE GIGGLERS***

***DANCE BAND COMPARISONS***

◆ ◆ ◆

"Harold," the dance-band expert, has reviewed again the activities of the various bands broadcasting and has sent me an interesting survey of the present position.

"It is some time since I made a list of broadcast dance bands in order of merit," he writes, "and as the position has changed a lot, and some new bands have appeared on the scene, it is time I made a new list. In general, the past few months have seen a marked improvement in the styles of most of the bands, and, with the exception of Ambrose's Orchestra, which is still far and away the best, it is much more difficult to place the bands. Jack Payne has "hotted up" his band considerably, but they are still very stagey, and from the dancers' point of view are about as useful as a symphony orchestra. However, in my list I have judged both from the dancers' viewpoint and that of the listener who wants to be entertained; so the B.B.C. Dance Band will have a fairly good place. Here is my list:—

1. Ambrose's Orchestra.
2. Billy Cotton's Band.
3. Jack Payne's Orchestra.
4. Jack Harris's Grosvenor House Band.
5. Gross-Bart's Ambassador Club Band.
6. Billy Mason's Capheans.
7. Piccadilly Players.
8. Sir Robert Peel's Band.
9. Gleneagles Band.

"There is every possibility that this list will be disputed by many. Well, I should love an argument with Jack Payne fans and Robert Peel enthusiasts."

# THE FORTY-

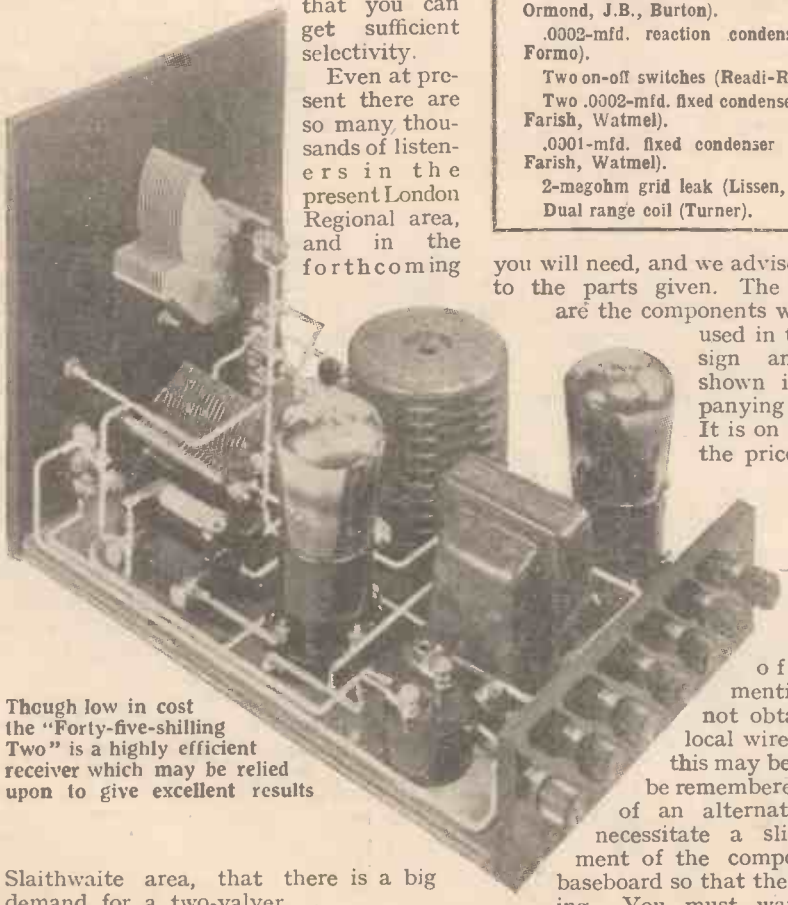
## CHEA

NOT everybody wants to pay a great deal for local broadcast reception, nor is there any need to nowadays, for, whereas formerly a two-valve set could get only one station well—the local—and perhaps another main station at fair speaker strength after tricky adjustment of the knobs, now the Regional Scheme makes it possible to receive two stations at equal strength, and often more.

### A Popular Combination

Of course, many readers of AMATEUR WIRELESS in the remoter parts of the country, in Devon and Cornwall, and in Wales, for example, will rise up and ask how they, with only two valves and no screen-grid stage, can get these alternatives. True, at present they cannot, but the Regional Scheme is spreading and there seems no doubt that within a couple of years the high-power regional station link will be complete, and then the two-valver will entirely come into its own; provided that you can get sufficient selectivity.

Even at present there are so many thousands of listeners in the present London Regional area, and in the forthcoming Slaithwaite area, that there is a big demand for a two-valver.



**Though low in cost the "Forty-five-shilling Two" is a highly efficient receiver which may be relied upon to give excellent results**

At the outset, a word about cheapness. No component has been chosen which, although cheap, does not give good performance. Although no very expensive parts have been incorporated in the design, there is not a single component upon which any critic could pick and say that part does not do its work properly and a more expensive part should be substituted. So you need not have any qualms on the score of performance when you make up this two-valver.

The accompanying panels show the parts you will need, and we advise you to adhere to the parts given. The first mentioned are the components which have been used in the original design and which are shown in the accompanying photographs. It is on these parts that the price estimation of the set has been obtained.

**COMPONENTS REQUIRED**

Panel, 9 in. by 6 in. (Becol, Trelleborg, Raymond).
.0005-mfd. variable condenser (Formo, Lissen, Readi-Rad, Ormond, J.B., Burton).
.0002-mfd. reaction condenser (Burton, Readi-Rad, Dubilier, Formo).
Two on-off switches (Readi-Rad, Bulgin, Lissen, Junit, Benjamin).
Two .0002-mfd. fixed condensers (Lissen, T.C.C., Dubilier, Graham-Farish, Watmel).
.0001-mfd. fixed condenser (Lissen, T.C.C., Dubilier, Graham-Farish, Watmel).
2-megohm grid leak (Lissen, Dubilier, Watmel, Graham-Farish).
Dual range coil (Turner).

Alternatives are given so that if you already have one of these on hand, or if one of the first-mentioned parts is not obtainable at your local wireless stores, then this may be used. It should be remembered that the use of an alternative part may necessitate a slight rearrangement of the components on the baseboard so that there is no crowding. You must watch this point when you come to the constructional work.

### The Circuit

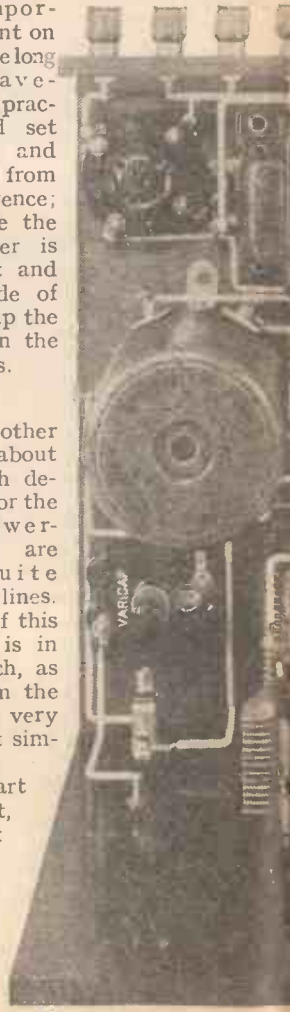
Now just a glance at the circuit diagram, for those who like to take an interest in the technical side of their radio work. You will see that the reason for the sharp tuning is the incorporation of a special coil having an intermediate tapping (taken to terminal No. 4, as you can see on the blueprint) and the use of a little .0003 pre-set condenser in the aerial lead.

Of course, this efficient set tunes both on the medium and long wavelengths, and wave-changing is effected by short-circuiting the long-wave section of the aerial coil for medium-wave working. You will see that the intermediate tapping point is practically cut out of circuit on the long wavelengths, but this is of no account because at the moment selectivity is not so important on the long wavelengths, where practically any good set can get 5XX and Radio Paris free from mutual interference; and in any case the pre-set condenser is always in circuit and use can be made of this to sharpen up the tuning a little on the long wavelengths.

### The Layout

There are no other special points about the circuit which deserve mention, for the detector and power-valve circuits are arranged on quite straightforward lines. The real merit of this side of the set is in the layout, which, as you can see from the photographs, is very compact and yet simple to arrange.

When you start making up a set, do not overlook the fact that a full-size blueprint is available and if you are a novice at radio home construction



**This plan view should be diagram and**

# FIVE SHILLING TWO

## P TO BUILD :: EFFICIENT IN USE

you are well advised to get this, because it not only shows all the wiring, but it shows each component full size and in its exact position and the print can, therefore, be used as a drilling and mounting template. The price of the print for this set is one shilling, and it can be obtained, post free, from AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4.

You should drill the panel as the first job, and here you can make use of the blueprint for showing the drilling centres. Holes will be needed for the terminals, the two switches, and the two variable condensers. These are one-hole mounting parts and no difficulty should be experienced in the drilling.

Firmly attach the panel to the baseboard by means of wood screws, and then mount the parts upon it.

### Position of Parts

The blueprint can also be used for showing the positions of the parts on the baseboard and the screw holes can be pricked through. Make sure that you get the low-frequency transformer and the tuning coil the right way round, because if these components are not placed with the terminals in the positions shown, the wiring will not be quite so straightforward as it appears in the photograph and layout diagram.

If you follow the blueprint exactly you will experience no difficulty in wiring up the coil, but for those who are not working from the blueprint the following terminal connections will prove useful. Terminals Nos. 5 and 6 are connected to the reaction winding, while terminals Nos. 1 and 2 are the extreme end of the aerial coil. The aerial is taken through the pre-set condenser to terminal No. 4, while the wave-change switch is connected between the extreme end terminal No. 2 and the join point of the long and medium wave sections, terminal No. 3.

You will see that the grid condenser has a value of .0002 microfarad, and the grid leak has the normal value of 2 megohms. These are values which have been found best with most detector valves and the usual battery voltages.

Two high-tension tappings are provided, the terminals H.T.+1 supplying the detector valve and the terminal H.T.+2 supplying the power valve.

### Wiring

You can wire up with insulated wire or with bare wire placed in loose lengths of insulated sleeving. With this latter method it is not necessary to make square corners in the wiring.

In the interests of "safety first," soldering is advised, because there is no possibility of a well-soldered joint pulling off and leads accidentally making contact, but if you make a good job of the point-to-point system with screw-down connections, you will not go far wrong.

### *COMPONENTS (continued)*

Two anti-microphonic valve holders (Lotus, Lissen, Benjamin, Igranic, W.B.).

Low-frequency transformer (Telsen Ace, Igranic, British General, Lissen, Varley, Brownie, R.I.).

High-frequency choke (Readi-Rad, Lewcos, Lissen, Polar, Watmel, Tunewell, Burton, Telsen).

.0003 max. capacity pre-set condenser (R.I., Sovereign, Formo).

Vernier dial (Ormond, Browne, Formo).

Nine terminals, marked: Aerial, Earth, L.S.+, L.S.—, H.T.+1, H.T.+2, G.B.—, L.T.+, L.T.— (Belling-Lee, Eelex, Igranic, Clix).

Baseboard and cabinet (Pickett).

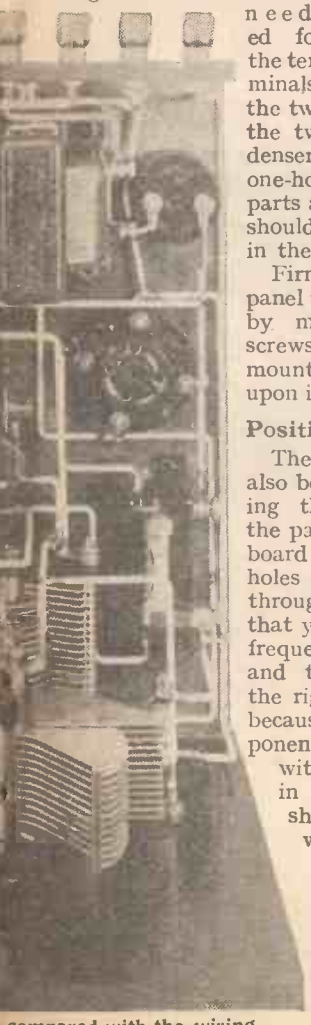
In getting the best results out of a set of this description a lot depends upon correct choice of batteries and valves and an efficient aerial and earth. So far as valves are concerned, the detector valve should have an impedance of about 20,000 ohms, and the following 2-volt valves will serve as a guide: Cossor 210HF, Dario Univ., Marconi HL210, Osram HL210, Six-Sixty 210HF, Mullard PM1HF, Mazda HL210, Lissen HL210, Fotos BA9, P.R., PR3LF, Triotron HD2.

So far as the power valve is concerned, the following 2-volt valves are suitable, and 4- or 6-volt valves can be used if desired: Cossor P2, Dario SP, Marconi P2, Osram P2, Six-Sixty 220P, Mullard PM252, Mazda P220, Lissen P220, Fotos BD9, Tungsram 215, P.R. PR120.

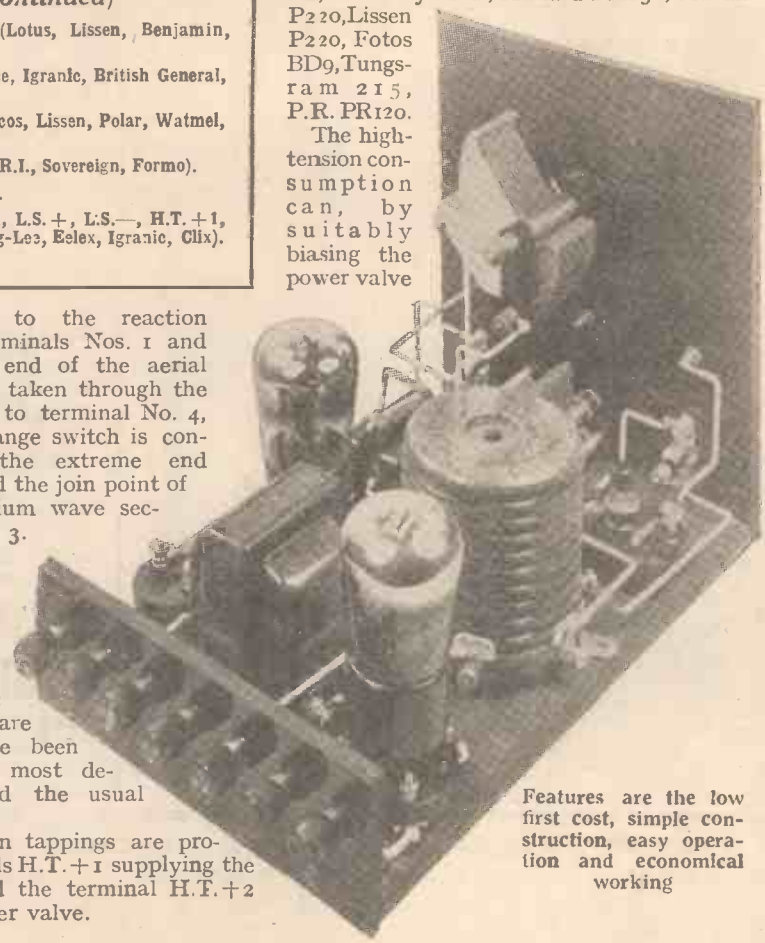
The high-tension consumption can, by suitably biasing the power valve (you will need practically the whole of a 9-volt grid-bias battery in circuit) be cut down to about 9 milliamperes, a consumption that can be well withstood by a medium-capacity high-tension battery.

Naturally, you will get better results by using 120 volts on the H.T.+2 tapping, but quite good strength is to be obtained with only a 100-volt battery. Provided you use suitable grid bias the current consumption should be about the same in both cases.

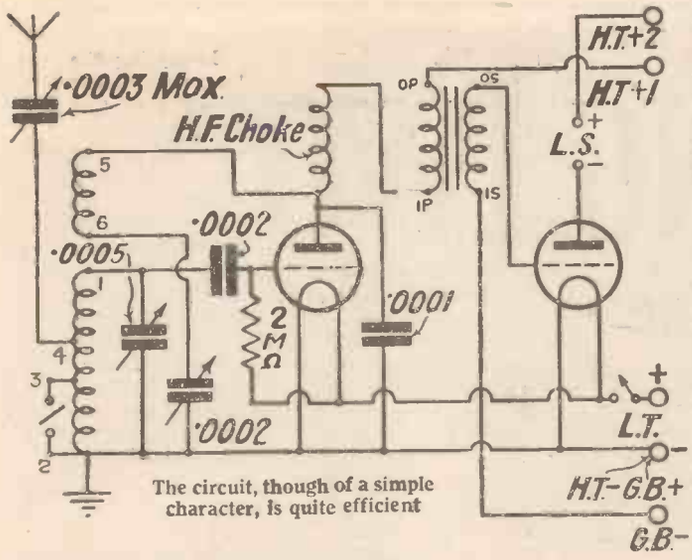
The H.T.+1 detector tapping will need about 60 to 80 volts, and there is room for



compared with the wiring circuit overleaf



Features are the low first cost, simple construction, easy operation and economical working




The circuit, though of a simple character, is quite efficient

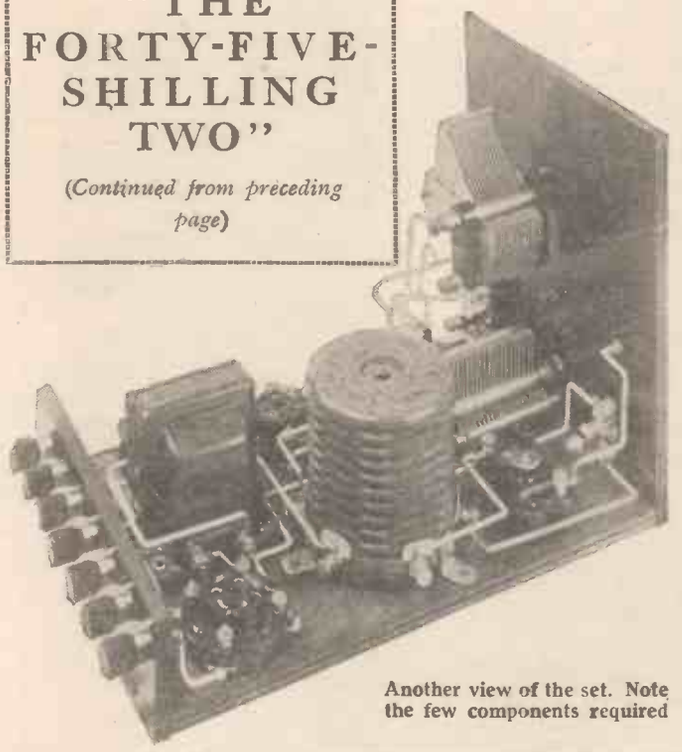
a little safe experimenting here. In the interests of high-tension economy, you should work with as low a detector voltage as possible, compatible with good strength.

When you first try out the set, screw the pre-set condenser right in, bringing its value up to the full .0003 microfarad, and pull out both the on-off and wave-change switches, so switching the set on to the long waves.

Later, you can readjust high-tension and grid-bias voltages to get the best results on the speaker, and then the pre-set condenser may be slackened off a little to sharpen up tuning.

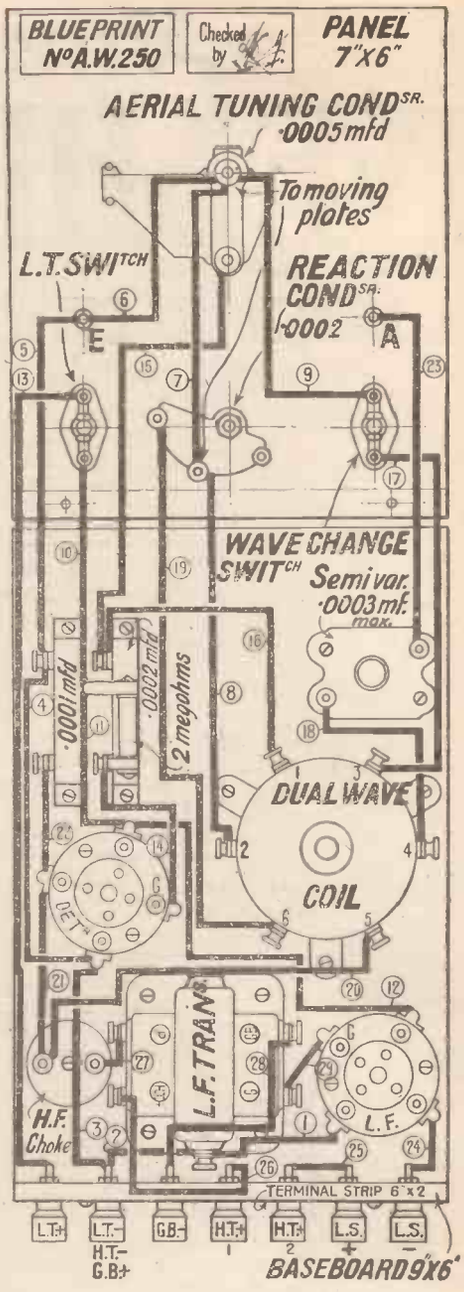
## "THE FORTY-FIVE-SHILLING TWO"

(*Continued from preceding page*)



Another view of the set. Note the few components required

**NEXT WEEK: WE GIVE AWAY TWO FULL-SIZE BLUEPRINTS OF THE "CHALLENGE FOUR"**




The wiring diagram, of which a full-size blueprint is available, price 1/-

### SPEAKING TO AMERICA

At present the only means of speaking direct to America is via the ether. If experiments now being carried out on the West Coast of Ireland prove successful, a second channel for direct speech will shortly be available in the form of a submarine telephone cable. Although transatlantic telegraphy has been carried out for the past 50 years, it has never previously been possible to transmit the spoken word to the U.S.A. by cable. Recent improvements in "loading," and the application of special "shaping circuits" to eliminate distortion, now promise to remove all difficulties. The advantages offered are absolute secrecy, together with freedom from "fading," which still remains the bugbear of long-distance radio transmission.

M. B.

### HALF-METRE WAVES

TELEPHONY transmission on 50 cm. waves has recently been carried out over a distance of roughly ten miles. Owing to the fact that such waves travel, like light, in a perfectly straight line, both the transmitter and receiver were located on the opposite sides of a valley so as to be in "sight" of each other. The aerial system was a network of wires suspended in parabolic formation, with a centre line of "director" wires extending out from the parabola in the direction of the distant station. The director wires have the effect of concentrating the wave energy into a sharp beam at the transmitting station. They also increase the "pick-up" in reception.

B. A. R.

### "A.W." SOLVES YOUR PROBLEMS

### THE BARKHAUSEN EFFECT

IN the process of magnetisation the various "molecular magnets" of which the iron is composed are oriented so that they all lie in the same direction. Before magnetisation, they are arranged higgledy-piggledy fashion and have no resultant field. After magnetisation, they are set pole to pole so that their fields add together. Barkhausen discovered that the orientation of the molecular magnets takes place, not smoothly, but in a series of sudden jumps, just as if the original piece of iron was divided up into small unitary regions which fall into line one after the other. The successive movements can actually be heard by means of a valve amplifier and a pair of phones, and have been compared to a load of coal rattling down a chute.

M. A. L.

# G.P.C.

# LISSEN scores with it!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The energy flowing from each cell is smooth and without the slightest sign of ripple or hum. Choose a Lissen Battery and your loud-speaker will find the battery eager to show the power it contains and for how long that power will last.

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| 36 volt | 4/6 |
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# IN MY WIRELESS DEN

## WEEKLY TIPS— CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

### Trying Out Valves

I HAVE just been trying out a number of valves as commonly used for detection, noting, in particular, the anode current.

To my surprise I found that all of the valves of the make tested passed 5 milliamperes with an anode circuit voltage of 120. The valves were not of the so-called "steep slope" class at all, but just plain 20,000-ohm valves of the moderate impedance class.

Five milliamperes is, of course, a fairly heavy current for a detector stage, for two reasons.

First, when a transformer is fitted the amount of the current may be such that the core is practically saturated. Its inductance may, therefore, be but a fraction of the inductive value of the transformer when the current is small. Distortion may, therefore, be introduced by the transformer and the reception spoiled.

The second reason is, of course, the heavy drain upon the anode battery, although this may not matter with a large size.

### If the Valves Warm Up

If your power valve appears to be running warm and the quality of the reproduction is poor, it is quite possible that the last stage is oscillating at, perhaps, a high frequency.

With modern valves of the "steep slope" variety it is surprisingly easy for oscillations to occur. If a meter is included in the anode circuit supply you will see at once that something is wrong, as the current will be excessive.

Sometimes the self-oscillations occur at a frequency corresponding to the natural frequency of the low-frequency circuit. Of course, the circuit ought not to have one, but with certain loud-speakers and transformers audio-frequency oscillations do occur.

High-frequency currents may be stopped by connecting a grid leak in the grid lead to the valve, or a small iron-cored choke may be used.

For stopping a low-frequency oscillation a grid leak may be connected across the secondary of the transformer which is joined to the power valve.

### In Search of a Crystal!

A few days ago I wanted a crystal detector for use in some experiments being carried out.

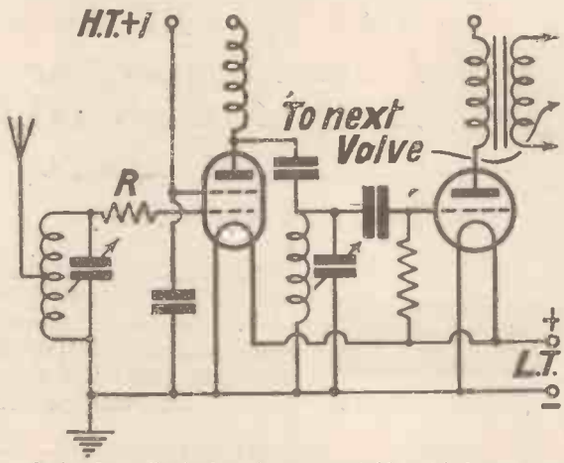
What a job I had to obtain a satisfactory one! There cannot be many people using crystal sets in these days.

A crystal detector and a milliammeter, by the way, may be used with satisfactory results in signal strength measurements.

When joining the detector to an aerial coil you must remember that the loading effect of the detector circuit will be serious unless it is joined to but a part of the coil. It may not be convenient to tap the aerial coil, but a few turns of wire can be wrapped round the earthed end of it. A good crystal detector will remain sufficiently constant for many purposes and, being cheap, is worth having for testing.

### Unstable H.F.'s

A trick worth remembering when dealing with an unstable high-frequency stage is that a small resistance connected in the grid lead will usually improve matters. As a rule, a set tends to become more unstable at the lower wavelengths.




**A simple method of curing an unstable set is by means of the grid resistance shown in this circuit. The resistance R should have a value of about 600 ohms, as a rule, and should be non-inductive**

The resistance is of special value in this instance, as its stabilising effect is more marked at the higher frequencies. Sometimes a few hundred ohms is all that is needed to cure a difficult set, and the resistance should be as nearly non-inductive as possible.

It functions with the capacity of the grid of the valve to which it is connected. If it had a high value, such as 50,000 ohms, but little high frequency would reach the valve.

This is well known of course, as we often connect a resistance in the grid of a low-frequency stage to stop the passage of H.F.

### A Wiring Hint

I don't know why people use thick wire for connecting the parts of a high-frequency circuit. The results are not so good as when a thin wire, such as No. 26, is used.

The thin wire has a smaller surface and, therefore, its coupling with other parts is less than when thick wire is employed.

From the point of view of resistance losses, the thin wire is no worse than the thick. The only point is that the thin wire is more easily broken at connecting points, especially at terminals. Thin wire should, therefore, be used with care, but I strongly recommend it.

### Screen-grid Voltage

A set having a stage of screen-grid high frequency may often be stabilised by adjusting the screen voltage.

By reducing the impedance of the valve, the load upon the coupling circuit is increased and it does not, therefore, oscillate so readily. Try this next time the set seems too lively.

### Pick-ups and Record Wear

While it must be admitted that some pick-ups, even when used under the best conditions, wear records very badly, yet there is a good proportion which can be said hardly to wear records at all.

A good pick-up badly used, that is, for example, not in the correct alignment, will also wear records. But with a little care in setting the carrying arm and in avoiding undue friction, an average pick-up may be relied upon to play favourite records time after time without damaging them.

Some of the early types of pick-ups used to spoil a record with one playing, but average ones may now be used to play records dozens of times with little wear. It is worth while paying a little attention to the carrying arm now and again, as parts may fall out of adjustment and so prevent the pick-up from working properly.

### Coils and Strays

Coils of the astatic type have, as a rule, quite a small stray magnetic field, with the result that for many practical purposes complete *magnetic* shielding is not necessary.

It must be remembered, however, that the coils usually have a stray magnetic field of such an amount that care is needed in placing them. Further, capacitative couplings must be avoided.

The capacitative coupling depends upon the size of the coils, how far they are spaced, and how they are connected.

# WE TEST FOR YOU

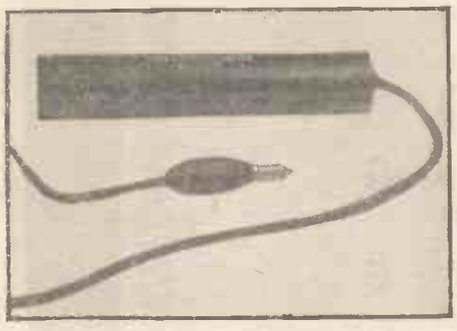
*A weekly review of new components and tests of apparatus.*

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

### A Handy Sifam Testing Gadget

A VOLTMETER is an admirable medium for testing the continuity of a circuit. If the circuit is through, the voltmeter will read the full voltage (or, perhaps, slightly less if the circuit contains appreciable resistance), while if there is a break no reading will be obtained. A disadvantage of this system lies in the necessary provision of a suitable battery and the difficulty of satisfactorily connecting a pocket meter to it.

The Sifam Electric Co., Ltd., makers of



**A useful testing gadget made by Sifam**

Sifam meters, have placed on the market a most useful adaptor for circuit testing with a pocket voltmeter. It consists of a small insulated cartridge, in which a single 1 ½-volt cell is contained. Attached to one end of the cell is an insulated lead, terminating in a metal prod. At the other end of the cartridge is a metal socket with a spring loaded ball, which serves to grip the prod of a pocket voltmeter. In this manner one can interpose a battery in the voltmeter circuit, with the least inconvenience.

The price of this component is 2s. 6d., and it can be recommended as an aid to a practical method of circuit testing.

### N. & K. Inductor Dynamic Speaker

THE mechanical system of a perfect loud-speaker must include a vibrating element whose motion is unrestricted within limits and whose natural vibration period lies outside the audible scale. It is on account of these essential properties that the moving-coil loud-speaker is so widely used, although its comparative insensitivity, necessitating a high-voltage power amplifier, and high cost militate against its universal use.

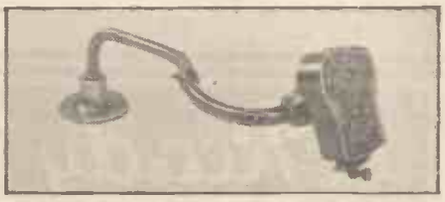
It is, therefore, with considerable interest that we tested the N. & K. inductor dynamic speaker chassis imported into this country by A. Brodersen, of 228 Goswell Road, London, E.C.1. It is claimed that with this speaker the defects of the normal cone have been largely overcome by the employment of a special parallel-motion armature. There are two pairs of poles, between each of which a portion of the armature is suspended in such a manner that it is free to swing to and fro. The windings are placed on two only of the four pole pieces, and the directions are so arranged that on passing a current the field on one set of pole pieces is strengthened and weakened on the other. In consequence, the armature is constrained to move in one direction. On reversing this current it will move in the opposite direction.

Although the natural vibration period of the armature is below 100 cycles per second quite a large movement is possible. The system compares favourably in sensitivity with the standard cone loud-speaker. The advantages are such that the reproduction is more constant throughout the audible register, and the low frequencies are better reproduced. There is no doubt that the quality of reproduction approaches in many ways the standard set by moving-coil loud-speakers.

The complete chassis may be obtained for £3 12s. 6d., and should naturally be mounted behind a large-size baffle for best results. The instrument can also be supplied mounted in a wooden cabinet for the price of £6. It may be recommended to those readers who, for practical reasons, are unable to employ a moving-coil loud-speaker.

### New Wates Star Pick-up

IT is becoming customary for pick-ups to be supplied with a suitably designed tone-arm, as it is realised that the correct tracking of a pick-up and, to some extent, the weight applied to the needle, is governed by the tone-arm. In cases where the former

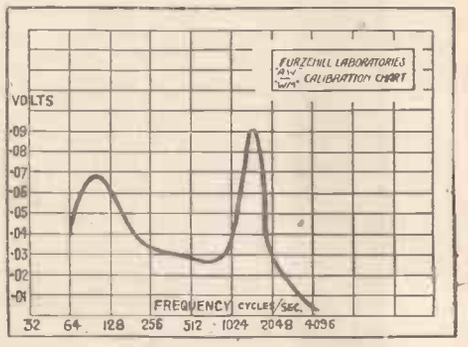


**The new Wates Star pick-up and arm.**

is a little over weight, the latter may be made exceptionally light.

We recently tested a Wates Star pick-up and tone-arm. The tone-arm is of light tubular construction, so shaped that the errors due to tracking are reduced to an almost negligible extent. To facilitate needle changing, the arm swivels at a suitable position. The pick-up is also supplied with an attachment for fitting on to any standard tone-arm. The design is conventional, except that the reed mechanism is stabilised by allowing it to rock on a semi-circular support, with a rubber bearing. The damping is moderately light.

A characteristic curve of this pick-up was taken in our laboratory and is shown here. It will be noticed that the sensitivity is rather lower than usual, but the days have now long passed when sensitivity was regarded as a criterion of performance. Up




**The characteristic curve of the Wates pick-up**

to a frequency of approximately 1,000 cycles per second, the characteristic is almost ideal, for there is a rise at the bass frequencies to compensate for the limitations in all gramophone records.

Armature resonance occurs, however, at approximately 1,500 cycles per second, and is strongly marked. While this gives a certain brilliance to the reproduction, we should like to see the resonance moved up to a higher frequency, perhaps between 3,000 or 4,000 cycles per second. It would then compensate for the falling characteristic of the average amplifier and speaker

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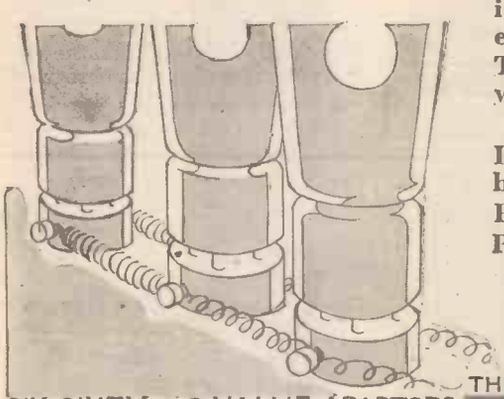
When a Danish manufacturer of Deisel motors was recently given an urgent order for a drawing of a Deisel motor part needed for a repair in America he sent the drawing to London, where it was transmitted via photo-radio to New York.

The Federal Radio Commission is compelled to refuse many requests for permission to operate television stations in America owing to the scarcity of wavelengths. Unless the applicant can convince the Commission that the work is to be legitimate research, there is little chance of getting a licence. There are at present twenty-two visual broadcasting stations, operated by eighteen companies.

# Convert your set to A.C. Mains

## *The Six-Sixty A.C. All-Mains Conversion Equipment is suitable for practically any battery operated receiver.*

*No internal wiring alterations, Equipment includes specially selected Six-Sixty A.C. Valves—and Six-Sixty 5/4 pin valve holder adaptors . . . . . .*



SIX-SIXTY A.C. VALVE ADAPTORS

SIX-SIXTY

**Specially designed to co-operate with selected Six-Sixty A.C. valves, this complete mains conversion equipment forms the ideal practical all-electric unit. No wiring alterations, no wasted components—once fitted, fitted for all time.**

**A valve-maker makes it, knowing the special features of the valves it works with. Valves that have made a name for themselves by their tonal purity, by their intense sensitivity to distant signals—valves with the name Six-Sixty. Rigid in construction, shock-insulated filament, full pressure emission.**

**They get more; they make more of what they get—that is why you should**

**Say SIX-SIXTY**

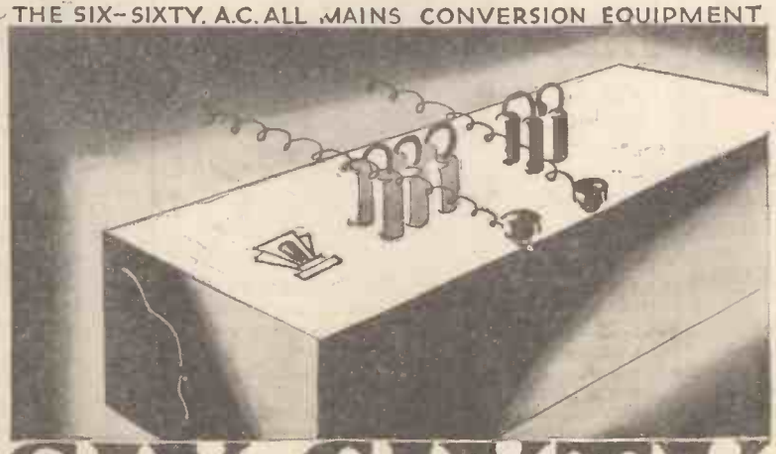
**Isn't that what you've been waiting for? Of course it is—but why wait any longer?**

**Power Unit (H.T., L.T. and G.B.) only - £6 6 0**

**PRICE, Complete A.C. Mains Conversion Equipment, from - - - - - £8 5 0**

*Write for latest Six-Sixty Literature giving particulars of the complete range of Six-Sixty Valves, Mains Conversion Equipment, Valve Adaptors, Valve and Set Tester, Cone Speaker Unit and Cone Speaker Assembly, Cone Speaker Paper, Turntable, Grid-Leaks, and Gramophone Pick-up Attachments.*

THE SIX-SIXTY A.C. ALL MAINS CONVERSION EQUIPMENT



SAY SIX SIXTY

(B.V.A. Radio Valves and Equipment.)

*Six-Sixty Radio Co., Ltd., Six-Sixty House, 17/18, Rathbone Place, Oxford Street, W.1. Telephone: Museum 6116/7.*

# A WORD ABOUT THE "A.W." "CHALLENGE"

THREE-VALVE sets of the type having a screen-grid stage of high frequency have been popular for the last two or three years.

There is now a general feeling, however, that no matter how serviceable a good three-valve set may have proved in the past, the time has arrived when it is no longer most suited to present broadcast conditions.

We need more selectivity. Greater magnification would provide that factor of safety so essential to uniform results.

Simplified tuning, too, would mean that finer results would be obtained by average people.

With a four-valve set having two screen-grid stages, there is, of course, more magnification than from a three-valve set and also better selectivity. The stations normally just brought in with an effort on a three are heard with ease when the extra stage is used.

In fact, the results are finer all round.

The four-valve set is worth the little extra cost to build and to maintain. Quality, too, is better, as a rule, for reaction, that spoiler of quality, has not to be used to the same extent as with a three-valve set.

As to simplified tuning, it is easier and more practical to deal with two screen-grid stages than with a single stage. The same highly efficient coils are not required and we are able to gang with confidence. The foregoing are the main reasons for introducing the AMATEUR WIRELESS "Challenge Four," which is the subject of **the two free blueprints to be given away next week, one for a battery-operated set and one an A.C. mains model.**

And now a word about the actual set. There is a single tuning knob, which tunes all circuits. On the left of this there is a volume control, and on the right the reaction control. Below is the filament switch for the battery model, these being the only controls on the panel.

At the end of the set is space for batteries or a mains unit. In the A.C. model the mains equipment is included. **Free blueprints of both models will be given** away—one being the battery model and the other the A.C. model. But you can, if you desire, fit a mains unit and continue to use battery valves. The circuit is so simple, and the parts so few, that anyone will be able to build either type.

Special coils are used. They were made specially for gang tuning. The ganging is easily set up; no trouble and no snags. Everything that can be done to produce a reliable set, easily constructed and bound to give fine results, has been gone into. We are confident that the set will more than hold its own over both wavebands on the points of quality, selectivity, and number of stations receivable. Tuning is so straightforward that anyone will be able to operate the set and to bring in the foreign stations with the ease of the local one.

*SEE THE ANNOUNCEMENT ON PAGE 510*

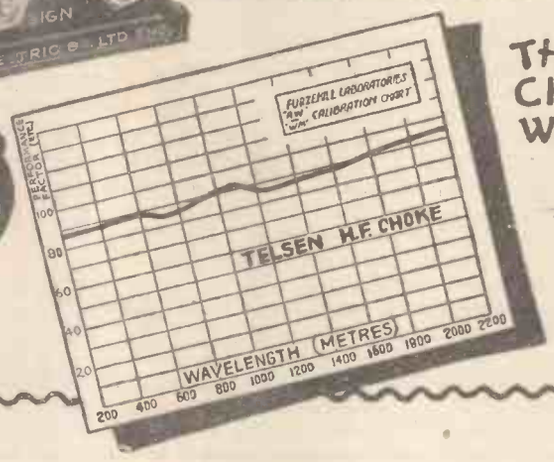
## LOUD-SPEAKER HUM

LOW-FREQUENCY hum may be due to a variety of causes, but there is one that is sometimes overlooked, though it is the simplest of all to remedy. Strangely enough, it will often appear for the first time in a set that has recently been fitted with a mains-eliminator, probably because the valves then work more efficiently than when the plate voltage is drawn from a dry-cell battery. The particular hum in question is due to microphonic reaction between the loud-speaker and the valves. It can be cured simply by moving the loud-speaker sufficiently far away from the set to prevent the vibration of the diaphragm from affecting the valves through the intervening air.

B. A. R.

# JUST LOOK AT THIS REMARKABLE NEW H.F. CHOKE!


2/6




## THE TELSEN H.F. CHOKE WITH THE WONDERFUL CURVE

The remarkable performance of this new Telsen H.F. Choke will be appreciated from the accompanying graph, showing the curve of this component, which is the result of a standard choke test carried out by J. H. Reyner, B.Sc., A.M.I.E.E., at the Furzehill Laboratories.
It is designed to cover the whole wave-band range from 18 to 4,000 metres, has exceptional low self-capacity and is shrouded in genuine Bakelite. Inductance, 150,000 microhenries, resistance 400 ohms. Price, each - - - - - 2/6

Telsen "Ace" Transformer, the ideal model for all Portable Sets, and where space is limited, gives perfect reproduction throughout the musical range. Shrouded in genuine Bakelite, with new windings and core, fitted with earth terminal. Made in ratios 3—1 and 5—1 - - Price, each - - - - - - - 8/6

Telsen "Radiogrand" Transformer, new model, shrouded in genuine Bakelite, with new windings and core, fitted with earth terminal. Made in ratios 3—1 and 5—1. Price, each - - - - 12/6

Telsen 7—1 Super Ratio "Radiogrand" Transformer, giving enormous amplification with perfect reproduction, shrouded in genuine Bakelite with new windings and core, fitted with earth terminal. Price, each - - - - 17/6


Telsen Valve Holders. Prov. Patent No. 20286/30. An entirely new design in Valve Holders, embodying patent metal spring contacts, which are designed to provide the most efficient contact with the valve legs whilst allowing the valve to be inserted or withdrawn with an easy movement, instead of being subjected to undue strain which often causes damage and loss of efficiency to the valves. Low capacity, self-locating, supplied with patent soldering tags and hexagon terminal nuts - - - Price, each - - - - - - - - 1/-

*Advt. of Telsen Electric Co., Ltd., Birmingham.*

# TELSEN COMPONENTS


### Signal Strength of Dublin

SIR,—I wonder if any of your readers could tell me at what signal strength Dublin (2RN) is received in England Scotland, and Wales (different counties). I am rather anxious to obtain this information.

FRANCIS P. YORKE.

2 Botanic Villas,
Off Botanic Road,
Glasnevin,
Dublin, N.W.3.

### A Request

SIR,—I have a "Britain's Favourite Two (1929) Up-to-date" set, and should be pleased if you know of someone who has been able to make out a list of stations with dial readings on the short and long waves, as I can only manage to get one or two, and I cannot trace which they are.

Can any reader oblige?

H ANDREWS (Birmingham).

### "Thermion's" Problem

SIR,—With reference to "Thermion's" problem in AMATEUR WIRELESS dated September 27, I should imagine that the breakdown occurred in the following way :—

1. The maid knocked the loud-speaker off the table while engaged in dusting or opening the window, etc.

2. The loud-speaker lead was drawn taut against the aerial terminal with sufficient force to penetrate the cotton covering. The resultant flash and arc ignited the cotton, thereby burning the insulation of the spade terminal and blackening the brass.

3. The maid picked up the loud-speaker and replaced it on the table, causing the burning lead to move further along the aerial wire, which became inflamed from the other.

4. She blew out the flames, but, finding the two wires still flashing and smoking, summoned her master.

I put above forward as the explanation for the following reasons :—

(*a*) The condition of the battery showed that the flashing had not been going on for long (all night, for instance).

(*b*) The maid being in the vicinity at the time seems to show that she had something to do with the affair.

(*c*) The heat to which the aerial wire had been subjected was the result of the burning of the covering and not the passage of heavy current. I have taken a piece of similar material and set fire to it; after the covering had burnt off its appearance was as described.

(*d*) There is no possibility of the L.T. battery being the cause, as any current from that would have to pass through the H.T. battery to get to the loud-speaker leads, and even if the two batteries were connected the same way round the internal resistance of the H.T. battery (anything from 15 to 45 ohms) would act as a stopper.

(*e*) I know maids.

J. F. H. (Sheffield).

### Freak Valves

SIR,—With reference to "Thermion's" note on "freak" valves in this week's AMATEUR WIRELESS, I myself happened to come across a most extraordinary valve.

A friend of mine asked me to get him a cheap 4-volt power valve. I happened

(*Continued on page* 524)

# "READERS' IDEAS AND QUESTIONS" (Continued from page 522)

to see in a shop a valve marked "Silver Star, 4-volt, fil. consumption 0.1 amp.," so I bought one.

I tested it in my set—a det. and two L.F., coupled by R.C.C. unit (Mullard) and transformer, fitted with 2-volt valves. As a power valve (on 2 volts) it was no good, but when I tried it in place of my detector valve (a well-known make) it just about trebled the volume with perfect purity. So I tried it with 4 volts, and it was better still.

I then altered the set, replacing the R.C.C. unit with a transformer, and although the difference was not so much, it was still better as a detector than a first-class H.F. valve.

Although it is only supposed to take .1 amp. filament current, I am sure it takes at least .5 (on 4 volts), as it runs down the accumulator quickly and gives out quite a bright light.

Can you suggest any reasons for this excellent performance, or is it merely a "freak"? J. B. (London, E.).

### "Are Transmitters Ahead of Receivers?"

SIR,—Apropos the topic "Are Transmitters Ahead of Receivers?" there is one factor which repeatedly sets at naught the progress in both. I refer to landline relays, of which we get so many.

As a horrible example which came to my ears, I would quote the lunch time transmission of the National Orchestra of Wales heard on Monday, September 15, from London (National). The reversion at 2 p.m. to "direct" transmission (and *gramophone records, at that*) gave the impression that one's receiver was suddenly transformed from a music mutilator to a superb quality model.

It is not fair to the excellent B.B.C. transmitters, to the artistes, to the trade (imagine a salesman trying to sell an expensive "last word" set to a discriminating music lover whilst demonstrating on such a transmission as I have mentioned), or to the listeners and their many friends who have not yet decided whether it is worth while to buy a good set—that this landline abomination should continue.

The pernicious effects of landlines can be heard at any time (if one has a really good set and speaker) by tuning-in a "direct" transmission and then going over to a station giving the same item via "Robber Relay." Where are the low and high frequencies? All gone!

Of course, not *every* landline is impossible, but the exceptions are rare, and surely we are entitled to "direct" transmission until such time as landlines can give the B.B.C. engineers the perfection they need and deserve. W. M. C. (Hove).

### The Non-technical Salesman

SIR,—I wonder if any other of your readers have had the same experience and have come away from the present Radio Exhibition at the Olympia feeling that, generally speaking, the representatives of the firms displaying there know very little about their models; and as to answering anything at all technical, that is quite beyond them.

To give you one or two examples. I visited the Olympia with a friend of mine who wishes to purchase an all-mains set, but knows very little about same, so left it to me to ask questions for him. The first firm's set in which we were interested I asked the use of a certain knob on the panel. About this the person whom I asked was very dubious. We passed further along. We then came to a set-maker's stand whose name is world famous. I there inquired whether the valves used in the set had indirectly-heated filaments or whether ordinary valves worked through an eliminator. The fellow immediately picked up one of their catalogues in order to find out. At a third stand we had the greatest laugh of all. The set in which we were interested did not appear to have any provision for an aerial, and as no frame aerial was visible inside the set, I asked whether the set was a transportable with a concealed frame aerial. After a good deal of looking round, the representative said, "Yes, here's the aerial," and, much to my astonishment as well as amusement, pulled out the flex wire with plug attached, which was the power connection. I will say that at last we came to a stand where my questions were all answered satisfactorily, which gave my friend greater confidence in this firm's set.

R. L. (London, N.).

# BROADCAST TELEPHONY

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

| Metres | Kilocycles | Station and Call Sign | Power (Kw.) |
|---|---|---|---|
| **GREAT BRITAIN** | | | |
| 25.53 | 11,751 | Chelmsford (5SW) | 15.0 |
| 200 | 1,500 | Leeds | 0.16 |
| 212 | 1,238 | Belfast | 1.2 |
| 261 | 1,148 | London Nat. | 68.0 |
| 288.5 | 1,040 | Newcastle | 1.2 |
| 288.5 | 1,040 | Swansea | 0.16 |
| 288.5 | 1,040 | Stoke-on-Trent | 0.16 |
| 288.5 | 1,040 | Sheffield | 0.16 |
| 288.5 | 1,040 | Plymouth | 0.16 |
| 288.5 | 1,040 | Liverpool | 0.16 |
| 288.5 | 1,040 | Hull | 0.16 |
| 288.5 | 1,040 | Edinburgh | 0.4 |
| 288.5 | 1,040 | Dundee | 0.16 |
| 288.5 | 1,040 | Bournemouth | 1.2 |
| 288.5 | 1,040 | Bradford | 0.16 |
| 301 | 995 | Aberdeen | 1.2 |
| 309.9 | 968 | Cardiff | 1.2 |
| 356 | 842 | London Reg. | 45.0 |
| 376.4 | 797 | Manchester | 1.2 |
| 398.9 | 752 | Glasgow | 1.2 |
| 479 | 626 | Midland Reg. | 38.0 |
| 1,554 | 193 | Daventry (Nat.) | 35.0 |
| **AUSTRIA** | | | |
| 246 | 1,220 | Linz | 0.6 |
| 283 | 1,058 | Innsbruck | 0.6 |
| 352 | 851 | Graz | 9.5 |
| 453 | 666 | Klagenfurt | 0.6 |
| 517 | 578.5 | Vienna | 20.0 |
| **BELGIUM** | | | |
| 206 | 1,460 | Antwerp | 0.4 |
| 212 | 1,415 | Binche | 0.2 |
| 217.1 | 1,382 | Chatelineau | 0.25 |
| 216 | 1,391 | Brussels (Conference) | 0.25 |
| 243 | 1,235 | Courtrai | 0.1 |
| 244.7 | 1,226 | Ghent | 0.25 |
| 251.2 | 1,194.6 | Schaerbeek | 0.5 |
| 338.2 | 887 | Brussels (No. 2) | 12.0 |
| 509 | 590 | Brussels (No. 1) | 1.2 |
| **CZECHO-SLOVAKIA** | | | |
| 263 | 1,139 | Moravska-Ostrava | 11.0 |
| 279 | 1,076 | Bratislava | 14.0 |
| 293 | 1,022 | Kosice | 2.5 |
| 342 | 878 | Brunn (Brno) | 3.0 |
| 487 | 617 | Prague (Praha) | 5.5 |
| **DENMARK** | | | |
| 281 | 1,067 | Copenhagen | 1.0 |
| 1,153 | 260 | Kalundborg | 10.0 |
| **ESTONIA** | | | |
| 401 | 748 | Reval (Tallinn) | 0.7 |
| **FINLAND** | | | |
| 221 | 1,355 | Helsinki | 15.0 |
| 291 | 1,031 | Viipuri | 15.0 |
| 1,796 | 167 | Lahti | 54.0 |
| **FRANCE** | | | |
| 210 | 1,430 | Radio Touraine | 0.2 |
| 214 | 1,401 | Fécamp | 0.7 |
| 219 | 1,370 | Béziers | 0.6 |
| 235.1 | 1,275 | Nimes | 1.0 |
| 249.5 | 1,202 | Juan-les-Pins | 0.5 |
| 256 | 1,171 | Toulouse (PTT) | 1.0 |
| 265 | 1,130 | Lille (PTT) | 1.0 |
| 272 | 1,103 | Rennes (PTT) | 1.2 |
| 286 | 1,049 | Montpellier | 1.2 |
| 287.2 | 1,044.6 | Radio Lyons | 0.5 |
| 294.4 | 1,013 | Limoges (PTT) | 0.08 |
| 300 | 1,000 | Strasbourg | 0.35 |
| 304 | 988 | Bordeaux (PTT) | 1.0 |
| 308.9 | 971 | (Vitus) Paris | 1.0 |
| 316 | 950 | Marseilles (PTT) | 1.5 |
| 328.2 | 914 | Grenoble (PTT) | 1.2 |
| 329 | 911.8 | Poste Parisien | 1.2 |
| 345.2 | 869 | Strasbourg (testing shortly) | 15.0 |
| 370.4 | 810 | Radio LL (Paris) | 0.5 |
| 385 | 779 | Radio Toulouse | 8.0 |
| 447 | 671 | Paris (PTT) | 1.0 |
| 466 | 644 | Lyons (PTT) | 2.3 |
| 1,446 | 207 | Eiffel Tower | 15.0 |
| 1,725 | 174 | Radio Paris | 17.0 |
| **GERMANY** | | | |
| 31.38 | 9,560 | Zeesen | 15.0 |
| 218 | 1,373 | Flensburg | 0.6 |
| 227 | 1,319 | Cologne | 1.7 |
| 227 | 1,319 | Münster | 0.6 |
| 227 | 1,319 | Aachen | 0.31 |
| 232.2 | 1,292 | Kiel | 0.3 |
| 239 | 1,256 | Nürnberg | 2.3 |
| 246 | 1,220 | Cassel | 0.3 |
| 253.4 | 1,184 | Leipzig | 2.3 |
| 259.3 | 1,157 | Gleiwitz | 5.6 |
| 270 | 1,112 | Kaiserslautern | 0.25 |
| 276 | 1,085 | Königsberg | 1.7 |
| 283.6 | 1,058 | Magdeburg | 0.6 |
| 283.6 | 1,058 | Berlin (E) | 0.6 |
| 283.6 | 1,058 | Stettin | 0.6 |
| 316.6 | 947.6 | Bremen | 0.3 |
| 318.8 | 941 | Dresden | 0.3 |
| 325 | 923 | Breslau | 1.7 |
| 360 | 833 | Stuttgart | 1.7 |
| 372 | 806 | Hamburg | 1.7 |
| 390 | 770 | Frankfurt | 1.7 |
| 419 | 716 | Berlin | 1.7 |
| 452.1 | 662 | Danzig | 0.25 |
| 473 | 635 | Langenberg | 17.0 |
| 533 | 563 | Munich | 1.7 |
| 560 | 536 | Augsburg | 0.3 |
| 566 | 529 | Hanover | 0.35 |
| 576.1 | 520.7 | Freiburg | 0.3 |
| 1,635 | 183.5 | Zeesen | 35.0 |
| 1,635 | 183.5 | Norddeich | 10.0 |
| **HOLLAND** | | | |
| 31.28 | 9,599 | Eindhoven (PCJ) | 30.0 |
| 299 | 1,004 | Hilversum (between 11.40 a.m. and 5.40 p.m. G.M.T.) | 8.5 |
| 1,071 | 280 | Hilversum | 8.5 |
| 1,071 | 280 | Scheveningen-Haven | 5.0 |
| 1,875 | 160 | Huizen | 8.5 |
| **HUNGARY** | | | |
| 210 | 1,430 | Budapest (Csepel) | 1.0 |
| 550 | 545 | Budapest | 23.0 |
| **ICELAND** | | | |
| 1,200 | 250 | Reykjavik (shortly testing) | 16.0 |
| **IRISH FREE STATE** | | | |
| 224.4 | 1,337 | Cork (1FS) | 1.5 |
| 413 | 725 | Dublin (2RN) | 1.5 |
| **ITALY** | | | |
| 25.4 and 80 | | Rome (3RO) | 9.0 |
| 247.7 | 1,211 | Trieste (testing) | 3.0 |
| 274.5 | 1,093 | Turin (Torino) | 8.5 |
| 332 | 905 | Naples (Napoli) | 1.7 |
| 379.5 | 790 | Genoa (Genova) | 1.5 |
| 441 | 680 | Rome (Roma) | 75.0 |
| 453 | 662 | Bolzano (IBZ) | 0.2 |
| 501 | 599 | Milan (Milano) | 8.5 |
| **LATVIA** | | | |
| 525 | 572 | Riga | 12.0 |
| **LITHUANIA** | | | |
| 1,935 | 155 | Kaunas | 7.0 |
| **NORTH AFRICA** | | | |
| 365.4 | 821 | Algiers (PTT) | 13.0 |
| 416 | 721 | Radio Maroc (Rabat) | 10.0 |
| 1,350 | 222.2 | Tunis Kasbah | 0.6 |
| **NORWAY** | | | |
| 364 | 824 | Bergen | 1.0 |
| 369 | 813 | Frederikstad | 0.7 |
| 455 | 659.3 | Porsgrund | 1.5 |
| 493 | 608 | Nidaros | 1.2 |
| 1,071 | 280 | Oslo | 0.5 |
| **POLAND** | | | |
| 214.2 | 1,400 | Warsaw (2) | 1.9 |
| 234 | 1,283 | Lodz | 2.2 |
| 244 | 1,229 | Cracow | 1.5 |
| 313 | 959 | Wilno | 0.5 |
| 338.1 | 887.1 | Poznan | 1.9 |
| 381 | 788 | Lvov | 2.2 |
| 408 | 734 | Katowice | 16.0 |
| 1,411 | 212.5 | Warsaw | 14.0 |
| **PORTUGAL** | | | |
| 240 | 1,247 | Oporto | 0.25 |
| 320 | 937.6 | Lisbon (CTIAA) | 0.25 |
| **ROMANIA** | | | |
| 394 | 761 | Bucharest | 16.0 |
| **RUSSIA** | | | |
| 720 | 416.6 | Moscow (PTT) | 20.0 |
| 800 | 375 | Kiev | 20.0 |
| 824 | 364 | Sverdlovsk | 25.0 |
| 1,000 | 300 | Leningrad | 20.0 |
| 1,060 | 283 | Tiflis | 10.0 |
| 1,103 | 272 | Moscow Popoff | 40.0 |
| 1,200 | 250 | Kharkov | 25.0 |
| 1,304 | 230 | Moscow-Stchelkovo (C.C.S.P.) | 100.0 |
| 1,380 | 217.5 | Bakou | 10.0 |
| 1,481 | 202.5 | Moscow | 20.0 |
| **SPAIN** | | | |
| 251 | 1,193 | Barcelona (EAJ15) | 0.5 |
| 266.7 | 1,125 | Barcelona (EAJ13) | 10.0 |
| 349 | 860 | Barcelona (EAJ1) | 8.0 |
| 368 | 815 | Seville (EAJ5) | 1.5 |
| 407 | 737 | Madrid (Espana) | 1.0 |
| 424 | 707 | Madrid (EAJ7) | 2.0 |
| 460 | 652 | San Sebastian (EAJ8) | 0.5 |
| **SWEDEN** | | | |
| 135 | 2,222 | Motala | 30.0 |
| 231 | 1,301 | Malmo | 0.75 |
| 257 | 1,166 | Hörby | 15.0 |
| 299.3 | 1,002 | Falun | 0.65 |
| 322 | 932 | Göteborg | 15.0 |
| 436 | 689 | Stockholm | 75.0 |
| 542 | 554 | Sundsvall | 15.0 |
| 770 | 389 | Ostersund | 0.75 |
| 1,223.5 | 244 | Boden | 0.75 |
| 1,348 | 222.5 | Motala | 40.0 |
| **SWITZERLAND** | | | |
| 318.8 | 943 | Basle | 0.65 |
| 403 | 743 | Berne | 1.1 |
| 459 | 653 | Zurich | 0.75 |
| 680 | 442 | Lausanne | 0.6 |
| 760 | 395 | Geneva | 1.5 |
| 1,010 | 297 | Basle | 0.25 |
| **TURKEY** | | | |
| 1,200 | 250 | Istanbul | 5.0 |
| 1961 | 153 | Ankara | 7.0 |
| **YUGOSLAVIA** | | | |
| 307 | 977 | Zagreb (Agram) | 0.7 |
| 430.7 | 696.5 | Belgrade | 3.0 |
| 574.7 | 522 | Ljubljana | 2.8 |

## LONG- AND SHORT-WAVE EFFICIENCY

THE proportion between the power put into a transmitting aerial and that actually radiated into the ether increases as the wavelength is reduced. For instance 300 kilowatts may be taken from the supply mains in a long-wave station. Of this roughly 50 per cent. or 150 kilowatts may reach the aerial, but only about 17 kilowatts is actually radiated.

On the other hand a short-wave transmitter working on 15 metres may absorb say 30 kilowatts from the mains. Of this, 10 kilowatts reach the aerial and 7 are actually radiated. In the first case less than 10 per cent. of the power put into the aerial is radiated as signal energy whilst in the second case the proportion is 70 per cent.

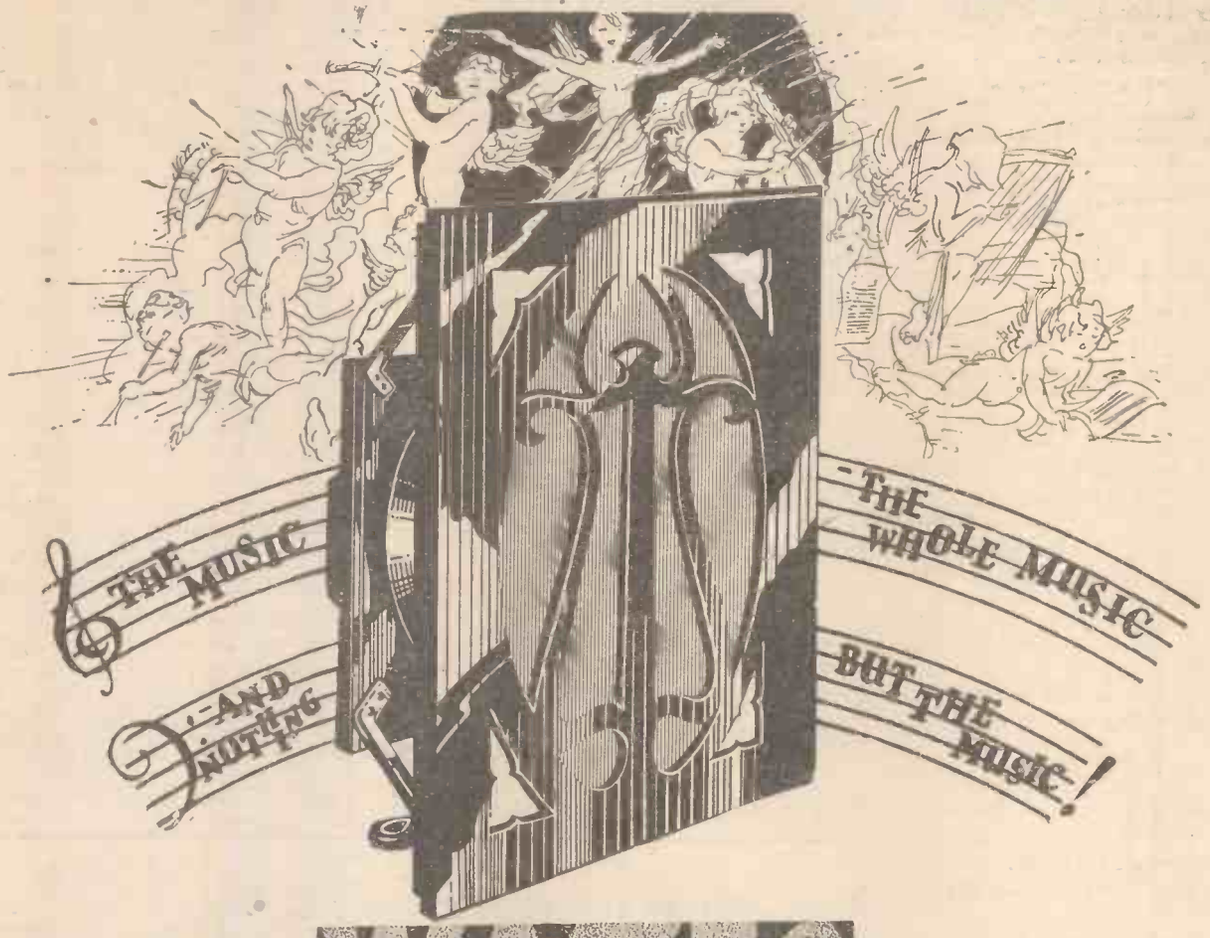
B. A. R.

## DIRECTIONAL WIRELESS

ONE of the latest methods of producing a sharply-directed beam of wireless is to enclose a single-wire or rod oscillator inside a reflecting system shaped like an open-ended barrel. The rod oscillator lies along the focal line of the barrel, so that when it is energised, the waves are first reflected back in phase from the sides of the barrel, and are then projected outwards in a straight line from each of the open ends. The method is particularly suited for short-wave transmission on ten metres or under.

M. B.

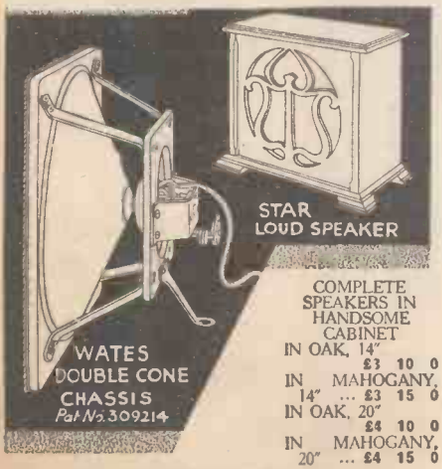
# "Soul-stirring REALITY"




# WATES

Patent No: 309214

## "DOUBLE-CONE" CHASSIS




COMPLETE SPEAKERS IN HANDSOME CABINET

IN OAK, 14" £3 10 0
IN MAHOGANY, 14" ... £3 15 0
IN OAK, 20" £4 10 0
IN MAHOGANY, 20" ... £4 15 0

THE wonderful superiority of reproduction is due to the use of large and small cones which, being free to move within the chassis, accurately respond to the high and low frequencies, through the small and large cones respectively. The whole range of audible frequencies, from the high pitched notes of string instruments to the deep full-throated majesty of bass notes, are reproduced with a fidelity and realism that adds enormously to the results of any unit. The most astonishingly life-like music and speech, however, is obtained when the chassis is fitted with the famous Wates Star Unit, now reduced to 25/-. Whatever unit you use, fit it to the Universal Chassis to-night and you will then realise how good your set really can be.

It must be heard to be believed. There is nothing else at any price to equal it. Ask your dealer to demonstrate, or if any difficulty write direct to the address below.

**WARNING.—When buying the WATES Patent Chassis, beware of imitations with the Cones *fixed* to the baffles—insist on seeing the name WATES before purchasing.**

### PRICES

| | | s. | d. |
|---|---|---|---|
| Wates Chassis with Universal Bracket to fit all popular Units. | 12" ... ... | 11 | 6 |
| | 14" ... ... | 12 | 6 |
| | 20" super | 17 | 6 |
| Universal Bracket (only) for fitting various units to speakers ... ... ... ... ... | | 2 | 0 |
| Silk-lined fret of attractive design, as illustrated at top, for 12" chassis ... ... ... | | 4 | 0 |
| " 14" " ... ... ... | | 5 | 0 |

*Fully illustrated leaflets sent on request to:*

**THE STANDARD BATTERY CO. (DEPT. A.W.)**

184/188 SHAFTESBURY AVENUE, LONDON, W.C.2

*'Phone: Temple Bar 6195/6*

886

# Postcard Radio Literature

### *You Must Have This*

I STRONGLY recommend you to get the new Tannoy eliminator leaflets if you are thinking of fitting your set out with a mains unit. And if you are tired of carrying the accumulator round to the charging station, then you will be interested in the Tannoy low-tension chargers. **64**

### *Kolster Brandes Sets*

Were you able to see the Kolster Brandes sets at Olympia or Manchester? The way they have got some of the prices down to a bare minimum is amazing, and most of the figures quoted include valves and royalties. All the Kolster Brandes sets and speakers are illustrated and described in a new booklet to hand. The Kolster Brandes "Pup" is well worth investigation. **65**

### *Permanent-magnet Moving-coils*

It has already been announced that Epoch permanent-magnet moving-coil speakers are guaranteed against perceptible loss of magnetism for two years. There are many speakers in the Epoch range, as you can see on glancing through the new catalogue. **66**

### *"Langmore" Cabinets*

Full details and measurements of the Langmore standard and radio-gramophone cabinets are given in a new leaflet received from the Miscellaneous Trading Co., Ltd. These cabinets are available in various sizes and will accommodate most "A.W." receivers. **67**

### *Fotos Valves*

Fotos valves are deservedly popular. A wide range is available, including pentodes and screen-grid valves. Characteristic curves and operating details are given in the latest Fotos folder. **68**

### *A Lot of Lotus*

The Lotus people, Garnett Whiteley, Ltd., make good transformers, chokes, valve holders, condensers, switches, coils, panels—but here I must stop, for there is no space to mention all. Write for the latest booklet, which deals with them all in an interesting way. OBSERVER. **69**

***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.*

# ABOUT VOLUME CONTROL

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

FEW receivers are made to-day without employing a volume control. The use of the reaction as a volume control has long been considered obsolete, except in outlying districts, for with the increasing power of stations the volume and sound received from the local stations, even with the reaction control at a minimum, is much too large.

It is necessary, therefore, to add some form of volume control, and this must essentially be of a type which restricts the voltage applied to the detector valve. Otherwise the detector itself will overload and this introduces horrible distortion, as well as imposing a considerable load on the tuning circuit, making it tune flatly. Generally speaking, with an H.F. valve in the detector stage, a high-frequency voltage of from half to three-quarters of a volt is all that can be afforded with a grid rectifier, operating at the anode voltages usually applied in practice, that is to say, from 30 to 50 volts actually on the anode of the valve. It is quite easy to obtain a voltage much larger than this from the Regional stations, for example, and the volume must be cut down before reaching the detector if difficulty is to be avoided.

This may be done by any of the well-known methods, such as controlling the screen voltage on the screen-grid valve if any, dimming the filament of the H.F. valve, whether of the screen-grid or neutralised type, or, thirdly, connecting a variable high resistance across the tuned circuit.

### Better Methods

Where one is handling a really strong signal, however, none of these methods is really satisfactory. If one has, for example, a really efficient screen-grid stage, the amplification will require cutting down to a small fraction of its normal value in order to receive comfortable volume at the loud-speaker. This means distorting the operation of the circuit to such an extent that the signals are mutilated and the quality suffers. Consequently it is becoming the practice to adopt two volume controls where a receiver is intended for service very close to a powerful station. These volume controls operate in two different portions of the circuit, reducing the efficiency of both simultaneously. The effect is that the overall volume is considerably reduced without an excessive reduction in the performance of each individual portion.

The two volume controls may operate on various parts of the circuit. For example, one may control the voltage on the screen grid, while the other may be a resistance across the tuned circuit. In this case both the controls are before the detector. Provided that one control is in front of the detector, however, it is usually found that this in itself is sufficient to prevent overloading; the second control, therefore, may be placed after the detector in some suitable portion of the low-frequency circuit. We may, for example, place the second control across the secondary of a transformer or some other similar position, leaving the pre-detector control on the screen grid as before.

## "THE MANCHESTER EXHIBITION —WHAT YOU SHOULD SEE"

(*Continued from page 509*)

The demonstration of Pertrix high-tension and grid-bias batteries which, as you doubtless know, do not employ the normal salamoniac action and are claimed to have particularly good long life and output characteristics.

The wide range of Wearite components on the stand of Wright & Weaire, Ltd.

The new Telsen "stars" for the forthcoming season, namely the Telsen Radio-Grand and Ace transformers, valve holders, high-frequency chokes and reaction condensers. The enclosed components in this range have moulded bakelite containers, and the prices are really remarkable.

On the Cossor Stand the new home-constructor kits, and, of course, the new Cossor screen-grid valves which have an exceedingly low self-capacity of approximately .001-micro-microfarads.

The new Lotus parts, particularly drum dial condensers, on the Stand of Garnett Whiteley & Co., Ltd.

Amplion sets and speakers on the Graham Amplion Stands. There are some novel new Amplion complete receivers.

The new Kolster Brandes mains portable receivers and, of course, the Kolster Brandes "pup," which represents astonishing value.

Some Philips newcomers in the way of radio-gramophones and cabinet speakers on the Stands of Philips Lamps, Ltd., 19 and 20.

High-tension and grid-bias batteries in an excellent range shown by the Ever Ready Co. (Great Britain) Ltd.

The needle-armature pick-ups as used by the B.B.C. for their gramophone broadcasts as shown on the Burndept Stand, together with many interesting receivers.

Dubilier condensers, *of* course, together with the new Dubilier radio gramophone.

The whole range of components for the home constructor shown by Lissen, Ltd., on Stands 12 and 13.

Terminals and connectors which leave no doubt as to their efficiency, shown by Belling & Lee, Ltd.

The new R.I. Madrigal receiver on Stand 83, Radio Instruments, Ltd., and, of course, the whole range of R.I. parts for the home constructor.

The Full-O'-Power range of high-tension batteries shown by Siemens Bros. & Co., Ltd.

New sets and speakers on the Standard Battery Co. stand.

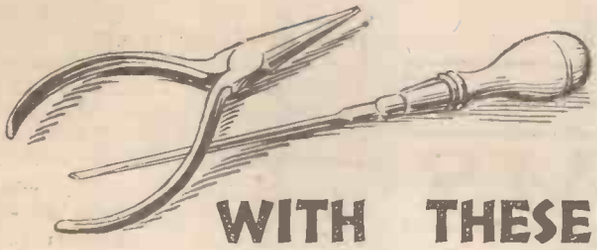
The Ormond speaker unit and chassis, together with some interesting condensers shown on Stand 64 by the Ormond Engineering Co., Ltd.

Metal rectifiers for every section of a mains unit made by Westinghouse Brake and Saxby Signal Co., Ltd.

The Junit mains units, some of which are made to match up with standard kit sets, so far as output is concerned.

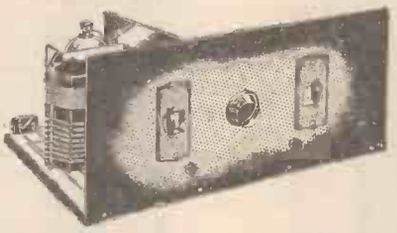
**A BIG FREE GIFT NEXT WEEK**

*See the announcement on page 510*



# WITH THESE

**AND AN EXPENDITURE OF £3-12-9 YOU CAN IN A FEW HOURS MAKE THIS**



# DYNAPLUS

## SCREENED THREE

*and prove the truth of these statements by "Amateur Wireless."*

"An indoor aerial . . . This set brought in Midland regional at fine strength."

"London Regional is not an easy station to get rid of, but . . . I lost it completely in less than 5 degrees. I could hardly find the National at first, so there was obviously no difficulty in cutting out that station.

"The Voltron people are quite justified in their slogan for as darkness came on I was able to listen to such familiar European stations as Toulouse, Rome, and Vienna at full loud-speaker strength."

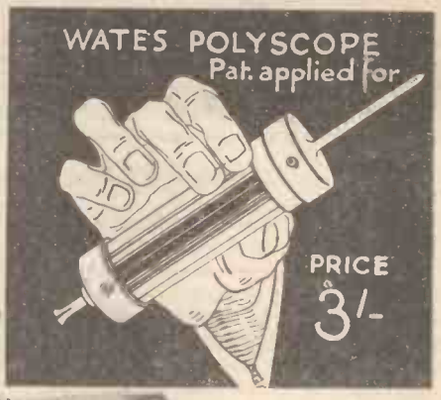
Cabinet to contain Dynaplus Screened 3 (as illustrated) finished polished walnut, complete with Voltron Cone Loud-speaker. Ample room provided at back for batteries or eliminator. **50/-**

You can get full particulars of Voltron products from Voltron authorised agents throughout the British Isles. In case of difficulty write to us for the free blueprint and name of our nearest agent.

**VOLTRON ELECTRIC**
LTD.,
QUEENSWAY,
**PONDERS END,**
Middlesex.

# MANY MORE TESTS

WATES STANDARD
3 in 1 METER
PRICE 8/6
Patent No. 822,558


*can now be made if you get the new*

# POLYSCOPE

**THE WATES POLYSCOPE**
Used with any 3 in 1 meter provides you the following tests:

(1) Resistance between 50 and 2,000 ohms.
(2) Valve filament broken or not.
(3) Insulation of Condensers.
(4) Short circuits.
(5) Whether circuit is complete.

This new addition to the Wates range of testing instruments has made the Wates 3 in 1 meter of even greater utility. Consisting of a container which houses a 3 volt torch lamp battery, it can be used with any type of 3 in 1 meter but is specially designed for the genuine and original Wates. Obtainable from all good dealers. PRICE **3/-**

*Then—for Valve testing use*

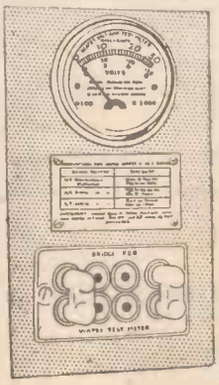
# WATES TEST PLUG

**WATES TEST PLUG**
used with a 3 in 1 meter gives the following tests:

(1) Distortion.
(2) Characteristics of valve.
(3) Milli-amp consumption.
(4) Filament voltage.

Indispensable for testing individual valves in the receiver. Place test plug in socket and fit valve in test plug. Convenient terminals then make various tests accurate and simple. Full instructions with each test plug. From all good dealers. PRICE **2/6**

**PANEL TYPE, 13/9**



*and for all readings—*

**The Genuine**

# WATES

*"three in one"*

# VOLT-AMP

## RADIO TEST METER

*Descriptive Leaflets from*
**THE STANDARD BATTERY CO. (Dept. A.W.)**
**184/188, Shaftesbury Avenue, London, W.C.2**
*'Phone : Temple Bar 6105*


READERS will be sorry to learn of the resignation from the B.B.C. of Mr. John Ansell, who for so many years has acted at Savoy Hill as conductor of the Wireless Orchestra. It is stated that he is returning to theatrical work. To wireless listeners the departure of John Ansell may prove a great loss, for on evenings when he wielded the baton in the studio it was a proverbial fact that the musical programmes were judiciously compiled with a view to giving a large audience light popular compositions—a fare which appealed to the majority.

Pending arrangements for regional broadcasting in the north of England by the twin Moorside Edge transmitters, Leeds will relay the Manchester programme, whether the latter is taking the National or some other broadcast. This has been made possible by the fact that Leeds possesses its own wavelength, and does not share one with other relay stations.

On October 30 listeners to the relay of the League of Nations banquet at the Guildhall, London, in addition to the Prince of Wales' speech, will hear an address by the chairman, Lord Grey of Falloden. The banquet is given in honour of the delegates from the Dominions and India attending the Imperial Conference and the eleventh assembly of the League of Nations.

The National transmitters on October 21 will include in their midday programme a relay from the Savoy Hotel of a luncheon given to Sir Henry Lytton, the old Savoyard and member of the D'Oyly Carte Opera Company. Mr. Lloyd George and the Lord Chancellor (Lord Sankey) will also broadcast addresses.

The evening of October 11 brings a star vaudeville programme to National listeners; it includes Scott and Whaley, Wish Wynne, Teddy Brown, Muriel George and Ernest Butcher, and Bert Copley in comedy. A sketch by A. J. Talbot, entitled *The Old Firm's Awakening*, played by Bobbie Comber, Ernest Sefton, and Lilian Harrison, will be found in the same bill.

The vaudeville entertainment down for broadcast at the Manchester Radio Exhibition on October 13 will be taken by all National and North Regional stations. The artistes contributing to the programme are Stainless Stephen, Winnie Melville, Derek Oldham, Bransby Williams, Gillie Potter and Foden's Brass Quartet.

In the autumn the B.B.C. will present a microphone version of the Berlin musical comedy *Evelyne*, based upon E. Phillips Oppenheim's successful novel, *The Amazing Quest of Mr. Bliss*.

Puccini's opera, *Madame Butterfly*, with Elizabeth Melvi in the title rôle, is down for transmission on October 16 and 17.

The new 12-kilowatt Bordeaux Lafayette (France) broadcasting station, which is under construction in close proximity to the River Gironde, is rapidly nearing completion. It is reported that tests will be carried out before the end of this year.

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

Pending the official opening of the new high-power Strasbourg-Brumath broadcasting station, the Radio Club du Bas Rhin transmits thrice weekly on 300 metres (1,000 kilocycles). The power of the private station is 350 watts; all announcements are made in French and German, and the cuckoo interval signal is being retained.

Considerable excitement was aroused amongst listeners to the Berlin programme on September 25 when, interrupting a musical broadcast, the announcer stated

(*Continued on page* 534)

## "RADIOGRAMS"

(Continued from page 532)

that "the German Foreign Minister has been murdered at the Friedrichstrasse Railway Station on his return from Geneva." The German Foreign Office, other Government Departments, and the principal newspaper offices were unable to cope with the overwhelming number of telephone calls received from the general public, and it was some little time before it was discovered that the evening wireless entertainment included a play entitled *The Minister is Murdered*, of which the announcer's short speech constituted the opening scene!

The broadcasts of the Vienna station are to be extended nightly. The station will now be found on the air until after 11 p.m. G.M.T. with light musical programmes.

The Trieste (Italy) transmitter will be officially inaugurated on October 28; it will work on 247.7 metres (1,211 kilocycles).

FFB, the powerful French coastal station at Boulogne-sur-Mer, is now equipped with an up-to-date I.C.W. transmitter in place of the old "spark" set that caused so much interference hitherto. This change will, no doubt, be welcomed heartily by listeners in south-eastern England, as the badly spreading signals from FFB were a continual source of annoyance when receiving distant broadcasting stations on wavelengths adjacent to those used for shipping transmissions.

As the result of the appeal in Glasgow for funds to provide wireless sets for blind persons, substantial donations have been received, and arrangements are now being completed to give about 1,000 crystal sets to blind persons in the city.

Microphones have been placed in certain regions of the Siberian Steppes and linked up with hunting lodges. When packs of wolves draw near the sound of their howling is clearly conveyed and their number can be estimated. Then huntsmen start off on the chase.

The short-wave station W3XAL, located at Bound Brook, N.J., operating on 49.1 metres, is on the air three hours a day, from 5 to 6 p.m. and from 10 p.m. to midnight American time. The station is being used largely for experimental international relay broadcasting.

## *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.**

# FULL-SIZE BLUEPRINTS

When ordering, please send Postal Order, NOT STAMPS

### CRYSTAL SETS (6d. each)

B.B.C. Brookman's Park Set .. .. .. .. AW206
Regional Crystal Set .. .. .. .. WM176

### ONE-VALVE SETS (1s. each)

B.B.C. Official One .. .. .. .. AW208
Hartley Single-valver .. .. .. .. WM198

### TWO-VALVE SETS (1s. each)

Talisman Two (D, Trans) .. .. .. AW194
No-battery A.C. Mains Two (D, Trans) .. AW230
No-battery Gramo-radio 2 (D, Trans) .. AW238
1930 Talisman 2 (D, Trans) .. .. .. AW239
Easy Tune Short-wave 2 (D, Trans) .. .. AW242
Searcher Two (D, Trans) .. .. .. AW245
Arrow Two (D, Trans) .. .. .. .. AW249
Forty-five-shilling Two (D, S Trans) .. .. AW250
Brookman's Two (D, Trans) .. .. .. WM168
New Crusader (D, Trans) .. .. .. WM182
Radio-Record Two (SG, D) .. .. .. WM187
Gleaner Two (D, Trans) .. .. .. WM201
Music Monitor (D, Trans) .. .. .. WM208
Merlin Two (A.C. Set) .. .. .. .. WM213

### THREE-VALVE SETS (1s. each)

Knife-edge Three (D, RC, Trans) .. .. AW201
Wide World Short-wave Three (HF, D, Trans) AW207
Everybody's Three (SG, D, Trans) .. .. AW209
1930 Ether Searcher (SG, D, Trans) .. .. AW211
New All-Britain Three (HF, D, Trans) .. .. AW214
Best-by-Ballot Three (SG, D, Trans) Price 4d. free with copy of "A.W." .. .. .. AW217
Brookman's By-pass Three (D, 2 Trans) .. AW220
Everybody's All-electric Three (SG, D, Trans) —A.C. .. .. .. .. .. AW221
1930 Clarion Three (SG, D, Trans) .. .. AW223
Beginner's Regional Three (D, 2LF) .. .. AW233
Britain's Favourite Three 1930 (D, 2 Trans) .. AW243
Car Three (D. R.C. Trans) .. .. .. AW244
The "A.W." Exhibition 3 .. .. .. .. AW247
Standard Coil Three (HF, D, Trans) .. .. WM117
Brookman's Three (SG, D, Trans) .. .. WM161
Community Three (D, RC, Trans) .. .. WM164
Brookman's Push-Pull Three (SG, D, Trans) 1/6 WM170
All-nations Three (D, 2 Trans) .. .. .. WM178
Inceptordyne (SG, D, Pentode) .. .. WM179
Brookman's A.C. Three (SG, D, Trans) 1/6 .. WM184
Music Marshal (D, 2 Trans) .. .. .. WM190
Gramo-Radio D.C. Three (SG D Trans) .. WM196
Concert Three (D, 2 Trans) .. .. .. WM199
New Lodestone Three (HF, D, Trans) .. .. WM205
De-Luxe Three (D, RC, Trans) .. .. WM209
Five-Point Three (SG, D, Trans) .. .. WM212

### FOUR-VALVE SETS (1s. 6d. each)

Music-Lover's Gramo-radio (SG, D, RC, Trans)—1s. 6d. .. .. .. .. AW202A
Music-Lover's Gramo-radio (Loud-speaker) 1s. AW202B
Horizon Four (SG, D, 2 Trans) .. .. .. AW237
1930 Monodial (2SG, D, Trans) .. .. WM158
Electric Four (All A.C.—SG, D, RC, Trans) .. WM162
Brookman's Four (2SG, D, Trans) .. .. WM174
Transportable Four (SG, D, 2 RC) .. .. WM180
Super Q4 (SG, D, 2 Trans) .. .. .. WM189
Lodestone Four (HF, D, RC, Trans) .. .. WM193
Searcher's Four (SG, D, RC, Trans) .. .. WM194
Invitation Four (SG, D, RC, Trans) .. .. WM200
Regional Band-pass Four (SG, D, RC, Trans) WM211

### FIVE-VALVE SETS (1s. 6d. each)

James Quality Five (2SG, D, RC, Trans) .. AW227
All-wave Lodestone Five (HF, D, RC, Push-pull) .. .. .. .. .. WM146
1930 Five (2HF, D, RC, Trans) .. .. WM171
Dual-screen Five (2SG, D, RC, Trans) .. WM185
Radio-Record Five (SG, D, Trans-parallel) .. WM188
Overseas Five (3SG, D, Trans) .. .. .. WM191

### AMPLIFIERS (1s. each)

"A.W." Gramophone Amplifier .. .. .. AW205
Brookman's Separator (HF Unit) .. .. AW212
Two-valve Amplifier .. .. .. .. AW216
"Mag" Gramo Unit .. .. .. .. AW224
Radio-Record Amplifier (DC Mains) .. .. WM183
Selecto Amplifier (HF, Unit) .. .. .. WM210

### MISCELLANEOUS (1s. each)

Short-wave Adaptor (1 v.) .. .. .. AW183
Simplest H.T. Unit .. .. .. .. AW197
By-pass Unit (Wavetrap) with copy "A.W."—4d. AW218
"Twin" Brookman's By-pass (6d.) .. .. AW222
James H. T. and L.T. Charging Unit .. .. AW232
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**AMATEUR WIRELESS** 58-61 FETTER LANE LONDON, E.C.4.



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**General Correspondence** is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

**Contributions** are always welcome, will be promptly considered, and if used will be paid for.

**Queries** should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

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



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FREE: TWO LARGE BLUEPRINTS OF FINEST SETS YET

OUR "CHALLENGE" SETS—FULL DETAILS

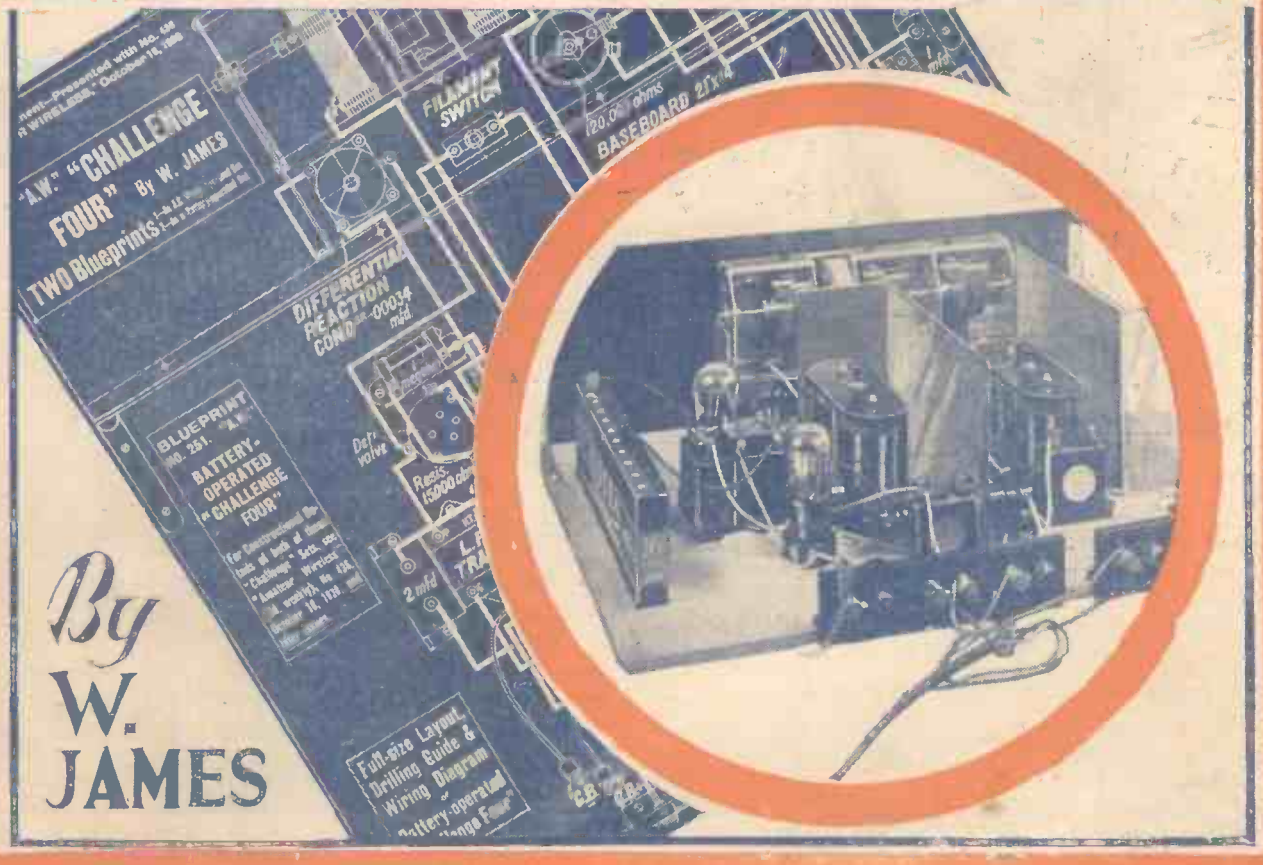
# Amateur Wireless

and Radiovision

60 PAGES 3d

Vol. XVII. No. 435 Saturday, October 18, 1930

## The "CHALLENGE FOUR"

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**THE LEWCOS DUAL-WAVE COIL**

Wave-band ranges 235/550m. and 1,000/2,000m. Aerial Coil, Ref. D.W.A. Screened Grid Coil, Ref. D.W.G. Price **15/-** each

Write for leaflet Ref. R65.

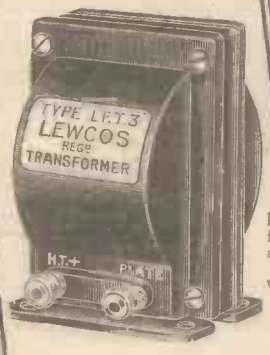
"Gee! That's fine!"

"Listen. You can hear every note, and the volume is magnificent. That band might be in this very room."

And *that's* what Lewcos components do for your set. It would be no exaggeration to say they are the life and soul of any receiver. A "Lewcos enthusiast" writes:—

*"They (Lewcos components) are more than you claim in your advertisements. I have spent any amount of money on coils experimenting on different circuits, but the set incorporating your two coils has never been dismantled. I use this set as my 'standard' when testing other circuits; it still holds pride of place."*

The Lewcos Dual-Wave Coil, L.F. Transformer (Ref. L.F.T.3) and the Twin Six-pin Base, as illustrated, "hold pride of place" for their extraordinary capacity.

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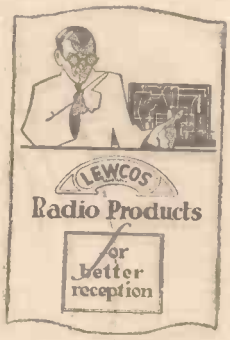
has a constant inductance for different values of anode current.

Type 22 - Price **20/-**

Write for leaflet Ref. R61

# LEWCOS

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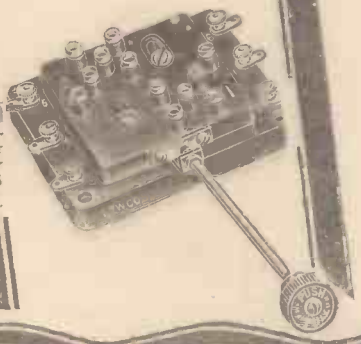

**THE LEWCOS TWIN SIX-PIN BASE**

With this base the wave-band range is easily changed by a simple push-pull operation. It is most suitable for use with Lewcos Binocular Coils. Price **9/6**

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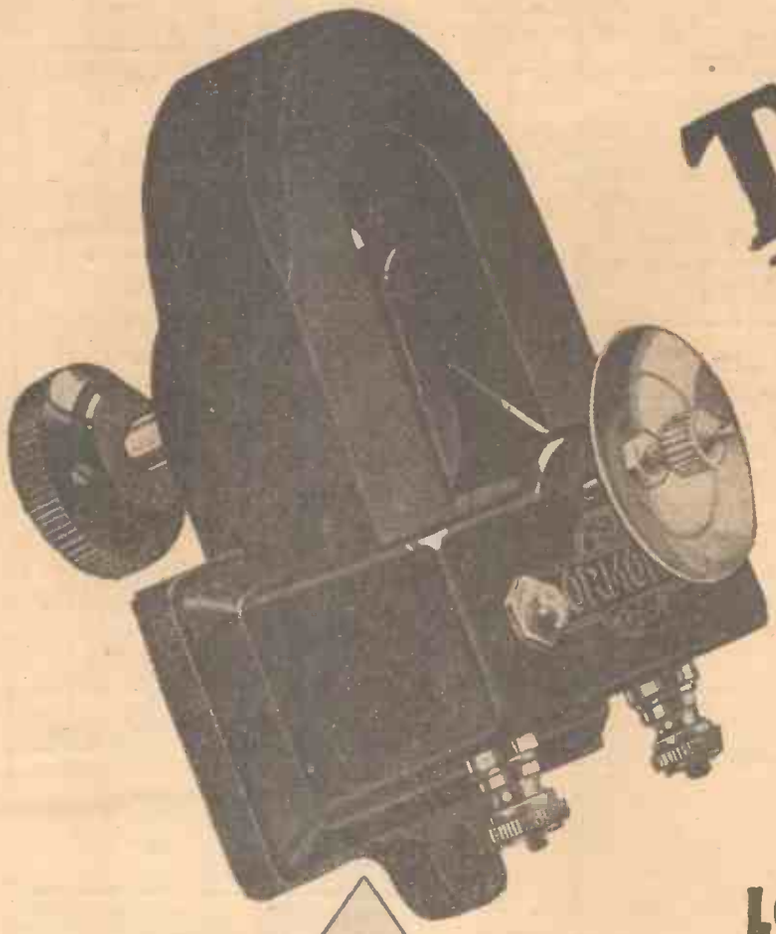

# The British Champion beats all comers!

## The ORMOND 4 POLE ADJUSTABLE LOUD SPEAKER UNIT

In performance this Ormond Unit is a recognised triumph. It reproduces music and speech with life and sparkle which gives vivid reality, and handles big volume without the least distortion.

All working parts are enclosed in a beautifully polished Bakelite cover of walnut colour, and the terminals are heavily plated. The care taken in its design and manufacture results in an extraordinary degree of sensitivity yet it is produced by modern methods at an extraordinary low price.

Remember it is an Ormond production and worthily upholds a great and proud reputation.

PRICE **12/6**

for PUNCH POWER & PURITY !

*We are exhibiting at the MANCHESTER RADIO EXHIBITION STAND 64 MAIN HALL*

### *The ORMOND CHASSIS & CONE*

Constructed of aluminium, ribbed to give absolute rigidity and incorporating a cone of specially selected material. Two sizes are available:
Small Chassis and Cone, 11⅜" diameter, Price 7/6
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# THE ACTUAL MANUFACTURERS OF THE NEW "A.W." LINEN DIAPHRAGM LOUD-SPEAKER

This entirely new principle Linen Diaphragm Loud-speaker was the biggest attraction at Olympia where it drew enormous crowds to the "A.W." Stand. 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 speakers. A model constructed entirely of Kone-Dope Components will be on view on "Amateur Wireless" Stand No. 11, Main Hall, at the Manchester Radio Exhibition. Come and see it for yourself.

Complete Speakers, ready for mounting unit, can be supplied without delay.

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

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

| | |
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| Size 14in. by 14in. ... ... | 15/6, post free. |
| Size 16in. by 16in. ... ... | 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/-, post free.

All well-known units supplied from stock.

Specially doped linen, 5/- per square yard. Dope 6d. and 1/- per bottle, postage 3d. extra.

*Post your order now and enjoy perfect reproduction.*

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## Start a Profitable Business With THE MACHINE THAT MAKES MONEY

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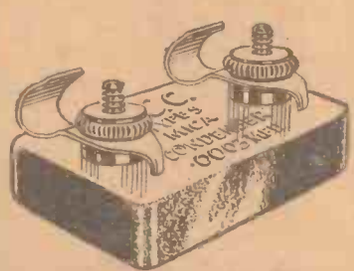
# TESTS OF TIME

## Nine Centuries Ago . . .

**the first tower of the Tower of London was built. It still stands, mellowed but not harmed by the passing of time. Like the White Tower (built in the Conqueror's time), the famous T.C.C. Condenser has stood the test of time. From the first years of this century the Telegraph Condenser Co. has made nothing but condensers. And so, to-day, when you buy "The Condenser in the Green Case," you know that you are buying the unrivalled experience of those many years of condenser-specialising. You are safe in buying T.C.C. Condensers. They will stand the test of time.**

**1CC CONDENSERS**



*The condenser illustrated is the .0003 mfd. T.C.C. flat mica type ..... 1/3d.*

**TOWER OF LONDON**

ADVERT. OF THE TELEGRAPH CONDENSER CO. LTD., N. ACTON W.3

6347


# Highest *effective* amplification

**The effective amplification available with any Screened Grid Valve is largely controlled by its inter-electrode capacity. The lower this self-capacity the greater the effective amplification available. In the new Cossor 215 S.G. residual capacity has been reduced to the low order of ·001 micro-microfarads. This is lower than any other Screened Grid Valve on the market. Due to this—and also to the absence of grid current—the new Cossor 215 S.G. permits a degree of effective amplification which, a year ago, would have been considered utterly impossible. Illustrated folder giving full technical details sent free on request.**

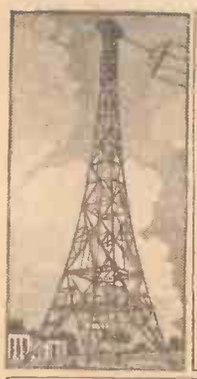
**Cossor 215 S.G. 2 volts, ·15 amp. Impedance 300,000. Amplification Factor 330. Mutual Conductance 1·1 m.a/v. Normal working Anode Volts 120. Positive Voltage on Screen 60-80. Price 20/-**

## THE NEW COSSOR 215 S.G.

**HIGHEST *ACTUAL* AMPLIFICATION**

*A. C. Cossor, Ltd., Highbury Grove, London, N.5.* ♡ 6312

No. 436. Vol. XVII. OCTOBER 18, 1930



# Amateur Wireless and Radiovision

EDITOR: BERNARD E. JONES.
TECHNICAL EDITOR: J. H. REYNER, B.Sc., A.M.I.E.E.
THE LEADING RADIO WEEKLY FOR THE CONSTRUCTOR, LISTENER & EXPERIMENTER.
RESEARCH CONSULTANT: W. JAMES.
ASSISTANT EDITOR: H. CORBISHLEY.

## NEWS · & · GOSSIP · OF THE · WEEK

### A CHALLENGE—

THERE'S no point in being boastful about your set unless you can justify it in results. In this issue AMATEUR WIRELESS makes a challenge with a description of an amazing new set, "The 'A.W.' Challenge Four," designed by Mr. W. James. Turn to page 564 and read about this.

### —AND A GIFT!

MAKE very sure of getting next week's issue of AMATEUR WIRELESS. There's a special reason: a free gift with each copy of a booklet, "Twenty-one Sets and Speakers." As its name implies, this gives constructional details of the best sets and speakers for the home constructor. No man who makes his own wireless gear can afford to be without this book—given free with every copy of next week's special issue of AMATEUR WIRELESS.

### PCJ LOSES A RECORD

A SHORT time ago PCJ was the only station broadcasting its announcements in six languages. Now from the Kaschau transmitter, Slovakian, Czech, Polish, Hungarian, Rumanian, and Russian can be heard regularly. Next month announcements will also be made in German. There is, surely, a "super" announcer at Kaschau.

### DON'T BLAME SOLDERING

YOU set constructors know that the AMATEUR WIRELESS Technical Staff advises the use of soldering where possible in the building of a set. Some people complain, but that is generally because they cannot make a good job of it, as the following example shows.

### AN EXAMPLE

THE other day a man said that he had for the first time used soldered joints in the making of his new set, an "Exhibition Three," and all he could get was a crackling noise! So he blamed the soldering—until he found that the heat of the soldering iron had loosened one of the terminal heads, and that was the root of the trouble.

### TELEPHONING TO SHIPS

THE new Canadian Pacific liner, *Empress of Britain*, launched recently by the Prince of Wales, is fitted out with one of the latest short-wave radio telephone installations. This will allow passengers to communicate with other telephone subscribers in Europe, Canada, and the United States through land stations, and the *Empress of Britain* will thus form another link in the telephone network of the world. The installation is similar to that used by the Marchese Marconi on his yacht *Elettra* when he spoke from the Mediterranean to London and New York.

**Radio with the Flying Squad—but not Scotland Yard! This is one of the cars of the Los Angeles police, which has been fitted with a short-wave set and speaker. The speaker-horn is seen on top of the windscreen rail**

### PRINCIPAL CONTENTS



### AN OLD FRIEND

"LISTENING to a talk from Geneva the other evening," writes an AMATEUR WIRELESS correspondent, "I was surprised to hear the voice of Mr. Arthur Burrows introduce the speaker. To the majority of present-day listeners, Arthur Burrows is just a name. I wonder how many remember him as the very first announcer from the old 2LO at Marconi House before the formation of the B.B.C.? In those early days Burrows made a name for himself as the owner of a remarkable microphone voice and he is the original of the phrase, 'golden-voiced announcer.' Now, Mr. Burrows is permanently at Geneva, where he holds an important appointment."

### PROGRAMME POST CARDS

"SPEAKING of Arthur Burrows reminds me of the early days of broadcasting. One day when I went to see him in his tiny office on the top floor of Marconi House, in the Strand, he told me that he had arranged to send post cards to all listeners, notifying them of the time and date of future transmissions! Several of these post cards were issued, bearing a large rubber stamp imprint giving the days of the week. Against various days was placed the time of transmission. I wonder if any readers have some of these interesting souvenirs."

**Another FREE Gift Next Week: Details are given on page 562**

# NEWS & GOSSIP OF THE WEEK—*Continued*

Imagine the present B.B.C. notifying all listeners by post card of the time of the next transmission!"

### TELEVISION NEWS

SEVERAL readers have written asking for more information about the American television broadcasts, which at least one London AMATEUR WIRELESS reader has managed to receive. Television is broadcast over W2XCR, the Jenkins Television Corporation, of Jersey City, from 3 to 5 p.m. on Monday, Wednesday, and Friday afternoons of each week. The standard forty-eight-line pictures is transmitted on a wavelength of 107 metres, and the sound accompaniment is broadcast on a wavelength of 187 metres by W2XCD, the experimental station of the De Forest Radio Company in Passaic, N.J.

### FOR BEGINNERS

THE "ghost in the cupboard" of many amateurs is that they don't know quite so much about the technicalities of wireless as they would wish! Everybody, no matter how "expert" (so-called), should take the opportunity of building up his radio knowledge by reading the special sixteen-page Beginner's Supplement in the November issue of the *Wireless Magazine*. There is something in this for everybody.

### THOSE DANCE BANDS

DANCE-BAND newcomers to the B.B.C.'s microphone are going perilously near the precipice of "plugging." One or two self-advertising announcements by the latest broadcast dance band prompted our correspondent to ask the B.B.C. what exactly was the limit of its control over this part of the programme.

"We have no control over the tunes played," stated a Savoy Hill official, "but if we find special announcements are being made we threaten to withdraw the microphone." Apparently that is enough, for if the desire to "plug" certain tunes is debatable, the desire of every broadcast band to advertise itself is unquestionable; so much so, that most bands broadcast free of charge.

### THE MUSICIAN'S WAR

LATELY, the B.B.C. has had to suffer the slings and arrows of outraged orchestral conductors; but our correspondent found them fully alive to their almost unassailable position. It is true they have taken two men from the Halle Orchestra, but in no sense can they be said to be competing with established orchestral combinations in their attempt to form the finest orchestra in the world.

### A GREAT ORCHESTRA

NO musician can fail to be impressed with the composition of the new B.B.C. Symphony Orchestra, which on October 22 will begin its series of symphony concerts at the Queen's Hall. Here it will be 114 strong; but it is so composed that sub-divisions can be made. On Sunday evenings it will be 78 strong. As Ernest Newman says, "The main conditions for a great orchestra now exist." But during the next year or so there will be the problem of finding a worthy conductor or series of conductors.

### BROOKMANS PARK CHANGE

AS from October 12 the National programme has been given on the 356-metre Brookmans Park wavelength instead of the 261-metre wavelength, during all periods when only one of the two transmitters is working. This change will affect the daily morning service and the morning talks, as well as those evening periods of dance music covered by only one transmitter. The reason for the change is that, owing to its very short wavelength, the National station on 261 metres has not such a good range as the Regional station on 356 metres.

**A new B.B.C. department! This large warehouse near Waterloo Bridge, London, has been taken over by the B.B.C. as a studio for the Symphony Orchestra of 114 members. No Savoy Hill studio is large enough, and this 30-ft. high warehouse has good acoustic properties**

### NATIONAL 261 A FAILURE?

LISTENERS living outside the immediate vicinity of Brookmans Park have commented on the fact that, although its power rating is so high, the National 261-metre station is very weak compared with the Regional 356-metre transmitter. There is every possibility that when the Regional scheme is more fully developed the London National station will abandon its present wavelength for a more favourable one.

### MORE LAND-LINE RELAYS

THE Relay Commission of the International Broadcasting Union is to meet at Budapest. The B.B.C. will be represented at this meeting, and plans are in hand for fixing up relays by land-line from places as far afield as Warsaw, Budapest, and Vienna.

### B.B.C.'s GRACIOUS COMPLIMENT

AS Sir Walford Davies was too indisposed to come to Savoy Hill to give his second talk in his tenth series on "Music and the Ordinary Listener," the B.B.C. arranged microphones in his home, the Cloisters, Windsor. In this way the continuity of this popular series was maintained; incidentally the B.B.C. paid Sir Walford Davies a great compliment, which we are sure he deserves.



### INDIGNATION AT ABERDEEN

SCOTTISH listeners have already begun to show their resentment at the proposed annexation of the 301.5-metre Aberdeen wavelength by the new North Regional station. If Aberdeen gives up its present wavelength it will have to go on the National common wavelength of 288.5 metres, and so become a London relay. We shall hear more of this trouble within the next month or so.

### THE RADIO ASSOCIATION

NO doubt most readers are awafe of the activities of the Radio Association, by means of which for a payment of only six shillings a year you can receive free set maintenance. If you want to know details, listen to Lieut.-Col. J. T. C. Moore-Brabazon's talk this Friday, October 17, when he will explain the Radio Association's benefits. Free information and free insurance are also given. The address of the Association is 22 Laurence Pountney Lane, London, E.C.4.

### INDOOR-AERIAL POINTS

WITH the great increase in efficiency in receiving sets and the increase in power in broadcasting transmitters, the indoor aerial is becoming increasingly popular. From time to time, though, you come across not a few that give receiving sets no real chance of showing what they can do. The beginner at wireless—and perhaps sometimes the old hand, too—does not always realise that walls are, from a radio point of view, earth. Hence you will find the down lead draped for yards and yards close to some wall or brought in through a door by a very long way round for the sake of neatness.

***The demonstration receiver at the South Kensington Science Museum has been entirely redesigned and here the new equipment is described by KENNETH ULLYETT. The set is now on view in the Radio Hall of the Science Museum and London readers can judge the performance for themselves. It works entirely from A.C. mains, has screen-grid high-frequency amplification and novel "paraphase" power amplification. B.B.C. engineers have assisted in the design.***

# THE PERFECT SET?

NO doubt you remember the bother that was raised in the AMATEUR WIRELESS correspondence columns towards the end of last year about the quality of reproduction of the demonstration set at the South Kensington Science Museum.

Everybody seems agreed that this receiver *should* represent radio to the highest possible degree of perfection, and the question was as to whether it did, or not. This set was designed about five years ago, and there was a certain justification for the suspicion that it was not so good as it might have been; even if the reproduction were true, there was a doubt as to whether it was advisable to have an old-fashioned set on demonstration.

The set was purely a local-station job and, using ordinary battery valves, worked from the mains through the medium of a convertor. It was a five-valver having a resistance coupled H.F. stage (not a screen-grid), a Kirkifier detector and three low-frequency stages, one being resistance-coupled, one choke-coupled and a final L.S. 6A output stage.

There was a rumour that this set had been designed by Capt. Eckersley for the use of H.M. the King, but like most rumours it was unfounded, and what actually happened was that the Museum authorities approached the B.B.C. Engineering Department when the set was needed, and together they worked out a suitable circuit. Part of the set was made by the B.B.C. and part by the Museum engineers.

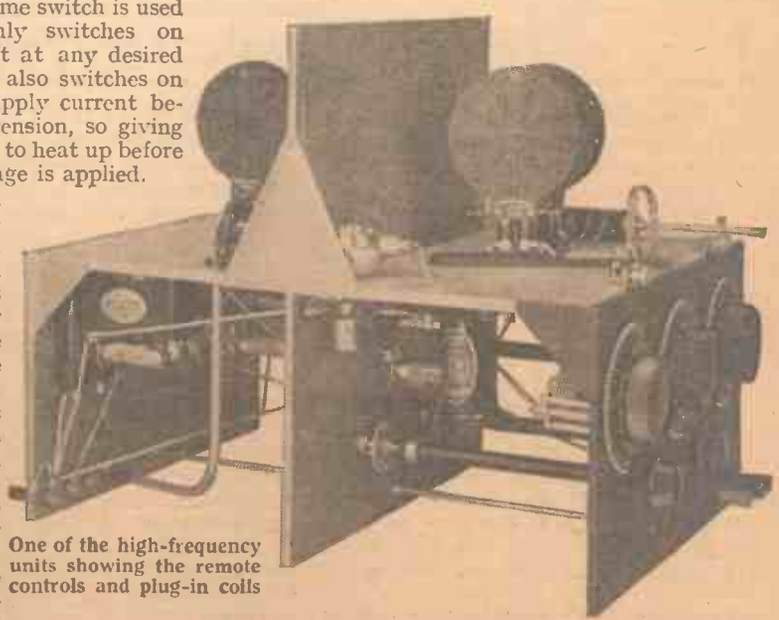
A difficulty was (and to a certain extent still is) that the hall of the Science Museum in which the set is situated is not ideal, acoustically speaking. There is an echo which it is very difficult to control, and the engineers had a deal of difficulty with the huge exponential horn with Western Electric drive.

However, I think readers will agree that the new set and the quality it gives are quite satisfactory, and you can prove this for yourself by paying a visit to South Kensington and hearing the set during one of its demonstration periods.

The old set has been scrapped and an entirely new job built up. The circuit is rather puzzling at first, but when shorn of all its details of mains supply and alternating current filament heating it is comparatively simple. All the valves are lit by alternating current and indeed the whole power for the receiver is taken from the alternating-current mains supply.

No batteries are used and the local 230-volt 50-cycle mains drives the whole set. An ingenious time switch is used which not only switches on and off the set at any desired periods, but it also switches on the filament supply current before the high tension, so giving the valves time to heat up before the anode voltage is applied.

I understand that the designers "worked backwards" in producing this set in so far as, given the speaker to be used (a 27 ft. logarithmic horn with a moving-coil unit), they decided that the output power should be 40-watts to give true reproduction in the Exhibition Hall; and with this power output in mind they then designed the mains supply and low-frequency stages.



**One of the high-frequency units showing the remote controls and plug-in coils**

There is one high-frequency stage, using a screen-grid valve lit by alternating current. A neatly arranged filter circuit is employed which preserves the side-bands of the transmission and gives a flat top resonance curve.

In plain language this means that the use of the high-frequency stage does not upset the tone of reproduction as it does in some amateur sets where the operating conditions are not quite right.

Push-pull detection is used, which is a thing of which the average amateur probably knows nothing, for I doubt if there are any amateur sets using two valves for detection in a push-pull arrangement.

The old Kirkifier detector used in the original set was satisfactory, but it was felt that in the new arrangement the push-pull detection would be able to stand greater volume. Also there was the question of the inter-electrode capacity of the detector, and in such a set as this it is necessary to free the high-frequency stage from any big load of this description.

The Museum officials got in touch with the B.B.C. regarding the push-pull detection arrangement, which I believe the B.B.C. has used in experimental work, and together the engineers produced a rather complicated but very efficient push-pull detector, using A.C. valves and having strings of high-frequency chokes, resistances and condensers as filters in the anode

*(Continued at foot of next page)*

SOME NOTES ON PRESENT-DAY SHORT-WAVE CONDITIONS

# Around the Short-wave Dial

BY M. BARNETT

THINGS seem to be a little more active again now and we will make a note of the following revised schedules from some of the transatlantic stations which are just to hand: Firstly we have station W8XAL, at Cinncinatti, Ohio, which works on 49½ metres or exactly 6060 kcs. It is on the air daily from 11.30 to 4 p.m. and from 6.30 to 8 p.m., and again from 11 to 6.30 p.m. (G.M.T.). So you will see that this station has a pretty busy time and is on at a time which is most convenient for reception over here. The power is only 250 watts, but that has not prevented it being heard over here quite well. Another station is W9XAA, at Chicago, Ill., which works on 49.34 or exactly 6080 kcs. This is a 500 watt, crystal-controlled transmitter employing 100 per cent modulation. It is on from 1 a.m. to 5 a.m. (G.M.T.) daily and should stand a good chance of being heard at this time of the year.

Somewhat higher up the dial we have W3XK on 146 and 103 metres. These wavelengths are certainly rather high for reception in England but nevertheless the station may be heard. One wavelength is used for speech and music whilst the other is for television transmissions. It has 250 watts for the higher wave and 500 watts for the lower and is on the air with both wavelengths from 1 to 3 a.m. every day except Sundays and holidays.

Here is a chance for television enthusiasts! Inter-continental television reception will undoubtedly be a thing of the future and amateur experimenters have an opportunity now to pave the way for future results. One bad snag is that different stations sometimes use scanning discs with a varying number of holes, no standard having been arrived at.

Another station which first made its appearance about a year ago but which has been off the air recently has just lately made a reappearance. I am referring to XDA, at Chepultepic, Mexico, and even if you can't pronounce this address properly you should find no difficulty in receiving it! It does not appear to have any fixed schedule and works on various wavelengths from about 16 to 20 metres. It has a very strong signal at times.

### Reaction Control

Have you ever tried controlling reaction by means of a very high resistance, on the short waves? There are several means of doing this: it can be connected across the reaction coil with a fixed condenser used in place of the variable reaction condenser; it can be connected in series with the detector H.T. lead and the reaction condenser set at maximum and in cases where a screen-grid valve is used as a detector, it can be connected in series with the screening lead. One very nice feature of this method of control is that it does not affect tuning to any appreciable extent. The trouble appears to be to find a control which is smooth enough to do the job without any crackling.

## "THE PERFECT SET?" (Continued from preceding page)

circuits. I am afraid, that although entirely efficient, this arrangement is not one that could be used in an amateur set, on the score of expense.

The low-frequency stages are connected in what is known as the paraphase circuit, and volume controls and biasing arrangements are so provided that even a modulation of 100 per cent. cannot overload the last stage. All grid bias is automatically provided by dropping resistances and shunt condensers.

It is rather interesting to note that plug-in coils are used in part of the high-frequency circuit. High-tension at 480-volts is provided for the first stages of the set by means of an ordinary two-way rectifier while a high-capacity mercury rectifier is used for the final stages. Metal rectifiers are also used in some parts of the circuit.

The whole set is contained in several sections in shielded boxes. The mains equipment is in a special compartment and there are about twenty fuses easily get-at-able on the panel. Interference between the various circuits of the mains supply unit is prevented by grouping the leads in flexible metal tubing as used for gas piping.

Screening in the earlier stages of the set itself is carried out with rigid copper tubing and in the final stages the metal shielding and the use of flexible metallic tubing is reminiscent of the amplifiers used in talkie film work.

The Museum officials have so far co-operated with the B.B.C. that permission was obtained for a special test broadcast from Brookmans Park some months ago to enable the engineers to check the overall characteristics of the receiver.

I do not think that readers have any cause to complain of the present quality of reception, and as the whole receiver is automatic there is no reason why this quality should ever be upset.

Not only does the new Science Museum set represent the essentials of up-to-date radio, but it is a set which many amateurs would give much to possess—if they could afford to run the nine valves and the big mercury rectifiers!

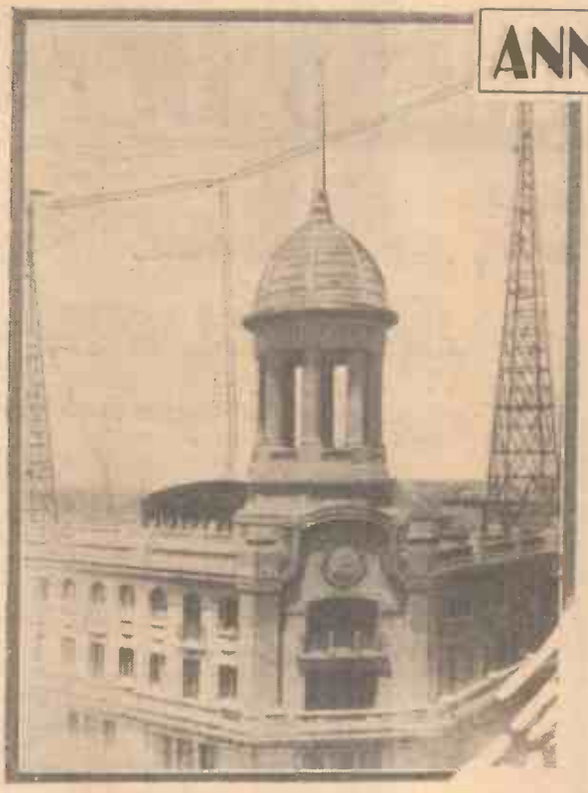
The A.C. mains battery eliminator equipment of the Science Museum receiver

READ THE ANNOUNCEMENT on page 562!

It is expected that the new 16-kilowatt Polish broadcasting station, LVOV, will commence its experimental transmissions about the middle of the present month.

An analysis of the dance numbers broadcast by the B.B.C. dance orchestra in a recent month showed 336 American items, 110 British and 18 Continental.

# ANNOUNCERS TELL THEIR STORIES



## LUIS MEDINA OF MADRID UNION RADIO ON THE HUMOROUS SIDE OF BROADCAST ADVERTISING

HUMOROUS scenes that occur in the studio are sometimes unforeseen and have not by any means been anticipated by the announcer, who, as a matter of fact, usually raves and tears his hair as the effect produced is diametrically opposed to the one desired! These moments and accidents, though, we announcers do not wish to forget, serve to break the regularity and monotony of life!

As a good example of this, I recall what happened one night before the microphone of Union Radio, Madrid. Listeners were expectantly awaiting the programme as announced, which consisted in summoning up (by means of records) the voices of celebrated singers of the past.

I made a brief but high-flown prologue to the effect that all who were interested in *bel canto* should listen with religious fervour to those melodious voices with their marvellous trills and arpeggios, which, thanks to the science of man, could be heard for ever, and so on, and so on.

At this point the electric lights of the station began to grow dim and we in the studio were enveloped in a weird and eerie darkness. I confess I shuddered as the broadcast went on in the semi-darkness and there came out from the shadows the rich voice of Caruso. The second record was put on and I announced: "Let us now hear the heavenly voice of a famous artiste, who was born here in Madrid, in 1843, and who died in Wales in 1919—Adelina Patti."

The record began to revolve, and while we waited for Patti something went wrong with the "works" and the transmitter broadcast a positively infernal din, that could only be compared to the yapping of twenty dogs fighting for a bone. Hurriedly I switched off, and then I had to improvise something to account for this untoward occurrence. What was I to do? Suddenly I had an inspiration. Connecting the microphone, I explained that perhaps the howl was caused by "spirit" interference of Patti herself, as the record of Caruso was put on first! The excuse appeared to go down with listeners!

One afternoon I was working in my office when a middle-aged lady came in.

"Mr. Medina?"

"At your service."

"Are you quite sure that you *are* Mr. Medina, the Union Radio announcer?"

"Absolutely."

"Impossible."

"And may I ask why?"

"It is impossible that the Mr. Medina who recites verses so wonderfully should not have curls. When I hear you on the wireless, I imagine you with lustrous, curly hair. Take Charlie Chaplin, for instance, his head of hair is famous."

"Yes, but he always hides it under a bowler."

"Perhaps so, but you can see the rings and curls all the same. I am sure, Mr. Medina, that without curls you cannot possibly awaken romance and I cannot understand why any woman should even look at you."

"That is why I am announcer here, where nobody sees me!"

"Do you know your wife is deceiving you?"

"Madam?"

"She is courting the friendship of a man with curly hair!"

By this time I began to think that I was talking to a lunatic. "Well," I said, "I will ask my barber to devise some means of giving me curls or waves. Will that please you?"

"It will not be necessary, sir. Without leaving this room you can have curls. Take this. It costs only one dollar."

She placed in my hands a small bottle, and on it was written: "Moreno's Curling Lotion. Purveyor to His Majesty."

My English readers must know that our broadcasting has to depend almost entirely on advertisements. That is why the lady with the hair lotion was so insistent. A notice across the microphone to the effect that I was using her coiffure concoction would create almost a literal revolution in the hair world!

I had on one occasion just concluded an advertisement for a pastry shop, proclaiming their cream puffs the best in the world, when I was called to the 'phone. "I am a listener," said a voice. "A listener who desires to inform you that if you continue to advertise those cream puffs he will com

(*Continued in third column of next page*)

The Studio of Union Radio, Madrid

# IN MY WIRELESS DEN

## WEEKLY TIPS— CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

### Fine Wire and Coils

I SUPPOSE some people think there is little difference to be noted between the results obtained from a coil of, say, No. 26 and another of No. 28.

Actually, of course, the results from a pair of sets fitted with the different coils may not be quite alike. Thus one set may appear to be unstable over part of its tuning range.

If it is of the ganged type the actual tuning may be more difficult and so on, all because one of the sets of coils is of No. 26 gauge as compared with the other set of No. 28.

A point to note is that the effective resistance of tuning coils changes with the wavelength and usually the conditions are such that the impedance of the tuned circuit of which the coil forms part is the maximum at about the lower wavelengths.

Now most valves and circuits are such that the feed-back is the maximum at the lower wavelengths. The result is, therefore, that the coils and circuit combine to produce instability. Coils however, can be arranged to avoid this effect and slight differences in the wire are of importance.

### These New Rectifiers

There are, I notice, two or three new types of metal rectifiers. They are relatively inexpensive, being finished in durable but thin metal cases.

One type, style 4T6 (Westinghouse) is rated at 175 volts 25 milliamperes, which is very useful. Being a believer in ample anode-circuit power I am pleased to note that such a useful rectifier is to be obtained for less than a pound.

I am rather fond of metal rectifiers myself. You put them to work and haven't further need to remember them.

### "Strays" in Screen-grids

A point that ought to be remembered when noting the small values of anode-grid capacities of screen-grid valves is that differences in the same type of over 100 per cent. are to be noted.

Calculations based upon figures for the best valves of a type are therefore only approximate in practice and, in fact, the wonderful results claimed are not often to be achieved.

### Loud-speaking Transformers

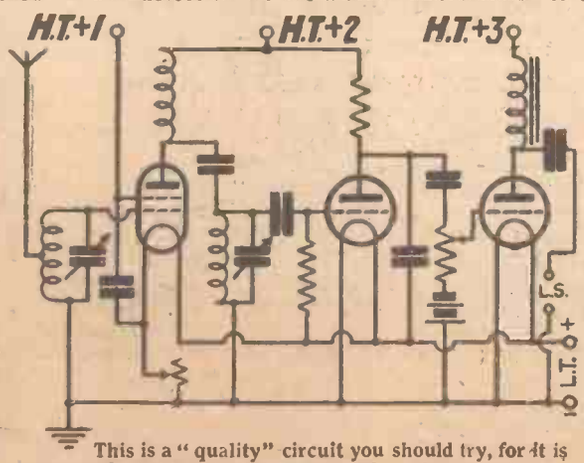
Have you ever heard the broadcast from an output choke or transformer? This must be a fairly common experience as I often note that when the loud-speaker is disconnected the broadcast can be heard from the set.

Sometimes the laminations are a little loose and can be tightened, but I have had chokes which appeared to be quite tight yet which responded. Distortion must be introduced by this effect and it is a point to which the designers of low-frequency parts might well give a little more attention.

### A "Quality" Set

My diagram this week shows a "quality" circuit. The screen-grid circuit is as usual, excepting that rather high-loss coils are used with the object of not cutting sidebands.

For detection we use a .0001 microfarad fixed condenser and a .25 megohm grid leak. In the anode circuit of the detector is a 50,000-ohm resistance and a .0003-microfarad by-pass condenser. For coupling the detector to the power valve we have a .1-microfarad condenser and a 150,000-ohm wire-wound potentiometer.




**This is a "quality" circuit you should try, for it is recommended by Mr. W. James. The valves are shown, and a description is given in the accompanying paragraph**

There are two volume controls, one being in the high-frequency circuit and the other in the power-valve circuit. Good quality from local stations is assured with a circuit of this description and the amount of the volume to be obtained depends essentially upon the anode supply available and the size of the power valve. With a good power valve and a large high-tension supply the quality and volume will be fine.

### When Testing Strength

An effect which I noticed a day or two ago might also have been observed by others using a valve voltmeter to measure signal strength.

The instrument was connected to the detector of a set and I was noting the effect of using different values of coupling condenser in a choke-fed tuned-grid circuit.

What I found was that the nearness of the condenser to a metal screen had an effect. The signal strength actually fell off when the condenser was placed against the screen.

Retuning the circuit was, of course, tried, but it was found that the actual losses were being increased by the condenser lying against the screen.

This is one of those small points so often overlooked by constructors who feel that so long as the condenser is connected to the circuit it is bound to be satisfactory. Actually this is not necessarily true and wiring plans should always be followed.

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### "ANNOUNCERS TELL THEIR STORIES"

(*Continued from preceding page*)

pell you to eat three dozen! After hearing you last night, my entire family has been nearly poisoned by those infernal pastries. The purpose of the wireless is culture, and not murder."

"Good heavens," I said to myself, "that fellow is right," and I hung up the receiver.

When a broadcast play is in progress, we announcers are kept running in all directions to see that the actors do not approach too near to the microphone, that the various accompaniment sounds occur at the precise moment, that the pistol shots do not fail, and that the "storms" which must overawe listeners shall burst with all punctuality and violence.

In Spain we have a quaint custom on New Year's Eve. As the chimes announce midnight, ushering in the New Year, those who really want to be blessed with good luck must eat twelve grapes, one at each stroke of the clock. We in the studio last year were without the fruit for this "sacred" rite and I expressed through the microphone our hope that we might not be punished for the omission.

Within half an hour there appeared from some hotel a "buttons," bearing a huge bunch of grapes and two bottles of champagne. Which shows that Spanish listeners appreciate their announcers!

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# On Your Wavelength!

## THE AIRSHIP DISASTER

SPECULATION has naturally run wild in connection with the appalling tragedy of the R101. The other day I was asked whether the wireless equipment represented a possible source of danger by fire. I replied that I could not for the life of me see why it should add one iota of risk. The question, however, brought back to mind the early days of the War, when certain pilots showed a very pronounced dislike to having their machines fitted with W/T sets—especially with the original Stirling type of spark transmitter. It was useless to point out that the spark-gap was enclosed. They simply didn't like it, and I don't know that I blamed them.

Nowadays, with modern valve transmitters, things are very different. There is no "sparking," and the whole of the oscillatory circuit is thoroughly insulated from the machine. An adequate capacity "earth" is formed by bonding together a large area of the metallic structure, so that no dangerous voltage can possibly arise there. In such circumstances, I can see no reason whatever why the wireless installation should be viewed with suspicion. On the contrary, it seems to me to be one of the surest safeguards left to aerial navigation.

## A SUGGESTION

MANY an owner of a big car uses also a small one for odd jobs when only one or two persons have to be carried. Why do not we apply the same idea to wireless? There is many an occasion when one member of the family wants to listen to a talk, or some other item, which does not interest the rest. The loud-speaker is an annoyance to several, for the benefit of one, in such a case. A single-valve "baby" set will usually do all that is required and phone reception will enable one or two to listen without disturbing the others. Our receivers tend to become more and more powerful and more and more complicated, and we are inclined to forget the economy and convenience of the single-valver. I have just constructed such a set, with a two-volt valve and a small dry-battery H.T. supply. It is entirely self-contained and can be attached to aerial and earth, and switched on at a moment's notice. The capacity-controlled reaction works very sweetly, and many foreign stations come in after dark at very good strength. It has been hailed with enthusiasm by the family, and before it was put into commission beside the big set I had no idea how often someone would have liked to listen to an item whilst the others were not interested or were otherwise engaged.

## ROME

ROME is coming through wonderfully just now on the lowest of its several short-wave transmitters—25.4 metres. The quality is remarkably good and it does not seem to be suffering from fading—at any rate, not at present. I believe that it is now nearly at full power and that it is putting something like 7 kilowatts on to the aerial. I have been picking up Bucharest, too, recently, on 21.5 metres, on Saturday evenings. It fades a bit, but never sufficiently to interfere with reception.

## SHORT CIRCUITS TO METAL PANELS

METAL panels for receiving sets are now the rule rather than the exception. It seems strange, therefore, that some manufacturers turn out certain components that are quite unsuitable for mounting on metal panels. Devices for obtaining the "one-hole fixing" effect are frequently designed for the old-fashioned $\frac{3}{8}$-inch thick ebonite panel and simply will not cope with a thin metal panel without the aid of untidy washers. And when it comes to insulation, one finds that in some cases, a "live" part of the component will be short-circuited to earth by the screws or flanges that hold it on the panel. A friend of mine constructed a very simple receiver, a straight two-valver, which had a metal panel and a push-pull switch for breaking the positive lead from the L.T. When the set was complete he attached the accumulator and switched on. The valves did not light up, but the flex from the accumulators very nearly did! He had short-circuited his L.T. through the innocent-looking switch, one pole of which was in direct contact with the metal panel, which, in turn, was connected with L.T. negative.

## EXPONENTIAL HORNS

IN commercial fields, notably in connection with talking-picture installations in cinemas, the exponential-horn loud-speaker is coming into favour. Well-designed exponential horns give a crispness and intelligibility to speech, are exceedingly efficient, and possess controllable directional properties. Moving-coil loud-speakers of the usual cone type are used in B.T.H., R.C.A., British Acoustic and several other cinema equipments, and the difference in tone of these equipments compared with the widely-used exponential horns of Western Electric, is most remarkable. The advantages of the exponential horn I have already noted, but on the other hand, the moving-coil instruments give a much truer tone, particularly of musical instruments, and diffuse the sounds evenly in the auditorium. Even diffusion of sound is a most important consideration; in some cinemas, patrons of certain parts of the "house" have to be almost deafened in order that the people at the sides or directly below the screen may hear anything at all!

## RADIO WINS

THE frequency characteristics of talking-picture projectors are poor in comparison with the average broadcasting transmitter linked up with a good radio set. Frequencies above 5,000 are usually lost in the effort to eliminate background noise from disc or sound track, and as a result, the sibilants of speech and high musical notes become somewhat fuzzed. Bass notes, too, as poorly reproduced, especially in disc systems. However, talk seems to be the order of the day and musical films seem to be going out of fashion. So one can hardly blame the picture people for attempting to get greatest intelligibility on speech, even if it means a slight loss of quality. I am afraid that that certain "metallicness" will echo around the walls of cinemas for a long time to come. I would be interested to hear readers' views on "moving-coil" versus "exponential-horn" quality of tone in cinemas.

## VALVES AND VALVE HOLDERS

IT is a curious commentary on the improvement in valves, that we are using rigid type valve-holders to an increasing extent to-day. Many of these are provided with a form of spring contact immediately underneath the sockets, but this is designed to accommodate the differences in the thickness and location of the pins, and the spring in any case is too stiff to give an appreciable vibratory action. Yet we do not appear to be experiencing any undue trouble from microphonic noises.

Compare this with the state of affairs a few years ago, when no one would dream of using anything but an antiphonic valve-holder throughout the set. There are cases where the vibratory valve-holder was definitely a disadvantage. I have on many occasions experienced trouble in portable receivers with the cheaper form of holder, in which the springs were of rather light construction. During transit the valve, of course, wobbled about considerably, and the continual vibration simply broke the springs at the anchorage. The result was that the set ceased to function, and after having located the fault it was necessary to take the valve-holder completely out, undoing all the wiring, and to replace it with another one. Valves themselves have been broken by the excessive vibration of some of these holders, and one can only regard it as a step in the right direction that we are reverting to the rigid form of holder, which is more satisfactory from all points of view.

## AND VALVE PINS

THE development of the solid pin seems to be a little more tardy. There was a suggestion a year ago, that all valves should be made with solid pins, instead of the usual split type. American valves, of course, or should I say "toobs," are all solid, except in the very high-powered variety, but then the American socket does not rely for its contact on a sliding slit. The bottom of the pin comes into contact with strips of springy material, often tipped with an alloy, and consequently as long as the length of the pin was within certain limits variations in the position or diameter of the pin did not matter very much.

In this country where we retained the

# On Your Wavelength! (continued)

sliding contact this question of positioning and dimensions was still of great importance, and it has presumably been found impracticable to use solid pins. At any rate, nearly all the valves in use to-day still retain the spring or banana type of pin.

## ANOTHER SUCCESS

BY all accounts, the Manchester Radio Exhibition has repeated the success of its big brother at Olympia. It is, of course, a smaller show; but there are no less than one hundred and twenty-nine stands, and that's a pretty good number when you come to think of it. Many northern readers will have had the opportunity of meeting the AMATEUR WIRELESS people, and I hope that they don't fail to turn up at Stand No. 11 to examine the good things displayed there. Almost all of the most important wireless firms are well represented, as is only natural, for Manchester has always been a great centre of wireless enthusiasts.

## A QUEER POLICY

LISTENERS in the north will shortly be introduced to the Slaithwaite super station in the same gradual way that Southerners made their acquaintance with the Brookmans Park twins. The idea is to operate at first only one of the transmitters, and this on quite moderate power during normal broadcasting hours. The power will gradually increase, and presently the second of the pair will be, to use the B.B.C.'s own expression, faded in. The scheme is, I suppose, to break it gently to listeners. But I am not at all sure that past experience has shown it to be really sound policy. What I am driving at is this. You want to repair a set that will cope with the new conditions. You make a hook-up first of all, try it out, and find it perfectly satisfactory with the transmissions going at half-power. Not realising that there is the very "dickens" of a difference between this and full power, you turn your hook-up into a finished set and tell all your friends that you, at any rate, will not be bothered by wipe-out problems. Then one fine night the power goes up again, and you become conscious that your selectivity is not quite what you thought it was. A little later on you may find that it isn't good enough and have to re-make the whole thing.

## ANOTHER POINT

AGAIN, unscrupulous dealers may palm off on customers, who know nothing of wireless, sets that are not suitable for the new conditions by giving demonstrations during the fading-in period. Personally, I think it would be very much better to issue full preliminary warnings and then to let the two stations go at full blast—at all events, for certain periods each evening. Meantime, I am wondering whether some of the Northern readers who called me selfish when I criticised the Brookmans Park station won't revise their opinions after they have had a dose of high-power medicine at short range.

## A NEW PROBLEM

SOME people with whom I have chatted on wireless subjects profess themselves rather nervous about what will happen when 5GB comes down to 376.4 metres. Personally, though I don't welcome the change, I don't anticipate any difficulty in separating the London Regional from the Midland Regional. The alterations made some time ago in the Daventry medium-wave aerial reduced the field strength of the station in a southerly direction, and when he is working on 479 metres I have no bother at all about getting Langenberg, 6 metres below him or 9 kilocycles above him, whichever way you like to put it. In his new position 5GB will be 20.1 metres above the London Regional or 45 kilocycles below him. Most listeners, I imagine, will have little difficulty in getting London without Daventry, and it doesn't matter very much if they cannot get Daventry without London, for the two nowadays seem mostly to send out the same programme. The people most likely to suffer are those living to the north-west of Brookmans Park and south-east of Daventry; but this, luckily, is not a very thickly populated area.

The thing that does annoy me is that I may find it difficult to receive, without using something very selective in the way of circuits, those excellent Continental stations Hamburg and possibly Toulouse. However, as I have said before, people like myself need not grumble very much, for wireless, after all, is our job, and we have both the knowledge and the components to alter our sets as may be needed. It is, though, pretty hard lines on non-technical people who must take their sets as they find them.

## THE REGIONAL SCHEME AND FOREIGN RECEPTION

WITH the development of the regional scheme in the next year or two we must eventually arrive at a state of affairs in which listening to any but long-wave foreign stations and a very few of the more powerful medium wavers becomes a matter of impossibility except for those with powerful and selective sets. Many people would not mind this so long as they could pick up a reasonable number of alternatives from the home stations. But, unless I am very much mistaken, what we shall be given, unless we are careful, is simply two main programmes—the Regional and the National from all stations, with just occasional genuine local evenings. And if people then are tied to two programmes there is sure to be some grousing, particularly during the festive hours of our home-produced Sunday programmes. What I think will happen is that, just as is the case at present, listeners will divide themselves into two classes. One of these will want nothing but the local programmes; the other will still demand foreign stations, and will either buy or build the bigger and more selective sets made necessary by the conditions of the near future. Unfortunately, such sets cost money, both to make or to buy and to operate, and the number of people to whom long-distance listening forms one of the most enjoyable of hobbies must necessarily diminish.



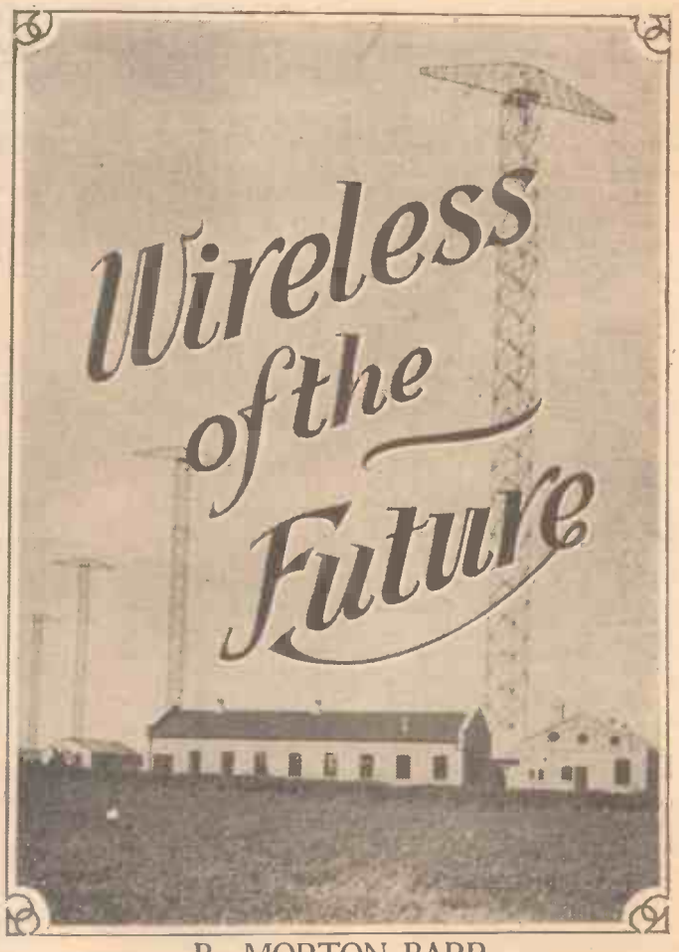
## SETS OF THE FUTURE

IT is quite clear that the receiving set of the future must become more and more selective, and at the same time there will be stronger and stronger demands for good quality. To my mind, Dr. Robinson's Stenode system is the one most likely to provide a solution for the keen long-distance man. The broadcast model of the Stenode has now emerged from the experimental stages, and licences to construct it are being issued to firms and manufacturers. Readers may be interested to know that I have used one of these sets both for broadcast reception and for the reproduction of gramophone records, and I am so delighted with it that I hope to install one in my own house before so very long. The original Stenode made use of a quartz crystal gate, and with this I found no difficulty in separating stations working on channels 2 kilocycles or less apart. The tuning, however, was really too fine for any but those who had considerable practical experience with sensitive sets. Now, for present-day broadcasting conditions, such high selectivity as this is unnecessary. The broadcast model does not incorporate a crystal gate, but it gives clear-cut separation between stations working on channels 5 kilocycles apart. The set itself is a seven-valver designed for mains operation. The tuning controls are very simple indeed to operate and the quality, as I mentioned recently, is super-excellent.

## LOWER AND LOWER COSTS

MASS production can achieve amazing results upon prices. Until recently, though, we have not seen anything like real mass production in receiving sets. Now sets are offered at prices that but a few years ago would have been thought utterly impossible and the question that everybody is asking is: "Can they be any good?" So long as you don't expect all the refinements possible with a big and expensive receiver, a little fellow costing far less may give you very satisfactory reproduction of local programmes, and even enable you to reach out a little. But don't expect with the small set to be able to fill a large hall with undistorted music. Like the baby car, it is a miniature affair and it will give of its best if you don't overload it.

THERMION.




By MORTON BARR

THE use of short waves, ranging from 10 to 45 metres, is a comparatively recent development in long-distance commercial wireless. Its success is almost entirely due to the fact that such waves can be concentrated by means of special aerial systems and reflectors into a directed ray or beam, whereas the longer wavelengths are not so amenable.

A few years ago a small band of amateur workers astonished everybody—including the technical experts—by covering distances up to 10,000 miles, using waves below 100 metres and very little power. In a sense, they were the pioneers of what may be called the short-wave "revival," because such waves were, in fact, used for a time in the very early days of wireless, and were then abandoned as being unsuitable for long-range working.

Unfortunately, the later amateur results were found to be too much at the mercy of "fading" and other atmospheric conditions to justify adoption on a commercial scale. However, radio engineers were quick to see the possibilities ahead, and before long succeeded in designing special directive aerials capable of radiating the waves in a concentrated beam. In this form shorter waves were first definitely harnessed to useful work.

### Power Saved

To illustrate the saving in power effected by a directional wireless system, the circle shown in Fig. 1 may be taken to represent the distribution of the wave energy radiated by a non-directional aerial. Now imagine

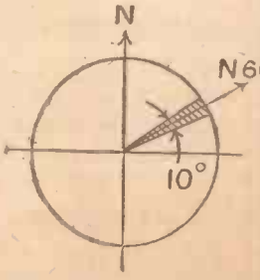



Fig. 1. Power saved by directional radiation

that some method can be found of localising the radiation inside the shaded sector of 10 degrees, i.e. of confining the waves to an angle of 5 degrees on each side of a line pointing directly towards the distant receiving station.

It is clear from the figure that, in the ideal case, only 10/360, or one-thirty-sixth the original power is required to produce the same field strength in the desired direction—and this is all that matters, because energy radiated in other directions is simply wasted in a communication system.

Or, from another point of view, if the original amount of power is radiated, then the signal strength at the receiving station is increased thirty-six times. Of course, the full theoretical advantage is never attained in practice, but the general principle holds good.

### Long-wave Working

Early long-distance radio communication was carried out on wavelengths varying from 5,000 to 20,000 metres. Only in this way was it found possible in those days to get sufficient power into the ether to give reliable transoceanic or transcontinental reception.

For instance, the first public transatlantic telephony system, opened early in 1927, utilised a wavelength of 5,000 metres. Such a wave is approximately three miles long and requires an extensive and costly aerial system supported by towers or pylons each 400 ft. high. The power input was nominally rated at 50 kilowatts, but in practice varied between that figure and 100 kilowatts. The signals were received on low-lying aerials of the Beverage or "wave" type, extending for a distance of over 16,000 ft.—roughly three miles in length.

### The New Short-wave Service

By contrast, the new directional system is worked on a normal wavelength of 15 metres, though this may be increased to 38 metres, the particular wavelength in use at any time depending upon the time of day and upon other seasonal and climatic conditions.

The transmitting aerials are approximately 500 ft. long and are supported by towers only 180 ft. high. The power radiated is nominally 15 kilowatts, though the peak value is probably double this figure. The receiving aerials are about 700 ft. in length, but are only one-quarter of a wavelength high, viz., 30 ft. above ground at the most.

The production of a directed wireless beam is only possible when the aerial or reflector system is at least several wavelengths long. This at once limits such systems to the use of short waves.

For instance, to produce a directed beam on a wavelength of 500 metres, a transmitting aerial over 10,000 ft. long and 2,000 ft. high would be required. The cost of such an aerial would be absolutely prohibitive, even if the mechanical difficulties of erecting it at such a height could be overcome.

### The First Beam Aerial

The earliest form of beam aerial was constructed on the principle of the well-known parabolic reflector as used in optics. It consisted of a single short-wave Hertzian rod oscillator surrounded by a series of similar rods forming a parabolic reflecting surface, the oscillator being situated at the focal point.

This type of aerial is still used in coastal

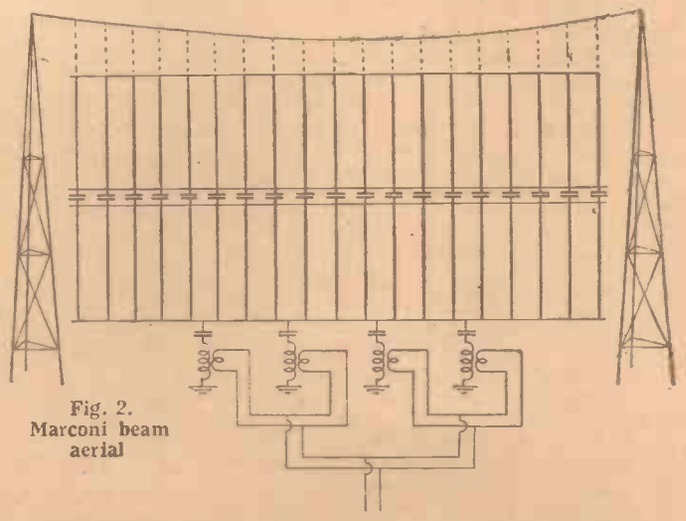


Fig. 2. Marconi beam aerial

installations for assisting navigators in foggy weather. The whole aerial system, including the reflectors, is mounted on a revolving platform, so that the directional wireless beam can be rotated in much the same way as the revolving ray from a lighthouse.

### Modern Directional Systems

The parabolic form of aerial has now been replaced by a series of vertical rods or

Hertzian oscillators, all arranged in the same plane and supported by horizontal wires strung between vertical supports, as shown in Fig. 2, which illustrates the modern Marconi beam.

Usually there are two or more vertical tiers of rods, placed one above the other, the whole forming a large screen or network of radiators.

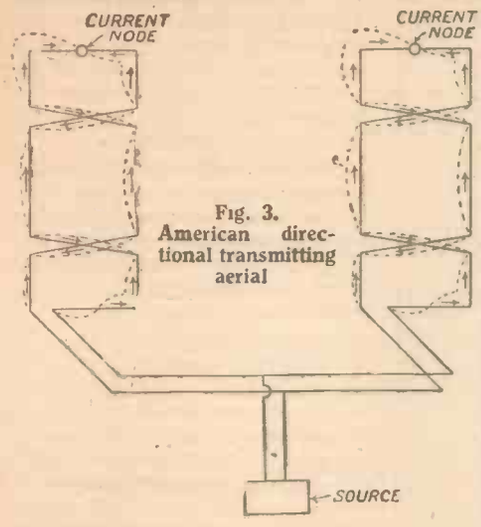



Fig. 3. American directional transmitting aerial

Fig. 3 illustrates two units or panels of the American beam transmitter. Here a closed circuit is formed partly of vertical and partly of horizontal wires. Owing to the manner in which the wires are bent over, the currents in the vertical portions are all in phase and radiate energy in a direction at right angles to the plane of the paper. On the other hand the currents in the horizontal portions are out of phase, so that there is no effective radiation from them.

The corresponding receiving aerial is shown in Fig. 4. The lower part of the figure represents a typical "unit," whilst the upper portion indicates the manner in which a line of such units is supported in position, together with a similar reflecting aerial.

The distribution of the induced voltages in each limb of the network is such that the effects all add together in the central receiver R when the received wave is travelling in a direction at right angles to the plane of the aerial, whilst they all cancel out if the wave is travelling in the plane of the aerial.

### "Broadside" Beams

The directional effect of a series of rod oscillators all arranged in the same plane, as shown, for instance, in Fig. 2, depends upon the manner in which the system is energised. If the high-frequency supply is such that the currents set up in all the vertical rods are in phase, then a "broadside" beam of wave energy is radiated front and rear, i.e. in both directions at right angles to the plane of the network.

By placing a similar network a quarter wavelength behind the first, the rear radiation is cut off and reflected back to augment the forward radiation, so that the system sends out only one-sharply-directed beam of energy.

By changing over, that is, by energising the second network, and using the first network merely as a reflector, the direction of the beam is reversed. In practice this is sometimes done in order to send the signals to their destination over a more favourable route, i.e. one in which the greater part of the path taken lies in darkness, and so is not subject to the disturbing effect of prolonged sunlight on the Heaviside layer.

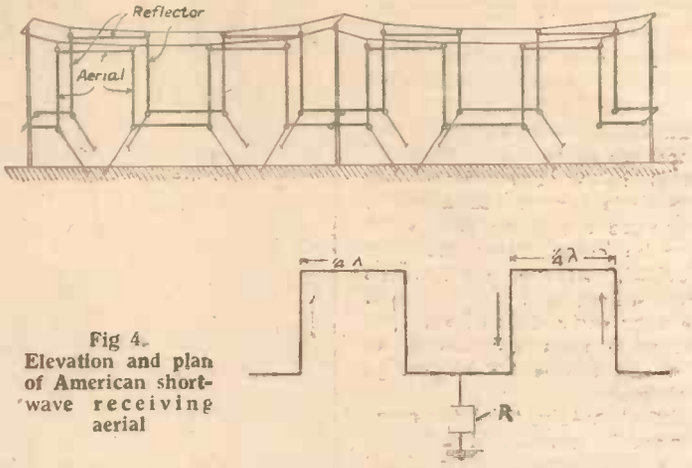



Fig 4. Elevation and plan of American short-wave receiving aerial

### Producing an "End on" Beam

If the original aerial network is so energised that the current in any one rod oscillator is out of phase with the current in the next rod, then the directional effect is altered. The beam is now radiated along the line of the aerials instead of at right angles, as before.

In this "end-on" arrangement the beam is not so sharply defined as in the first or "broadside" system, although it can be considerably improved by setting up a second similar network parallel to the first. If the second network is staggered relatively to the first by a quarter of a wavelength, the whole system is again made unidirectional, only one "forward" beam being emitted, the rear beam disappearing owing to mutual interference between the out-of-phase components.

## THE HEAVISIDE LAYER

OPINION is at present divided as to how far wireless waves penetrate into the Heaviside layer before they are diverted back to the earth's surface. According to one school of thought, the waves are reflected immediately on impact, i.e., they do not pass into the interior of the ionised zone. The other theory is that the layer refracts rather than reflects the waves, which means that there must be very considerable penetration before the wave-front is reversed in direction. The point is of considerable importance in considering the action of the earth's magnetic field as affecting polarisation, skip distance, etc. If the waves travel far into the interior of the layer, the effect of the earth's field must be much more pronounced than if they are merely reflected back from the near surface.

B.

Two steam trawlers belonging to the Iago Steam Trawler Company, Ltd., have recently been fitted with wireless-telephony sets at Fleetwood.

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Lissenden's impression of P. G. WODEHOUSE

## DIRECTION-FINDING

THE use of short waves for determining the course or bearings of a ship at sea is rapidly nearing perfection. On a wavelength of 24 metres, accurate readings can be ensured at a distance of twenty miles with a maximum error of less than two degrees. Under good conditions, reliable results can be obtained up to a range of seventy miles, though the margin of error tends to increase with distance owing to the predominance of waves reflected downwards from the Heaviside layer.

However, by using the Adcock aerial, correct bearings (within five degrees) have been secured up to distances of five hundred miles and over. In the Adcock aerial the effect of the horizontal component is automatically balanced out, thus eliminating the effect of the down-coming wave.

M.A.L.

Certain proposals are before the Indian Government regarding the establishment of a wireless telephone service between Bombay and Great Britain.

# W. JAMES'S CHOICE FOR THE "CHALLENGE FOUR"

*IGRANIC L.F. CHOKE No. 30C*

*IGRANIC MIDGET TRANSFORMER*

W. James has specified the Igranic L.F. choke No. 30C for the remarkable new receiver described in this issue. The following Igranic radio devices have also been recommended to constructors for building this set:

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2 mfd. and three 1 mfd. Fixed Condensers
Two ·0003 and one ·0002 mfd. Fixed Condensers

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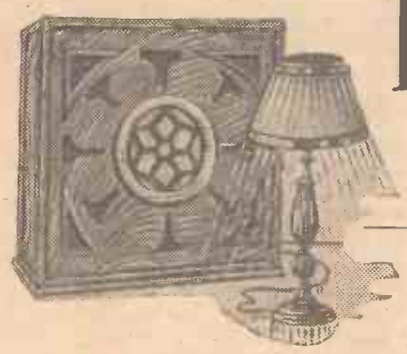

# LONG EVENINGS and IMPROVED RECEPTION

By N. W. McLACHLAN D.Sc., M.I.E.E., F.Inst.P.

## *An Explanation of Why Winter Conditions are Better for Long-distance Work*

SOME of the fascination of radio reception undoubtedly lies in its uncertainties and vagaries. Whilst good reception of distant stations may appear to be a matter of pure chance, radio waves follow quite definite laws. The generation of these waves can be controlled, but after leaving the transmitter, their behaviour is dependent upon the peculiar physical conditions encountered in their outward journey through space. Like all other forms

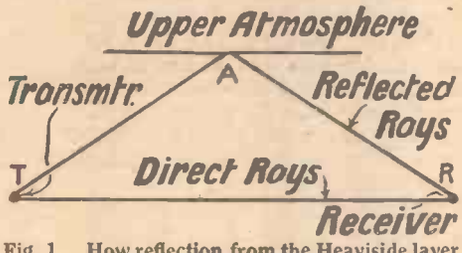


**Fig. 1. How reflection from the Heaviside layer assists long-distance reception**

of energy such as light and sound, radio waves become weaker as they travel outwards towards their destination. Neglecting effects due to reflection from the upper atmosphere, it is reasonable to assume that the greater the distance of a listener from a broadcasting station, the weaker will be his received signals. This will be the case quite irrespective of the season.

The temperature of the atmosphere does not affect the propagation of radio waves as such, but it gives rise to secondary effects which are particularly prominent where warm weather prevails, i.e., the creation of atmospherics or parastic disturbances in the ether which are picked up by an aerial and resolved into undesirable noises and "mush." Atmospherics are essentially due to variation in the electrical conditions of the atmosphere. The phenomena which occur give rise to disturbances of enormous power. They are propagated like radio and are capable of detection at great distances. Atmospheric disturbances are so irregular that they cover a wide band of wavelengths. Thus it is impossible to tune these disturbances out. Interference due to atmospherics is much more in evidence in Great Britain during the summer months than in the winter. One must expect therefore, that summer reception will suffer more interruption than that in winter. The use of a frame aerial with directive properties will tend to minimise the effects of atmospherics, but sometimes the source of maximum disturbance will lie in the same direction as the desired station when the frame will be of no avail.

Signals from a distant station arrive at the listener's aerial by two different routes as illustrated in Fig. 1. The transmitter sends out rays T R parallel to the earth and also rays T A which ascend towards the sky. These latter rays are reflected, as is light from a mirror. They return to earth and fall upon the distant receiver as shown by the rays A R.

### Effect of Sunlight

Owing to the influence of the sun upon the electrical properties of the upper atmosphere, the reflected radio rays A R are much weaker during the day than at night. If the stations are several hundred miles apart, the rays T R are always extremely weak and the signals arrive by A R, i.e., by reflection from the upper atmosphere. It is for this reason that the reception of distant stations is best after dark.

For example, signals from Australia reach here by that side of the earth which is in total darkness, rather than by the shorter path which is in daylight. Furthermore it is common experience that a foreign station tuned in towards dusk becomes progressively louder as darkness settles over the intervening space. For the same reason, also, a radio set of low H.F. amplifying power will occasionally—after dark—be capable of receiving a large number of foreign stations. This brings home the fact that in summer the greater portion of our listening is done in daylight. Thus,

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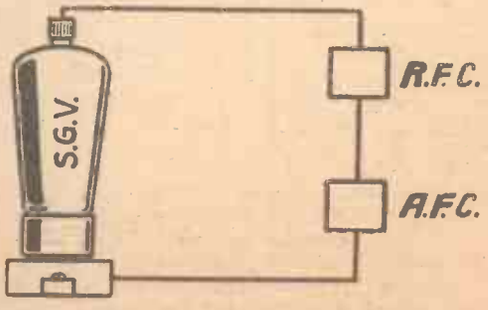
we cannot expect to have the same degree of success in picking up distant stations as in winter.

For distant reception in daylight it is essential to use a set whose H.F. amplification is large, particularly if a frame aerial is employed. The set with a single knob control, and a fair performance, will generally have two or more H.F. stages. The tuning is probably flat and the efficiency is by no means the theoretical maximum for the number of valves employed. Sets employing more selective circuits usually have greater H.F. amplification, but this necessitates the manipulation of two or more dials. The use of such sets is not to be deprecated, in fact their selectivity is a great advantage when the wavelengths of two stations are nearly equal.

We are thus faced with the conditions that in daylight the received signals from distant stations are inevitably weak. The proportion of noise due to atmospherics is




S.G.V.= Screen-grid valve
R.F.C.= Radio-frequency oscillatory circuit (variable) from 200 to 3,000 metres
A.F.C.= Audio-frequency oscillatory circuit (fixed) about 800 cycles

**Fig. 2. Schematic diagram of wavemeter of the modulated continuous-wave type**

considerable and the use of a receiver with efficient H.F. amplification and selectivity is essential. The latter will require a little patience in manipulation to overcome the tuning difficulties, but matters can be simplified by employing some form of wavemeter or station-finder.

Recently the author introduced a new type of wavemeter or station-finder of the modulated continuous-wave type. A schematic diagram of connections is shown in Fig. 2. The instrument emits a tuning note on the wavelength to which it is adjusted, so that it is really a broadcasting station in miniature. The action depends upon certain properties of the screen-grid valve. The latter being fed from the batteries operating the receiver. To obtain a distant station it is merely necessary to turn the condenser of the meter to the desired wavelength and tune the receiver for maximum signals. Then the meter is switched off and if the station is working it will be heard. It is quite certain that in conjunction with a well-made modern receiving set a wavemeter is a boon to the enthusiast who really wants to receive and indentify distant stations, irrespective of the time of day or the season.

# MAKING YOUR OWN H.F. CHOKE

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

RECENTLY I received a letter from a correspondent asking for particulars of the construction of high-frequency chokes. He was apparently very interested in the series of curves which were given in *Wireless Magazine* some time ago, showing the relative performance of various makes of choke, and indicating the desirable features. He pointed out that he is interested in the construction of his own components as a hobby, and would therefore welcome some practical data on the subject.

Now, a high-frequency choke is nothing more nor less than an inductance of particular construction. It does not act in the circuit as an inductance, however, and it is because of this that the special construction is necessary. It will perhaps be as well to make this point quite clear before proceeding any farther.

### H.F. Choke Requirements

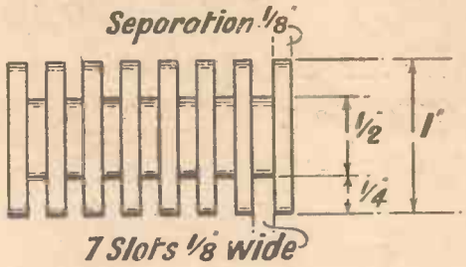
We use an H.F. choke to present a large impedance to the high-frequency current. If we take a simple coil, the impedance increases as the wavelength decreases. This increase continues until a point is reached where the inductance of the coil and its own self-capacity form a resonant or tuned circuit, at which point the impedance of the arrangement is very large indeed. If we continue to reduce the wavelength, however, beyond this point the current begins to be short-circuited through the self-capacity, and ultimately the system behaves as if it were a condenser of value equal to the self-capacity of the coil. The only difference is that the arrangement will pass direct or low-frequency current which, of course, a simple condenser will not do.

Practical experience shows that we must avoid this resonance occurring within the wavelength range which we are to receive, and therefore our first consideration is the choice of the inductance and self-capacity of the coil, so that the resonant wavelength is in the neighbourhood of 2,000 metres or more. Then over the whole of our working range of wavelength the system is behaving as a capacity, the value of which is determined by the actual self-capacity of the choke. The effectiveness of the component is increased if we can make this self-capacity very small, and our skill in design lies in this direction.

### Self-capacity

Apart from this aspect of the question, a simple coil will act quite satisfactorily as an H.F. choke; and, indeed, some of the H.F. chokes on the market are nothing more than plain inductance coils wound with a relatively large number of turns, so that the resonance with the self-capacity occurs outside the broadcast band. A disadvantage of this form of construction is that the self-capacity cannot be kept low, and it is for this reason that the well-known "section" winding is adopted. If we wind our coils in a number of slots, separated from one another, the self-capacity of the resulting arrangement is small.

There are, of course, various factors in the design into which I cannot enter in the present brief article. Generally speaking, however, the diameter of the choke should be kept small, as the self-capacity is proportional to this factor; and the slots should be narrow. The separation between the slots need not be more than the width of the slots themselves. Indeed, it is preferable to make the separation even less than the




Details of former for H.F. choke

width of the slots, as otherwise the inductance becomes relatively inefficient and one has to put on more turns in order to obtain the required value. This, of course, increases the resistance of the choke, and while resistance is not an important factor in the majority of cases, it is not desirable to have any more resistance than is absolutely necessary.

### Practical Details

Let us consider the design of a practical choke. We will choose a former 1 inch diameter, having slots ⅛ in. wide, ¼ in. deep, and ⅛ in. separation, as shown by the figure. How many slots shall we require? This question is best answered by practical experience. If only a few slots are used there is a danger of "peaks" or "holes" in the choke. These are subsidiary resonance points, quite distinct from the main resonance, and they disturb the even choking action which is obtained with the normal choke. In many circuits self-oscillation will occur at these peaks, while other circuits will refuse to oscillate or will function badly. The exact result depends upon how the choke is being used, but it will be clear that these peaks are to be avoided.

It is usually found that if seven or more slots are employed the danger of peaking is obviated, and we will employ this number in our choke. The next point to be determined is the winding, which is governed by the inductance we require. A good choke should have an inductance of at least 200,000 microhenries. Many chokes have higher inductances, while some have inductances as low as 100,000 microhenries and are still satisfactory. It is not desirable to go below this figure. In the present instance we shall work to a value of 100,000 microhenries. If the reader wishes to increase the inductance he will easily be able to do so.

### Winding

The winding must now be calculated, and it is usually sufficient for an approximation to neglect the slots and consider the whole coil. Thus in our case we have a coil 1 in. outside diameter, 1⅜ in. long, and ¼ in. thick. We can find the number of turns required to give the inductance we need, and divide this figure by the number of slots to obtain the turns per slot. In our case the number of turns is 3,500, giving 500 turns per slot.

### Wire Sizes

The final point is the gauge of wire. This is determined by the area of the slot—in our case ¼ in. by ⅛ in. = 0.031 sq. in. We do not use all this area, for there is a gap between the various turns, and this gap is quite considerable in relation to the wire diameter, particularly when using fine wires. Hence we must multiply our actual area by a "space factor," which we can assume to be 50 per cent., giving us an effective area of, say, 0.015 sq. in. The area of the wire is this 0.015 divided by 350 = .000043. This coincides almost exactly with No. 38 s.w.g. enamelled wire, and we can therefore specify 500 turns per slot of No. 38 enamelled.

The result will be a choke of good performance under average circumstances, of reasonably low self-capacity, and it will be easy to construct. The amount of wire required will be about 1½ oz.

### DO YOU KNOW—

**that with some of the first-produced transformers having special alloy cores, care must be taken not to upset their characteristics? Some of these transformers do not work well if dropped or knocked about.**

**that all screen-grid valves of one type are not necessarily the same in working? Some screen-grid valves take far more high-tension current than they should, and if your valve appears to be unduly greedy then you might try the simple experiment of putting a 1½-volt bias cell in the grid circuit.**

**that if it is not possible for you to erect an outdoor aerial and you are bothered with lack of selectivity, then you may get better results with a frame than with a small indoor aerial? That is why portable sets are often so much better off in the way of separating local stations.**

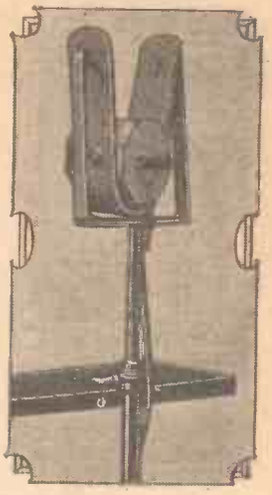
## NO HUM

HUM ought not to be heard from an A.C. mains set. Modern valves are good and so are most mains units, and you should therefore look to the set if a bad hum is heard.

The grid wire of the detector valve should be kept as short as possible, and a low value of grid-leak resistance be used.

Keep all low-frequency grid wires short and be sure the valves make good contact in their holders. Look after the detector in particular, as much hum is to be traced to this stage.

# WHY NOT HEAR THE TALKS?



*An article of topical interest by Alan Hunter, inspired by the B.B.C.'s new talks series*

RIGHT in the middle of one of the most exciting talks recently broadcast, a neighbour of mine called to discuss his new lawn mower. That neighbour is by no means lacking in manners; in fact in everyday affairs he is a stickler for etiquette. Then why should he so rudely interrupt the broadcaster's thrilling narrative?

Continually, I am annoyed by this sort of discourtesy to the broadcast talker; not because I feel unduly solicitous about the talker, but because of the implication that I have been listening to the talk just to pass the time away, without being interested, amused, edified, or thrilled.

The fact is that very few listeners attempt to *listen* to talks; and those who do are interrupted by family conversation —even by the rival attraction of a gramophone or piano playing in some other room.

Sir John Reith has often stressed the need for selective listening; for a careful choice beforehand of broadcast items that appeal. In no sphere of broadcasting is this need more true than in the talks.

To those who say the function of broadcasting is to entertain, thereby attempting to dismiss talks entirely, I would make this point; talks can be entertaining, and many B.B.C. talks are very entertaining, much more so than back-chat comedians deprived of the advantage of a laughter-provoking red nose.

It was Professor Millikan, the American astronomer, who recently said "The whole British nation is now being given educational advantages of the finest possible sort, at less than a cent a family a night." He was referring, of course, to the B.B.C.'s broadcast talks.

In his foreword to listeners, published in the new broadcast talks pamphlet, Mr. Harold Nicholson says: "You will observe that the B.B.C. are not such ninnies as you would wish to think. They have chosen a range of subjects which embraces all the most important problems of our age. And they have engaged to speak to you on these subjects the greatest experts which our country can produce."

Even a casual look through the new talks syllabus proves Mr. Nicholson's contention. The talent invoked on behalf of listeners presents the most imposing array of acknowledged experts I have ever seen. I wonder how many listeners will take advantage of this knowledge when it is imparted during these talks.

Many who now regard talks as so much wasted time in the broadcast programme would probably surprise themselves if they would only give the talks a chance. Please do not imagine that I, who have so often written in a complaining way of B.B.C. programmes, now regard talks as the main item of broadcast interest, but as they take up so much of the programme time we might at least try to enjoy them.

Perhaps the most startling talks development is the introduction of highly controversial topics on Sundays. Of particular interest to those who wish to hear religious leaders air their views is a series of talks by eminent thinkers, on science and religion. Here the B.B.C. is offering a way out of religious perplexities that might be impossible by any other means.

"A University at your command," is how Harold Nicholson epitomises the B.B.C.'s new talks series. He asks whether

**Dean Inge, who is to speak in the series of talks on science and religion**

he is making too high a claim. I do not think so, provided the listener is prepared to fall in with his stipulations.

Firstly, the listener must be unselfish, and not expect always to find the talk dealing with subjects he is personally interested in. Secondly, the listener must be patient. If he tunes in a station he is asked to stop there! Thirdly, the listener must excercise his powers of selection and not become terribly annoyed because he has switched on without previously making sure the talk was on one of his pet aversions.

On this basis I see reason to hope every listener will find something appealing in the new talks. Just look at the range of subjects:—

Books and reading; the countryside; health; the household; industry and economics; international affairs; languages;

(*Continued at foot of next page*)

**Sir J. H. Jeans will interest listeners with talks in "The Stars in their Courses" series**

# 21 SETS AND SPEAKERS for You to Build

THIS is the title of a 32-page book which I am presenting with every issue of AMATEUR WIRELESS next week. You will find it most useful, setting out in a simple and attractive manner the salient points of twenty-one pieces of approved apparatus—some splendid sets, two highly successful loud-speakers of the kind almost exclusively associated with AMATEUR WIRELESS and one or two gadgets in the nature of wave-traps, etc.

In most cases there is a circuit diagram or a layout drawing, and in every case a specification of the components.

It is a first-rate book for

**THE HOME SET-BUILDER**

to have by him. To every *new* reader it will come as a great boon, and the real object of this announcement is to provide me with an opportunity of asking my readers to make known to all their wireless friends the fact that I am presenting this book next week.

You will need no reminder that AMATEUR WIRELESS

**GIFTS ARE GIFTS**

indeed; they are the real thing. Just as our blueprints this week, presented with every copy, are the finest of their kind, without exception, and produced at considerable cost and thought, so our book next week will contain real value, and make a direct and practical appeal to everybody who builds, alters, or experiments with wireless gear.

As always, I make very definitely the request that you will be good enough to order your copy at once. An early order ensures your copy, saves trouble to the distributing trade, and prevents waste.

With the *very next issue*, you will observe, published next Thursday, October 23, I am presenting this book.

THE EDITOR.

## 32 PAGES OF PRACTICAL INFORMATION AS A FREE GIFT

## "WHY NOT HEAR THE TALKS?"

(*Continued from page* 561)

men, women and affairs; music; overseas; psychology; recreation; religion; science; social problems; and topical talks.

Well, if at least three of these headings fail to appeal to average B.B.C. listeners I have badly underestimated their intelligence and capacity for appreciation.

In the morning talks at 10.45 several new features have been introduced. Talks by Mrs. Oliver Strachey on "Reading for Fun," and those by various speakers on "Strange Peoples and Places," will be welcomed by listeners whose tastes lie in the direction of literature or travel. "The Trials of a Family" is the title of a series to be given on Thursday mornings, when children's diets, their physical and mental health, and how to avoid many troubles by care in the early years, will be discussed.

On Wednesday mornings the series by women M.P.'s will be continued, and talks on purely household matters, such as dress-making, hobbies, and handicrafts, will be given as usual.

Gardening and household affairs will again occupy alternate Friday evenings at 6 p.m.

There has been a re-arrangement of the critics' talks at 7 o'clock. A weekly talk on general literature on Mondays will be given alternately by Mr. Desmond MacCarthy and Miss Sackville West. On Thursdays Mr. Duff Cooper and Mr. Michael Sadleir will give in turn a fortnightly talk on new novels, which will alternate with a fortnightly talk on the cinema by Mr. Francis Birrell. On Tuesdays Mr. James Agate will give his usual talk on "Plays and the Theatre" once a fortnight.

### *SPARKS*

*Overheard near Covent Garden: "Hallo! where are you going?" "Home to listen to the wireless." "What's on?" "Carmen—are you carmen with me?" "No, too Bizet."*

*A bad colour scheme: Violet Lorraine in Red Pepper.*

*A popular studio vaudeville star is the German, Greta Keller, who sings in English. We ought to Greta over here with "Has anyone here seen Keller?"*

*The radio programmes are so poor in Spain that the number of licences has fallen off. In Spain, presumably, more castles are built than sets.*

On Wednesday nights there will be twelve talks called "Industry Looks Ahead." In this series experts will discuss modern industrial problems, concerning themselves chiefly with the human element in industry and with the changes that are taking place in the management and organisation of industry. Sir Josiah Stamp, Dr. Sargant Florence, Lord Amulree, and others will take part in this series.

On Thursday evenings an experiment is being tried in six international conversations. Representatives of six different foreign countries will discuss national differences and characteristics with representatives of this country.

On Fridays experts are going to discuss and describe "The Dark Continent"; and on Saturdays there will be the usual talks on "The Week's Work in the Garden," at 7.20 p.m.

In the London and Midland Regional programme on Mondays and Wednesdays half an hour, from 8 to 8.30 p.m., will be devoted to language talks. On Mondays, besides giving readings for more advanced students, M. Stéphan will attempt to teach French to beginners.

On Fridays, at 8.30 p.m., there will be six talks by Mr. J. C. Squire on "The Enjoyment of Words," followed by six talks by Mr. B. H. C. Matthews on "Electricity in our Bodies." In this series an attempt will be made to demonstrate currents in the body by the use of instruments which convert them into sound, so that listeners can hear them. That should prove interesting.

On Saturdays there will be a series of readings about great British explorers, under the title of "The Spirit of Adventure."

On Tuesday evenings Sir Walford Davies needs no introduction on his return to his evening series on "Music and the Ordinary Listener."

On Wednesdays talks will be given at 10 p.m., and it is hoped that during the Imperial Conference Dominion representatives and others attending the Conference will come to the microphone. If suitable arrangements can be made, a symposium of vital topical interest and importance, which will include different points of view on "Trade Within the Empire," will be given on Thursdays.

## TRANSFORMER ADVICE

A point that should be remembered when choosing a transformer for a set, and you are considering its characteristics, is how will it perform under overload?

This point is always considered in the case of power transformers and should receive every attention in wireless work. Not so many 6 to 1 transformers would be used, I am sure, were overload characteristics fully considered.

Have you ever noticed that the distortion produced by overloading is much more pronounced when the coupling transformer has a ratio of 6 to 1 instead of, say, 3 to 1? One day there will be, I expect, intervalve transformers of 1 to 1 ratio.

The effect of overloading will be the minimum with a transformer of good design having this ratio.

*A Weekly Programme Criticism*—By SYDNEY A. MOSELEY.

# Without Fear or Favour


## MORE ABOUT "PLUGGING"

### DANCE-BAND VERSATILITY

AS I anticipated, my criticism regarding "plugging" has brought me in a number of letters. Fortunately, my correspondents sign their criticisms, which is to the good, because I understand that the pluggers have a good propaganda organisation, part of which is to write in to the B.B.C. backing up their nefarious tactics!

I am afraid I have not room to quote all the letters, but among them the following is representative.

◆ ◆ ◆

For instance, here is Mr. George Ratcliff, of Highbury New Park, who hopes that the suggestion I put forward will never be adopted. And this is his reason, whatever you may think of it:—

"In view of the fact that the B.B.C. does not pay a penny for outside dance-band broadcasts, it is obvious that any attempt on its part to dictate what shall be played would be met with strong resentment by those bands which are at present giving their services free."

And then he adds the extraordinary assertion that previously when the B.B.C. has attempted to dictate it was told on two occasions to take the "mike" away. I confess that this is altogether new to me.

◆ ◆ ◆

Mr. Ratcliff claims that in the case of the Savoy dance bands, it was considered by dance musicians—he adds, "they really do know"—*that they were the finest bands that were ever broadcast.*

This, though, is open to question.

Many listeners will also controvert the further opinion expressed by my correspondent, that if the B.B.C. "starts to dictate" it will immediately lose its outside bands, so that those who were still willing to broadcast would not be worth listening to.

◆ ◆ ◆

"As a last point, I should like to state that broadcasting means more rehearsals and more work for the bands concerned. Why deprive them of their "perks," which is their only reward for broadcasting. Regarding the repetition of popular tunes, they always die a natural death in two or three months, and, in any case, it is no worse than listening to Bach every Sunday for years."

◆ ◆ ◆

I have given Mr. Ratcliff as much space as I can, because there is no doubt that the points he raises are highly controversial.

◆ ◆ ◆

Despite lots of criticism from "Harold" and others, Jack Payne's band of boys certainly does deserve a compliment for at least one quality, and that is its versatility. The other evening I had the pleasure of hearing it play "The Blue Danube.' Now, with the re-introduction of the old-fashioned waltz all sorts of bands have been digging out the old numbers, and in most cases have murdered them; but I must say that Payne's band did full justice to that grand old waltz. It was played with a sense of melody and, what is more, time.

◆ ◆ ◆

Another aspect of the versatility of this band is its clever way of putting over comedy numbers. I do not know who arranges all the patter and side-bits, but whoever he is the band does him justice.

◆ ◆ ◆

Of late we have heard a number of different brass bands, most of them new to the ether. I do not want to be unkind, but in my opinion a brass band is, as far as broadcasting is concerned, either first-rate or useless. Some of the recent brass bands


**Frederick Collier in Cartoon**

## BRASS BANDS

### THE SQUIRE OCTET

to broadcast have undoubtedly come under the latter category.

In many cases they are, I understand, spare-time musicians, and although as amateurs they may be good, I would suggest that their spare-time would be better spent in districts other than that of Savoy Hill. They blow lustily enough and their programmes are ambitious, but they have not the tone nor the expression for broadcast work.

◆ ◆ ◆

"Fat and Forty" writes:—

"Affectionately addressed to Mr. Stuart Robertson (baritone) and other singers. Gentlemen; will you oblige many listeners and, incidentally, myself by letting us hear less of that mournful ditty, 'Drink To Me Only.' At its best, it is a dreary song, and when you persist in dragging it out even more than it is supposed to be dragged out, we listeners are sorely tempted to burst into maudlin tears."

Again a matter of taste. A man who calls "Drink To Me Only" a mournful ditty is—mournfully dotty!

◆ ◆ ◆

For long I have been a warm supporter of the programmes of J. H. Squire's Celeste Octet, but I have a bone to pick with Mr. Squire. Out of nine items comprising the programme on a recent Monday evening, not less than three of them were Mr. Squire's own compositions. While I have no fault to find with Mr. Squire's excellent works, I think he should favour himself a little less and give us a greater variety of compositions.

This is a point I made long ago in reference to other and less well-known composers.

◆ ◆ ◆

I continually receive evidence of the care with which these notes are read.

Here again is a letter referring to a note which I wrote many moons ago regarding an interesting series of talks by Mr. E. R. Appleton, regional director of Cardiff, on the story of "Joseph and his Brethren."

Now a gramophone record of these very talks is sent to me. This, I believe, is a new departure in gramophone recording. The record is a shortened form of the broadcasts to which I refer, and should be useful in schools. Mr. Appleton's idea of making fuller use of dramatic work in our elementary and Sunday schools is good.

PUBLISHED BY BERNARD JONES PUBLICATIONS

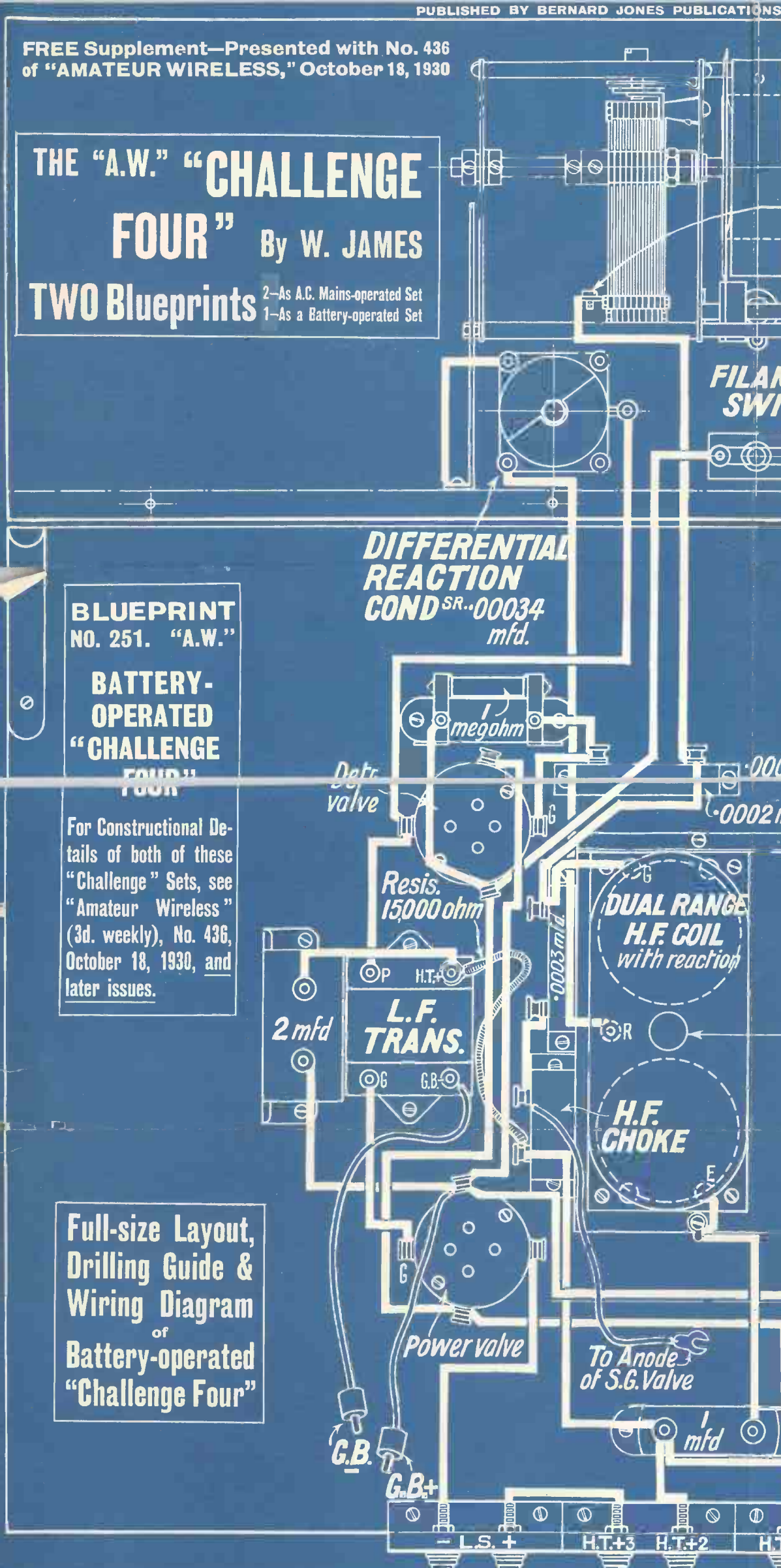
FREE Supplement—Presented with No. 436 of "AMATEUR WIRELESS," October 18, 1930

# THE "A.W." "CHALLENGE FOUR"

By W. JAMES

## TWO Blueprints

2—As A.C. Mains-operated Set
1—As a Battery-operated Set

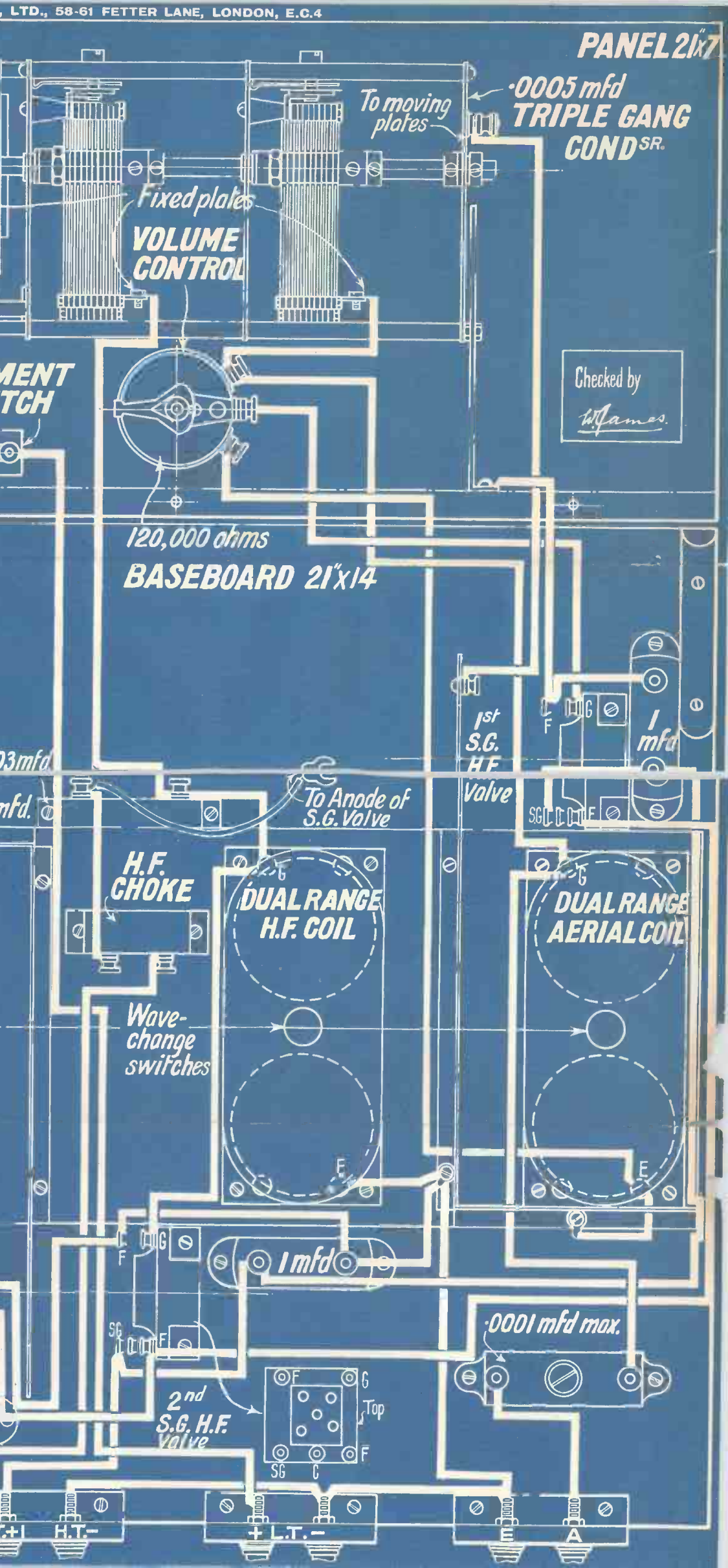



**BLUEPRINT NO. 251. "A.W." BATTERY-OPERATED "CHALLENGE FOUR"**

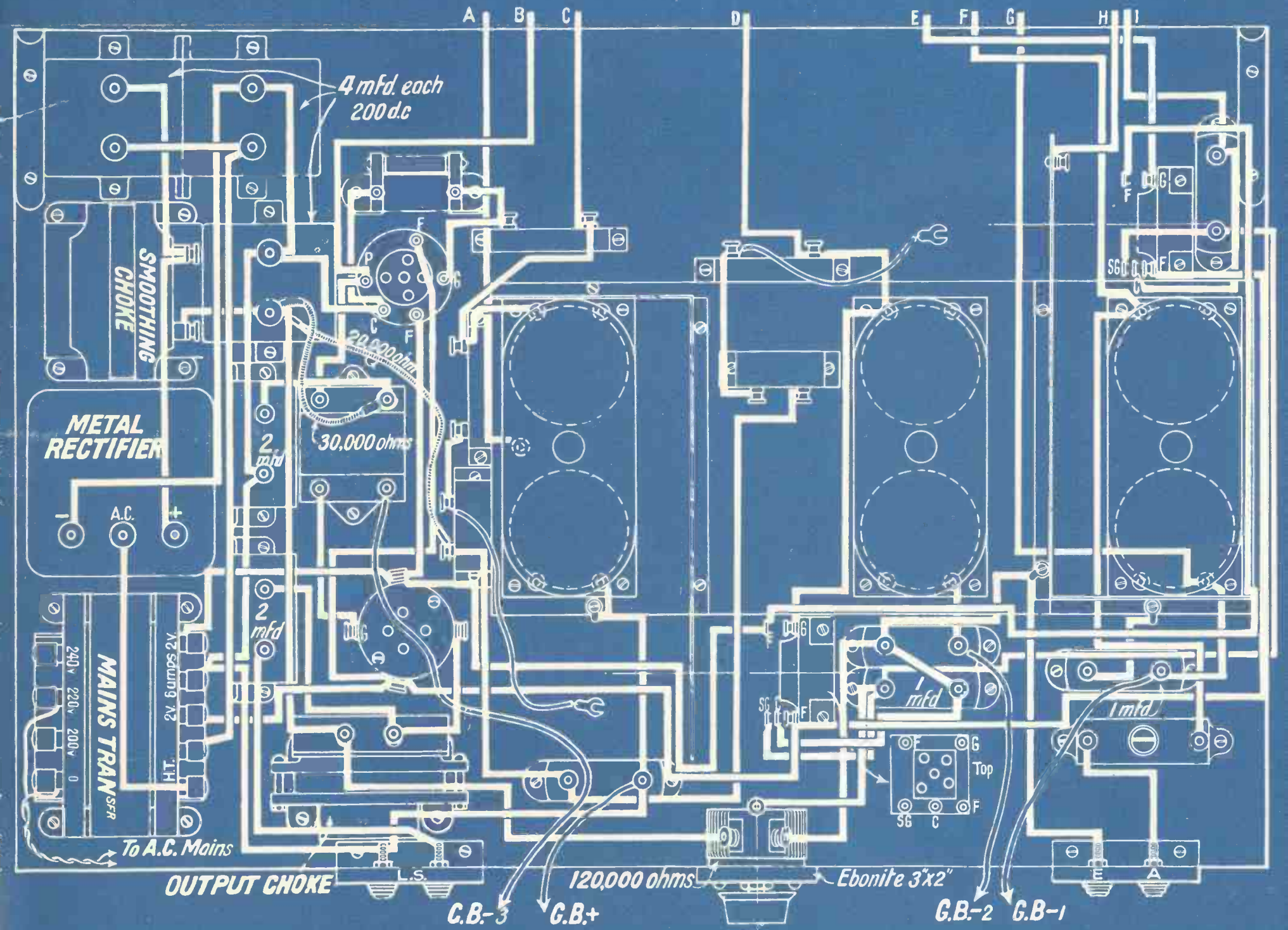
For Constructional Details of both of these "Challenge" Sets, see "Amateur Wireless" (3d. weekly), No. 436, October 18, 1930, and later issues.

**Full-size Layout, Drilling Guide & Wiring Diagram of Battery-operated "Challenge Four"**

, LTD., 58-61 FETTER LANE, LONDON, E.C.4

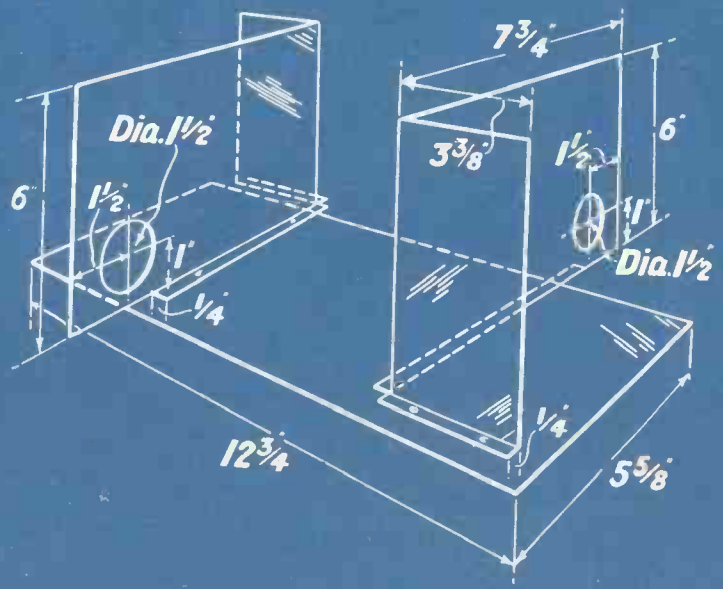


# BLUEPRINT No. 252 "A.W." A.C. Mains-operated

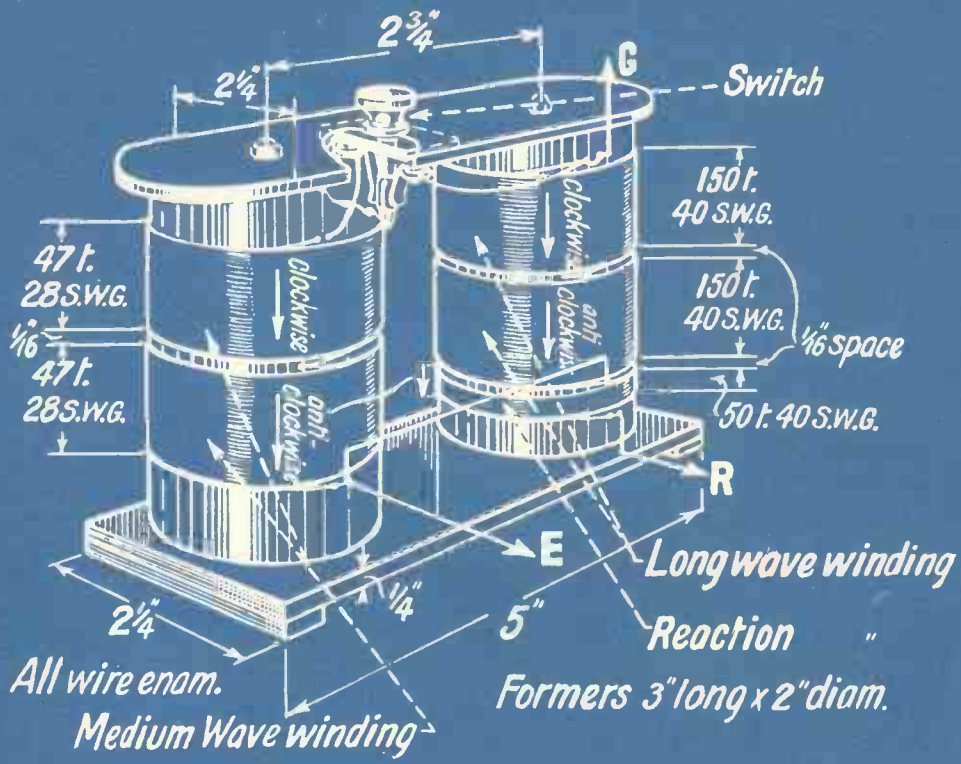



Published by Bernard Jones Publications, Ltd., 58-61 Fetter Lane, London, E.C.4

# "CHALLENGE FOUR" Half-scale Layout and Wiring Diagram




## DETAILS of the SCREENS




## DETAILS OF THE "CHALLENGE" COILS

# THE A.W. "CHA

## ONE-KNOB TUNING

## GREAT RANGE

## SUPER SELECTIVITY

## SUPERB QUALITY OF REPRODUCTION

## DESIGNED AND BUI

THE best set for present conditions of broadcasting is one having the magnification provided by four valves with the corresponding degree of selectivity.

Great magnification by itself is of no value. Too much is heard at once.

The one station desired cannot be received, others being in the background. Many sets are of this type.

Exceptional selectivity without the right amount of magnification is equally useless, for, while we can choose stations, we cannot hear them very clearly; they are too weak.

Magnification and selectivity are the two factors which must be considered together, and a set that is too powerful for its selectivity, or is too selective considering the magnification available, is a badly balanced receiver. It is not a good one.

You cannot, of course, be certain that the amount of magnification and selectivity actually provided in a new set is the best for all listeners. What you can do, however, is so to proportion the set that trials in numerous districts show the results to be above the average.

Even so, one listener might possibly be prepared to sacrifice a little magnification in order to have a little more selectivity. Another, on the other hand, living in a district well away from the nearest broadcasting station, might prefer all the magnification that can be obtained, provided the set is still reasonably selective.

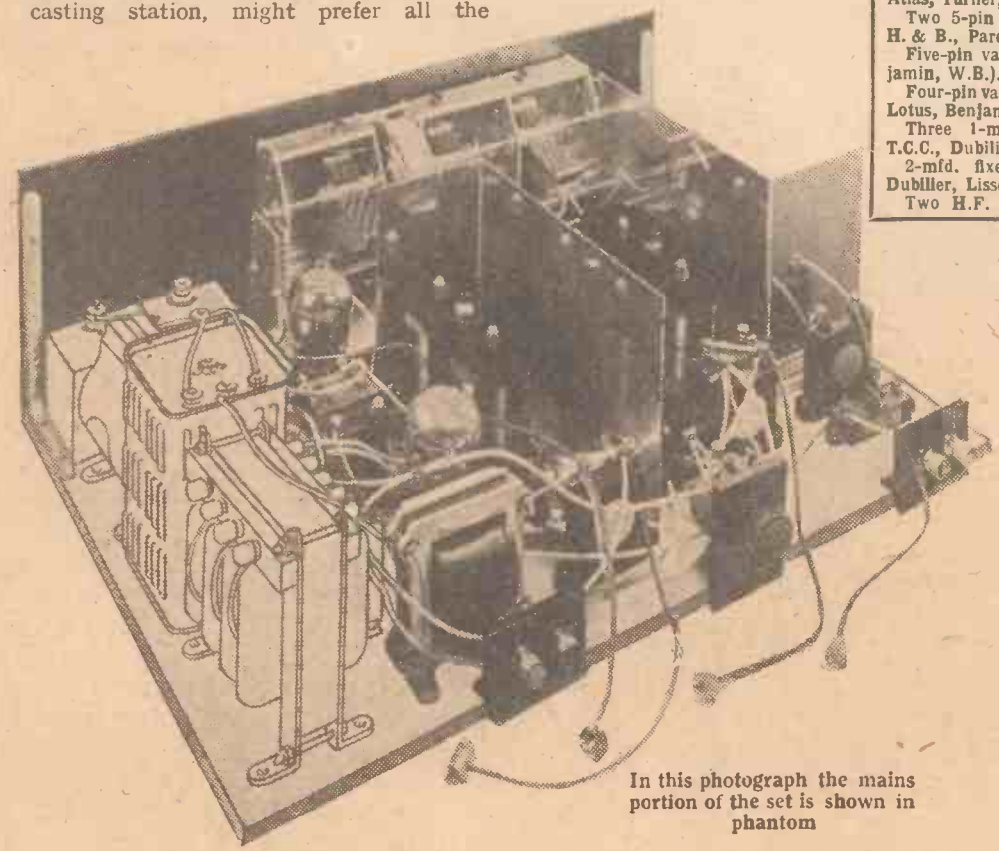
With a set having two screen-grid stages the tuning can be made very good. The magnification, too, can be made considerable.

But there remains a control, in the user's hands, of value. Screen-grid valves are peculiar in this respect, that the characteristics of the valves may be altered over fairly wide limits by adjusting the working voltages. Thus it is possible for the finest results to be obtained from a given set of valves. I will deal with this more fully a little later.

The point I want to make is that in a

### COMPONENTS REQUIRED FOR

Cabinet (Clarion).
Ebonite panel, 21 in. by 7 in. (Trelleborg, Becol, Raymond).
Three-gang .0005-mfd. condenser with drum dial (J.B., Lotus, Polar, Formo).
.00034-mfd. differential reaction condenser (Lotus).
120,000-ohm potentiometer (Regenstat).
On-off switch (Readi-Rad, Bulgin, Benjamin).
Three special dual-range coils (Clarke's Atlas, Turner, Wearite, Readi-Rad, H. & B.).
Two 5-pin universal valve-holders (Junit, H. & B., Parex).
Five-pin valve-holder (Burton, Lotus, Benjamin, W.B.).
Four-pin valve-holder (Burton, Lissen, W.B., Lotus, Benjamin).
Three 1-mfd. fixed condensers (Lissen, T.C.C., Dubilier, Igranic).
2-mfd. fixed condenser (T.C.C., Igranic, Dubilier, Lissen).
Two H.F. chokes (Telsen, Lissen, Varley, Readi-Rad, Igranic, R.I., L
Two .0003-mfd. fixed c
T.C.C., Atlas, Readi-Rad,
Igranic, Graham-Farish).
.0002-mfd. fixed condense
Readi-Rad, T.C.C., Watme
Graham-Farish).
1-megohm grid-leak with
sen, Dubilier, Readi-Rad,
Low-frequency transform
II, Telsen, R.I., Lewcos,
Ferranti, Brownie, Burton).
Five terminal blocks (J
Lissen).
Ten terminals, marked ;
E., H.T.—, L.T.—, L.T.+,
H.T.+3 (Belling-Lee, Eel
Burton).
Set of special screens (
H. & B., Wearite).
15,000-ohm Spaghetti res
Pair panel brackets (Bu
Keystone).



In this photograph the mains portion of the set is shown in phantom

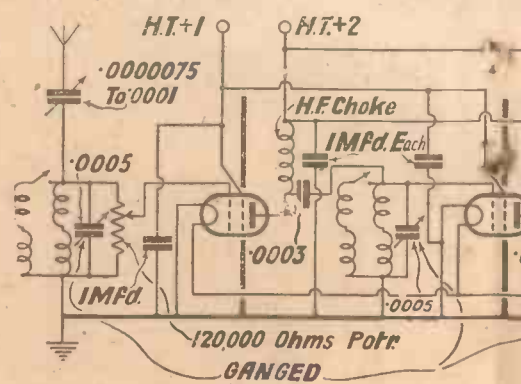



Fig. 1. The circuit of the battery-

# LLENGE FOUR"

## CHEAP TO BUILD

## EASY TO CONSTRUCT

## THE SET FOR EVERYBODY

## WORKS WITH AN INDOOR OR OUTDOOR AERIAL

LT BY W. JAMES

tion, ease of working, and its cheapness. The set is more easily constructed than many three-valve sets. There is plenty of room for the components and they are of the simplest types. The coils, which are sometimes rather complicated, are particularly simple. They have only two terminals, excepting that joined to the detector, which has a third for reaction. The switches are included in the coils, for efficiency and cheapness.

What could be more easy to operate than this set? It has one tuning control, reaction, and a volume control.

There could hardly be fewer knobs. In the battery model is a filament switch. The A.C. mains model has no switch.

The Free Blueprint shows first a complete battery model. There is room on the baseboard for the grid battery and at the right-hand side is a space that could be used for a dry battery or a mains unit by those who prefer to employ battery valves and to obtain the high-tension from the mains.

In the lower part of the blueprint is given the layout and connections of the set working entirely from A.C. mains, with A.C. valves and a built-in mains unit. A grid battery is used on the grounds of cheapness and the fact that little trouble is experienced with grid batteries, as they last a long time.

The same parts are used in the receiver in both sets, excepting that in the A.C. set an output choke and condenser are used because of the heavy current which is passed by the power valve. Also, a five-pin detector valve holder is used, the battery model also having five-pin screen-grid valve holders.

The blueprint therefore shows the wiring and constructional details of two complete sets, one being a battery model, full size, and the other an A.C. mains model, which is half size.

### THE "CHALLENGE FOUR"

ewcos, Wearite).
ondensers (Lissen, Dubilier, Watmel,
r (Lissen, Dubilier, el, Atlas, Igranic,
combination (Lis- Graham-Farish).
er (Varley, Ni-core Lissen, Igranic,
unit, Belling-Lee,
L.S.+, L.S.—, A., H.T.+1, H.T.+2, ex, Clix, Igranic,
Readi-Rad, Parex,
istance (Bulgin).
ulgin, Readi-Rad,

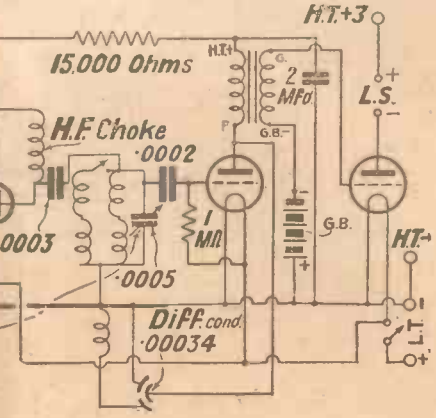
Pre-set condenser, .0001-mfd. maximum (Formo, Sovereign).
Two-volt accumulator (C.A.V. AG9, Exide, Ever Ready, Fuller).
100-volt H.T. battery, power type (Fuller, Ever Ready, Pertrix, Siemens).

**ADDITIONAL APPARATUS REQUIRED FOR MAINS SET**

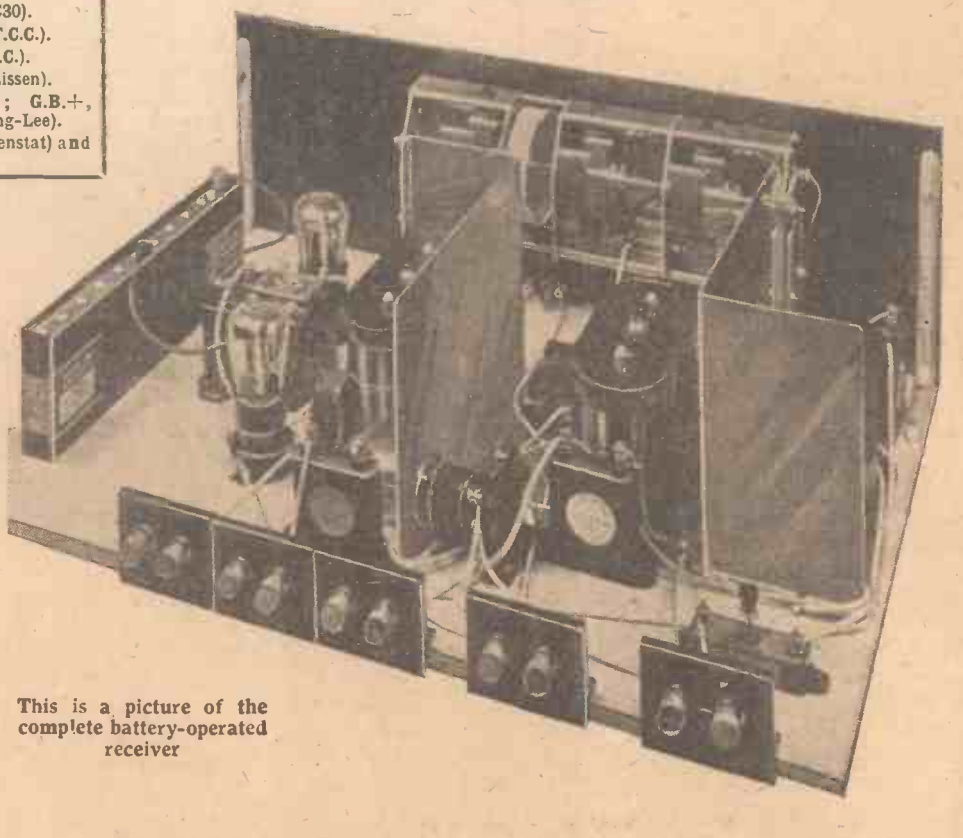
A.C. transformer with following secondaries; 4-volt, 6-amperes, 135-volt (R.I. type E/V19).
Metal rectifier, type HT7 (Westinghouse).
Low-frequency choke (Ferranti type B2, Igranic, R.I., Lissen, Varley).
Low-frequency choke (Igranic C30).
Three 4-mfd. fixed condensers (T.C.C.).
One 2-mfd. fixed condenser (T.C.C.).
Two 1-mfd. fixed condensers (Lissen).
Four wander plugs, marked; G.B.+, G.B.—1, G.B.—2, G.B.—3, (Belling-Lee).
120,000-ohm potentiometer (Regenstat) and ebonite bracket 3 in. by 2 in.

t of the type described here ample agnification and selectivity are available, ie proportions being, to an extent, in the ser's own hands.

Further points of the "Challenge Four" iat appeal to me are the ease of construc-




operated "Challenge Four"



This is a picture of the complete battery-operated receiver

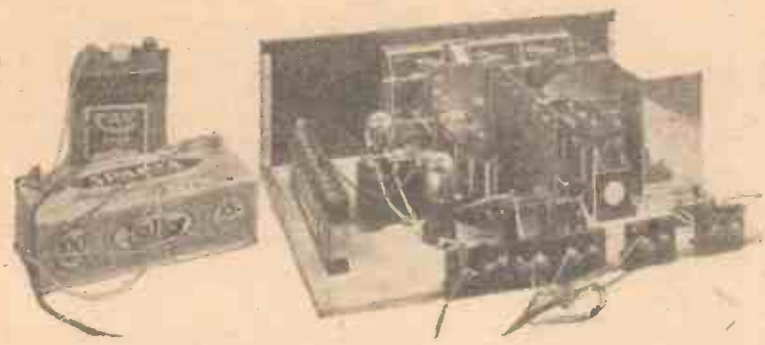
# "THE 'A.W.' CHALLENGE FOUR" (*Continued from preceding page*)

You could build the battery model now. Later, if desired, you could add the mains part and turn the battery set into an A.C. mains receiver. In addition, the necessary details for making the coils and screens are given

The circuit diagram of the battery set is shown by Fig. 1. In the aerial lead is included a pre-set tuning condenser, this being adjusted after the receiver is built to match up the three tuned circuits. Then there is the aerial tuning coil, having long- and short-wave astatic windings and a single short-circuiting switch.

When receiving over the medium wave-band the two coils are joined in parallel and the long-wave coil alone is in circuit when tuning over the long waves. The coils are astatically wound in order to avoid magnetic couplings. Plain coils *must not* be used.

The coils (Fig. 2) are easily constructed at home, as described later. For controlling the volume a high-resistance potentiometer is used across the aerial coil. The contact of the potentiometer goes to the grid of the first screen-grid valve and the amount of the signal applied to the valve depends upon the position of the contact arm. A wire-wound component is used here, and it has, of course, an effect upon the tuning of the aerial circuit, which is allowed for by the setting of the trimming condensers when receiving a weak signal.



The battery-operated "Challenge Four" ready for test.

As the valve itself has capacity, its full effect is felt only when the potentiometer is full on, such as when receiving a weak signal. This is satisfactory, a good control being obtained without trouble.

The first screen-grid valve is coupled to the second by a choke-fed tuned circuit, having a tuning coil exactly like the first.

A good high-frequency choke is used and the method is particularly useful for a ganged circuit on the grounds of stability.

To couple the second screen-grid valve to the detector a further choke-coupled tuned grid circuit is used, but this coil has a reaction winding. Leaky-grid detection is used, the values of the detector being such that good detection is obtained with fine quality. For the reaction circuit we use a differential condenser and the detector is transformer coupled to the power valve.

From this brief description it will be seen that the circuit is a modern but straightforward one, having no snags and being easily put together.

We have a good three-gang tuning condenser of .0005 microfarad capacity with a drum drive. There is a trimming condenser on each section for balancing the circuits where necessary. The coils are easily built and are, of course, a special design for this set to facilitate ganging.

If you want to make the coils yourself you will need six tubes of bakelite or similar material 2 in. diameter and 3 in. long and six pieces of ebonite 5 in. long and 2¼ in. wide. Full winding details are given in the blueprint. For the medium-wave coils No. 28 enamelled wire is used and there are 47 turns in each half with a ⅛ in. space between the two parts.

Start winding ⅜ in. from the end of one tube, making two small holes for the end of wire. When 47 turns have been wound

(*Continued on page* 580)

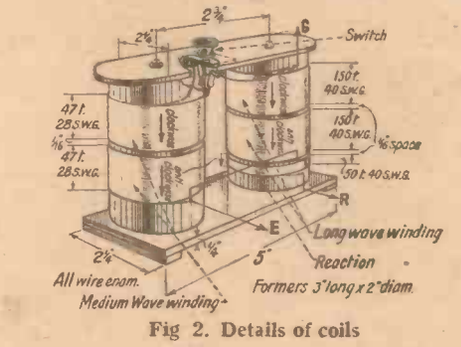



Fig 2. Details of coils

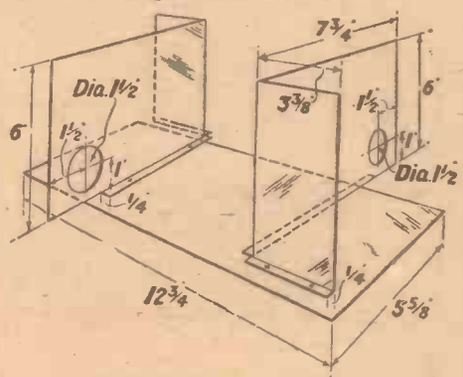
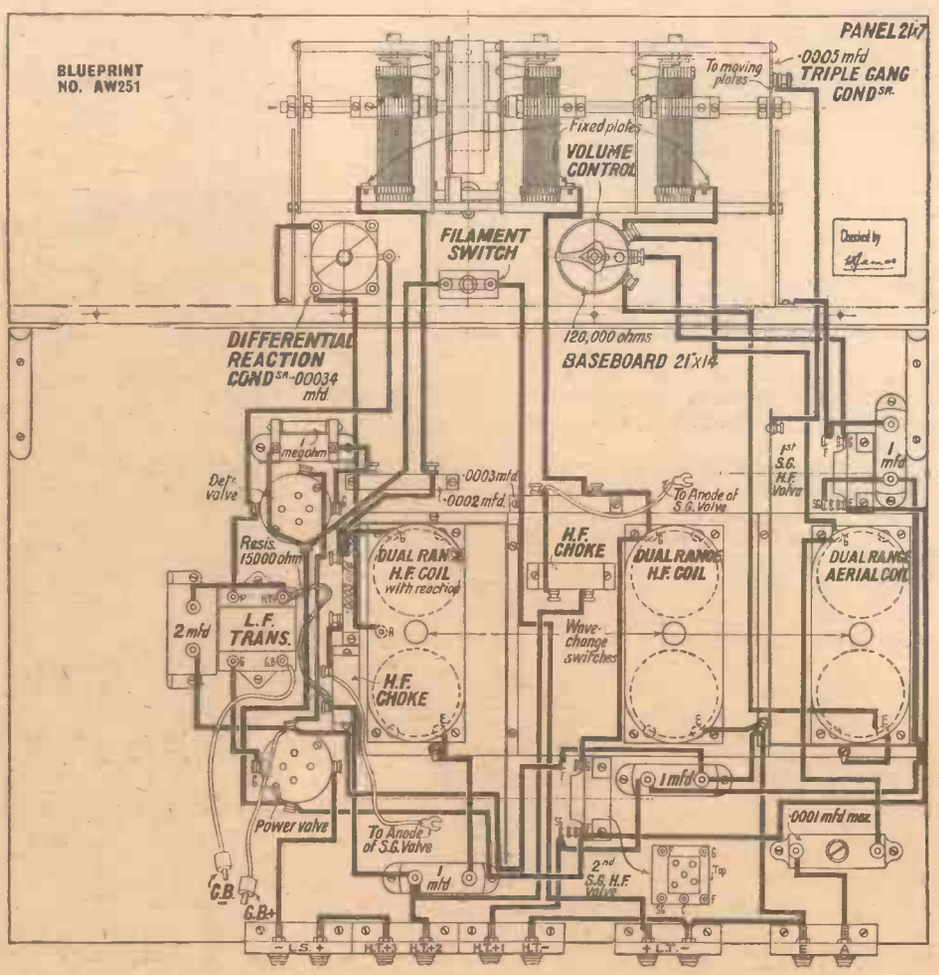



Fig. 3. Details of screens




The wiring diagram and layout of the battery-operated set. A Full-size Blueprint is presented Free with this issue

## THE HOW AND WHY OF RADIO

# V—WHY AMPLIFICATION IS NEEDED

***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***

DO not regard amplification as an entirely separate process in wireless transmission and reception; regard it as a process associated with all the distinctive changes, such as tuning and detection. For it is true to say that, were our tuners good enough and our detectors efficient enough and our loud-speakers responsive enough, we could dispense with amplification in a normal receiver.

But the weak impulses set up in the aerial through vibrations in the ether caused by the transmitter are not sufficiently increased by resonance and detection to operate that very inefficient piece of apparatus, the loud-speaker. Sometimes, if one lives very close to a transmitter, a

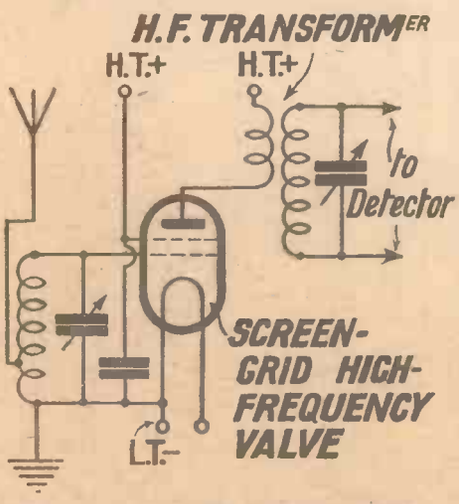



**Fig. 1. Circuit of high-frequency amplifier**

single-valve set can be made to give fairly good loud-speaker signals; that condition of reception is rare, but it proves one point of great importance: that amplification is not an essential process like tuning, detecting, or loud-speaking.

Two ways of amplifying are in use to-day: we must learn to distinguish between high-frequency amplification and low-frequency amplification. Before detection we can amplify the high-frequency signals bearing the modulation of the much lower frequencies of speech and music; that is high-frequency amplification. By its aid we can increase the strength of a distant signal before it is detected.

After detection, when the high-frequency has been by-passed to earth and only the low frequencies of speech and music remain, we can again amplify the signals so that they have an increased effect upon the loud-speaker; that is low-frequency amplification. By its aid the volume of sound heard from a station near or far can be greatly increased.

### Why both H.F. and L.F.

The most natural questions to arise here are: (1) Why do we need *both* high-frequency and low-frequency amplification? (2) Could we not amplify sufficiently at high frequency to provide the detector with an output capable of working the loud-speaker? (3) Or could we not amplify our weak signal after detection, without worrying about pre-detector amplification?

Some years ago, these questions would have been hotly debated by amateurs anxious to prove the superfluity of either high-frequency or low-frequency amplification; but now it is fully recognised that both forms of amplification are essential.

The need for high-frequency amplification is probably not obvious, especially when I add that even if all signals were received at good strength by the detector, high-frequency amplification would still be needed. A set under modern conditions cannot separate the dozens of stations in Europe with a single tuning circuit; two or three separate tuning stages are essential.

Now every time a signal is transferred from one tuning circuit to another, some of the energy is lost, so much is lost that unless amplification is introduced between the tuning stages the signal is too weak to operate the detector efficiently. So in a set with two tuned stages we find a high-frequency-amplifying valve between them. In a modern set with four stages of tuning we find three high-frequency-amplifying valves.

### L.F. Amplification

I have said that a signal passing through several stages of tuning without amplification becomes too weak to operate the detector efficiently There is the other reason for high-frequency amplification—detectors require a certain minimum strength of signal before they work properly. Owing to the need for selective tuning and for a sufficiently strong signal to make the detector work well, we cannot leave all our amplification until after detection.

If we assume a strong signal has been efficiently detected, why the need for low-frequency amplification? The first answer is that the detector valve, owing to its moderately high impedance, passes only a small anode current; and as the loud-speaker is a current-operated device, we want as large current variations as possible. Well, you cannot create a 6-ft. wave in a bowl of water 3 in. deep; so a much greater anode current variation is needed, mainly because the loud-speaker is an inefficient piece of apparatus, insensitive to weak current changes such as those taking place in the anode circuit of the detector valve.

So we use a valve with a lower resistance, thus allowing a greater anode current to flow, and so giving signals passed on to it by the detector a greater opportunity to create large current changes. The power valve is always the *last* low-frequency-amplifying valve; it can, of course, be preceded by intervening low-frequency-amplifying valves.

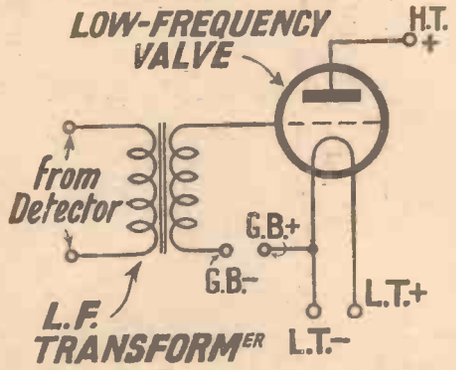



**Fig. 2. Circuit of low-frequency amplifier**

Here let me draw attention to a big difference between all valves preceding the power valve and the power valve itself. The object of high-frequency-amplifying valves and intervening low-frequency-amplifying valves is to increase the signal *voltage*; the object of the power valve is to create the largest *current* change for a given input voltage. All amplification preceding the final power valve has the object of increasing the signal voltage applied to the grid of the power valve so that this valve will then interpret the signal voltage as a current change of the greatest possible value.

HOTSPOT.

**NEXT WEEK: VI—HOW LOUD-SPEAKERS WORK**

*A newspaper article refers to "the amateur wireless builder surrounded with screws, etc."*

*Trying to pick up the "threads," of course.*

*A man who bought a cheap wireless cabinet at the street door complains that under the varnish were many defects.*

*The faults were evidently "glossed over!"*

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| 1 Lotus .00034 differential condenser ... ... ... ... | 8 6 |
| 1 Regentstat 120,000-ohm potentiometer ... ... ... ... | 9 6 |
| 1 Readi-Rad on-and-off switch ... | 10 |
| 3 Readi-Rad Challenge dual-range coils ... ... ... ... | 1 11 6 |
| 2 Junit 5-pin universal valve holders | 3 6 |
| 1 W.B. 5-pin valve holder ... ... | 1 3 |
| 1 Benjamin Vibrolder ... ... | 1 6 |
| 3 T.C.C. 1-mfd. condensers ... | 8 6 |
| 1 T.C.C. 2-mfd. condenser ... ... | 2 10 |
| 1 Lewcos H.F. choke ... ... | 7 9 |
| 1 Readi-Rad "Hilo" H.F. choke | 4 6 |
| 2 Readi-Rad .0003 fixed condensers | 1 8 |
| 1 Readi-Rad .0002 fixed condenser | 10 |
| 1 Lissen 1-meg. grid leak and holder | 1 6 |
| 1 Varley Ni-core II L.F. transformer ... ... ... ... | 15 0 |
| 5 Junit terminal blocks ... ... | 3 4 |
| 10 Belling-Lee engraved terminals ... | 5 0 |
| 1 Set Readi-Rad special screens ... | 8 6 |
| 1 Bulgin spaghetti resistance, 15,000 ohms ... ... ... ... | 1 3 |
| 1 Pair Readi-Rad panel brackets ... | 10 |
| 1 Formodensor, type F ... ... | 1 6 |
| 4 Valves, as specified ... ... | 2 19 0 |
| 1 Set Readi-Rad Jiffilinx ... ... | 2 6 |
| Screws, plugs, etc. ... ... ... | 1 8 |
| **TOTAL (including valves and cabinet)** | **£12 18 3** |

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| 1 Fuller 2-v. 30-amp. A.H. accumulator ... ... | 11 0 |
| 1 Amplion cone loud-speaker ... | 1 19 6 |
| 1 Atlas eliminator, model No. A.C.56X ... ... ... | 8 15 0 |

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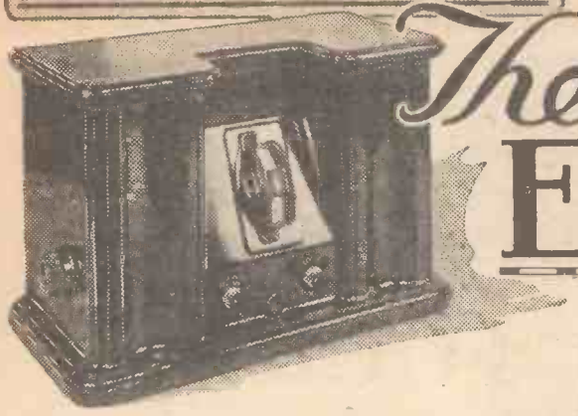
SETS OF DISTINCTION



# The BURTON EMPIRE TWO

Makers: C. F. & H. Burton, Limited.
Price: 57/6 (without valves).

AND now, as the Americans would say, meet the Burton Empire Two; a grandiloquent title perhaps, but a grand little set, too! I prophesy the early doom of crystal sets if two-valvers like the Burton get going on a big scale.

My tests of this new two-valve set were preceded by an interesting examination of its construction. The set is diminutive—more so than many of the crystal sets it is destined to oust. This compactness is the result of clever design and novel production methods.

### Well-planned Construction

The container is a thin bakelite moulding, with an attractive mottled brown finish. The controls are well arranged; right in the middle at the front is a smoothly-working drum dial for tuning. The hair line across the scale makes every one of the 100 degree divisions easy to log.

Just below are two small switch knobs; that on the left is for changing the wavelength range from medium to long waves. It is clearly marked "Long in" and "Short out." The knob on the right is marked "Off in," thus clearly establishing the fact that when the knob is pushed in the set is switched off.

On the left-hand side of the container is a knob controlling reaction; I found it very conveniently placed with respect to the tuning control.

At the back of the set, which can easily be slipped off, are four terminal sockets, two for the loud-speaker and two for the aerial and earth leads. From the centre at the back comes a battery cable with six leads, two for the high-tension battery, two for the low-tension accumulator and two for the grid-bias battery.

Inside the set, in spite of its small size, there seems to be heaps of spare room after inserting the valves. The makers do not suggest which valves to use with the Burton set, so I did my tests with a Cossor 210HF for the detector and a Cossor P220 for the power stage.

Besides the two valve holders, only the low-frequency transformer and the solid dielectric variable tuning condenser are to be seen. The tuning and reaction coils for medium and long waves, together with the sundry gadgets of the two-valve circuit, are wired beneath a bakelite platform. I forgot to mention the filament switch, which also projects through the front of the set to the upper side of the bakelite platform.

I should like to emphasize one thing about this compact construction; the connecting leads between components are very short and consequently results must be improved owing to the reduction of losses.

In addition to the set, a complete installation for the reception of broadcasting programmes involves a loud-speaker, an efficient aerial and earth and batteries in good condition. Given all these, the Burton Empire Two will put up a splendid show.

I gave it a linen-diaphragm loud-speaker, a 120-volt high-tension battery, a 2-volt accumulator, a 7-volt grid-bias battery and a 75-foot outdoor aerial—plus a really good earth.

### Some Results of a Test

In return, the Burton Empire Two gave me the National station at 9 degrees, the London Regional at 37 degrees and the Midland Regional at 74 degrees. All these were received at full loud-speaker strength, as was Daventry 5XX on the long waves at 53 degrees.

I suppose one really ought to be satisfied at that; and if one considers a wireless signal as a full loud-speaker sound capable of being heard all over the house, and if one dislikes fiddling with tuning and reaction controls, the four stations just mentioned would be the natural limit of the Burton set's capabilities.

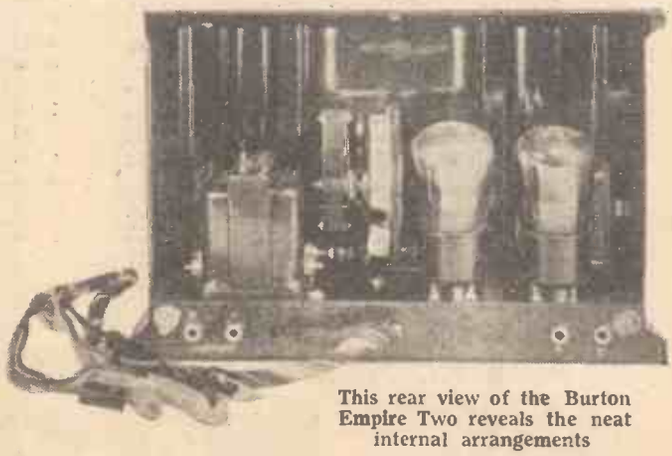
But if one is an ether searcher, prepared to adjust reaction and tuning to a nicety, I can promise a considerable extension of the log. Come round the dial of the Burton set during the evening of the test.

Starting on the medium wavelength band, at 91 we hear a Tzigane orchestra from Budapest, which sounds very Bohemian; incidentally it is received at fine strength. Milan's male announcer at 76 is the next; then skipping the Midland Regional we hear Langenburg at 72, with a faint background of the Regional. A good strong "Achtung" from Langenberg satisfies us, so we slip down past several carrier waves that could, with more time, be resolved into loud-speaker signals; then we arrive at Rome's lady announcer at 64. What a station Rome is these days, as strong on the Burton set as the Midland Regional.

Its strength still in mind, we skip a few weakly signals until at 52 we hear Katowice at good strength; down again to 44, where Toulouse is quite clear of the London Regional. Six more carrier waves intervening and we come to Turin on its new wavelength at 14. Liepzig at 4 brings us to the end of the log of really powerful medium wave signals. On the long waves, Huizen at 82, Radio Paris at 70, Daventry at 53, Eiffel Tower at 40, and Hilversum at 19 made quite a respectable log.

Thanks to the good loud-speaker, efficient valves and adequate high-tension supply, the quality of these signals was as good as the Burton is capable of giving—and that should satisfy most listeners. The Burton transformer works well with the type of valves I have mentioned. They took a total of 7 milliamperes from the high-tension battery which could therefore be an inexpensive standard-capacity type.

SET TESTER.



This rear view of the Burton Empire Two reveals the neat internal arrangements

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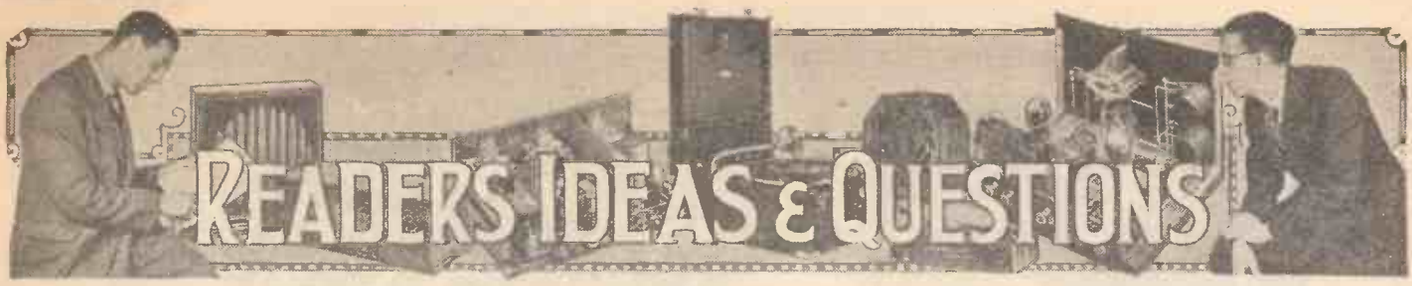
"With a modern wireless set," it is claimed, "turning on the programme is as easy as turning on a water tap." A critic remarks that there is a difference, however, namely, that "the stuff from the water tap isn't dry."




### The Hammersmith Grand Orchestra

SIR,—Our attention has been drawn by a number of our listeners to an article in your paper of September 20, by Sydney A. Moseley, and we are surprised that a paper of your standing should have seen fit to have printed a criticism without the apparent elementary knowledge of what our orchestra is composed of and has been broadcasting.

The "Grand" Orchestra which broadcasts from this theatre is a "grand" orchestra in the true sense of the word. Every musician is a picked man, fully qualified to play the most high-brow music.

If you will glance through the items broadcast during the last eight months, you will see that every type of music lover has been catered for.

Our postbag and that of the B.B.C. regarding the Commodore broadcasts is so numerous of congratulations that there can be no doubt as to the popularity and efficiency of it.

I cannot understand how anyone claiming to hold the public right of criticism can compare the small orchestras that normally broadcast from hotels with the large orchestra enjoyed by theatres of the size of the Commodore. Perhaps your critic does not realise that the orchestra broadcasts not for the cinema fan, but for the country as a whole, and for weeks now the orchestra is broadcast from a room in the theatre in which there is no public, which, I think, disposes entirely of his statement about music appropriate to the theatre's own numerous clients.

Your critic certainly cannot be keeping up to date with affairs in this country when he openly confesses that he does not know this theatre, which not only is one of the most widely advertised, but one of the largest and most successful in the whole of the country

Apropos of my previous remarks regarding his criticism, when he derides the music played at seaside piers, I do not think he can know anything of the wonderful municipal orchestras engaged for work during the summer period.

We feel strongly that Mr. Moseley cannot be *au fait* with the subject which he criticises, otherwise he would know that orchestras for which he is clamouring would engage with open arms the musicians comprising our Grand Orchestra, if they had the chance.

Every paper purchased by the public has a duty to perform to its public, and your page headed "Without Fear or Favour" deserves this reply being published.

Yours faithfully,
COMMODORE NATIONAL THEATRE, LTD.,
JAMES SABEL, *General Manager.*

We have submitted the above letter to Mr. Moseley and he replies as follows:

"I said that I did not disparage this Grand Orchestra or its work of entertaining cinema audiences but that I preferred the type of Saturday programme as given by the small Carlton orchestra. It was the *quality* of the programme rather than the *quantity* of players that concerned me."—(ED.)

### Programme Comparisons

SIR,—A few words from an Egyptian listener on the B.B.C. programmes. The only items worth listening to are dance music and news, though I cannot understand why your announcers are afraid to express themselves in "ordinary" English.

For the rest, the Continental stations provide fare of a quality almost unknown to the B.B.C, though I think that the Splendide Band is the best in England.

H. Y. C. (Cairo).

### Outside Orchestras

SIR,—In a recent issue of AMATEUR WIRELESS your critic, Mr. Sydney Moseley makes some very disparaging remarks about a grand orchestra in the Hammersmith district. Your critic might mention exactly what his tastes are, and possibly he might remember that our plebian desires in music might be equally affected if his "Restaurant Revellers" were given full sway.

I am a listener and a picturegoer occasionally, and like good music, though I cannot lay any claim to being a "Wise Guy," and I should strongly advise Mr. Moseley, if that one little hour in his domicile hurts his sensitive soul so acutely, to switch off and play the gramophone.

F. H. H. (Kew).

### The Linen Speaker

SIR,—I am writing to let you know that after making up your linen cone speaker you have, to my estimation, achieved for the ordinary listener wireless as it should be. I might state that I made up your double cone when you first published it, and that was quite a good speaker; but your latest is 100 per cent. better in every way.

M. A. U. (London, E.).

### Condensers and Tonal Quality

SIR,—As an amateur who is fond of experimenting, I have recently made a discovery which, to me at all events, is new and puzzling, and I am curious to know whether other experimenters have had a similar experience.

On one occasion when substituting a small reaction condenser of the ordinary type with *brass* vanes for one with aluminium vanes, I was agreeably surprised to find that reception as regards quality was much superior to that obtained from the condenser with aluminium vanes. The effect was particularly noticeable on orchestral and band music, the tone being much fuller and deeper, and more natural. A little later with another set I substituted a brass-vaned differential condenser for

(*Continued on page* 574)

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## "READERS' IDEAS AND QUESTIONS" (Continued from page 572)

one of aluminium, and again the result was the same, i.e., quality altogether superior to that previously obtained.

I have no recollection of ever having seen this peculiarity discussed or explained at any time, hence this letter; so if any of your readers have an opportunity of making the experiment I should like to hear the result to see if it agrees with my own experience. A. J. W. (Manchester).

### Slaithwaite or "Slowit"?

SIR,—I was amused at the suggestion that Slaithwaite should be pronounced "Slowit" because (1) the few people who live there are supposed to pronounce it that way and (2) that the foreigner could not sound *th*. Would he not pronounce it "Slovit," as he cannot form *w*.

Do we say "Owdum" because 100,000 people there call Oldham by that name instead of the third who call it "Old'm"? Or Ashton "Ehsh'n," or Mossley, "Mawzley"?

I think the announcer's plan of pronouncing names as nearly as possible as they are spelt is best, although it is misleading to hear "Lye-(i)tham" instead of "Lith-am."

"A LANCASHIRE MAN" (Penrith).

### "Thermion's" Problem

SIR,—Upon reading "Thermion's" notes in the current issue of AMATEUR WIRELESS *re* the damage done by lightning, would he permit me to solve this mystery?

As you know, lightning has a very high potential and periodicity. Upon striking the aerial the current would not be able to flow through the aerial coil, owing to its choking effect at the very high frequency. It would then take the next path, which would be through the aerial insulation, loud-speaker leads insulation, to earth, as he evidently has a choke filter output with one loud-speaker lead earthed.

This, of course, would fire the leads, the insulation breaking away when touched.

M. P. (Chester-le-Street).

### Pre-detector Volume Control

SIR,—I am using a special receiver of my own design, making use of a neutralised H.F. valve followed by a diode detector with R.C. and push-pull output. The coils used for the aerial and H.F. coupling are those designed by Mr. James for the Touchstone receiver as described in the *Wireless Magazine*. The receiver gives me terrific volume and ample selectivity and I use a volume control of approved type between the diode detector and the first L.F. stage. Unfortunately I seem to get overloading of the H.F. valve grid and find that by detuning to about half a degree, I can get the desired result. This, however, cuts off some of the side bands of telephony and in theory causes distortion. Distortion is not noticeable in actual practice but I would rather introduce a pre-H.F. volume control on sound basical lines rather than have a method of controlling volume which I know does, theoretically, give distortion. S. R. (Middlesex).

A pre-H.F. volume control arrangement to which we are rather partial is that making use of a high-resistance potentiometer connected directly across the tuning coil preceding the H.F. valve. The grid of the valve should be disconnected from the grid end of the aerial-secondary coil and connected to the sliding arm of the potentiometer. The latter should have a resistance of 120,000 ohms or more. Such a resistance is of too high a value to cause any damping or flattening of the tuning of the secondary coil but tapping the grid down nearer to the centre of the resistance permits cutting down the amplitude of the signal voltages that obtain between the two ends of the resistance. Thus satisfactory control of volume to the input to the H.F. valve is possible.—ED.

### "1930 Favourite Three"

SIR,—I am about to make up the "1930 Britain's Favourite Three" receiver but as I shall not be using a pick-up I wish to dispense with the pick-up jack. Can you tell me what wiring alterations are necessary? A. M. (London).

Referring to the blueprint wiring plan, connect wire No. 6 direct to wire No. 7 at the grid of the detector valve, and omit wire No. 25. Now you need not have the jack on the panel. The foregoing are the only alterations necessary.—ED.

# WE TEST FOR YOU

*A weekly review of new components and tests of apparatus.*

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

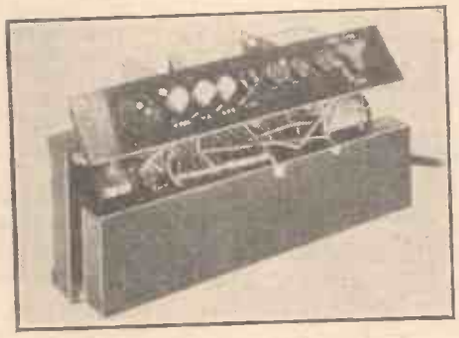
### Junit Eliminators

THOSE who are fortunate enough to have A.C mains at their disposal will probably have considered using the mains for both H.T and L.T. now that the efficiency and reliability of A.C. valves has been established. Judging from our test and inspection of the new Junit all-mains unit, known as Type 150, for A.C., and made by the Junit Manufacturing Co., Ltd., the change-over is quite a simple and inexpensive matter

This particular unit is commendably neat. The layout of the chassis is excellent, whilst the terminals and variable controls are mounted on a tilted panel The overall dimensions of the unit are 9 in. by 5 in by 3½ in. high

The H.T. eliminator includes a metal rectifier, whilst a 4-volt winding with centre tap is provided for heating A.C. valves. Other models are available.

The unit is adapted for use with input voltages of 200, 220, and 240 volts A.C., the correct winding being selected according to the position of a selecter switch. The H.T. output includes a maximum positive tapping, a variable tapping, acting as a series filter circuit to eliminate back-coupling, and a screened-grid terminal, taken from a tapping on a potentiometer.



The chassis of one of the new Junit eliminators

Tested on actual reception, the hum was sufficiently small to be neglected. With a total D.C. output of 20 milliamps the H.T. volts were 175, which fell to 150 with 26.5 milliamps and to 120 volts with 35 milliamps. The output is thus sufficiently generous to operate super-power A.C. valves.

The general design and attention to detail on this unit deserve praise, and it may be recommended to readers.

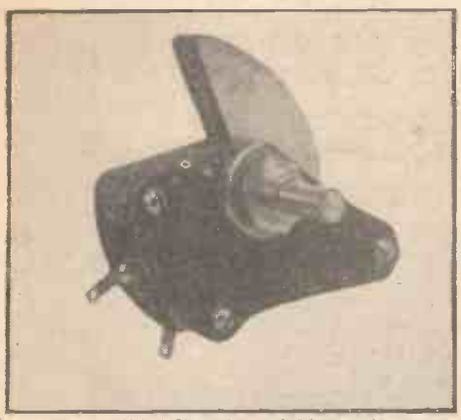
### Burton Reaction Condenser

THE air-dielectric variable condenser has been regarded in the past as an essential part of a tuning circuit, as the dielectic losses of air are a minimum. The disadvantages of such a condenser lie in its bulk, cost, and liability for short circuiting, and this has led to the introduction of condensers using paper dielectric. In many

(*Continued on page* 578)

cases the extra loss, introduced by the solid dielectric is not a serious matter, particularly in these days of high-power broadcasting stations and multi-stage H.F. amplifiers, where the gain per stage is purposely kept low.

This week we have tested a reaction condenser marketed by Messrs. C. F. & H. Burton. Both fixed and moving vanes are made of brass and are separated by insulated paper. A friction contact is obtained between the moving vanes and the appropriate terminal, which in this case is a soldering tag. The motion of the condenser is quite smooth and is sufficiently damped to remain in any position without a tendency to move under external vibration. The component can be mounted to a panel by drilling a single hole.



A new solid-dielectric variable condenser, the Burton

The capacity range as measured in the laboratories extended from .000029 to .0006 microfarads, thus covering the normal requirements with ample margin.

It sells at 2s. 9d.

### Epoch Moving-coil Speakers

THOSE who studied the exhibits at the Show must have been struck by the great rise in popularity of permanent-magnet moving-coil speakers. It was not as though the demand for these speakers had suddenly been realised, because the necessity for applying field current to a moving-coil speaker has always been a stumbling block in its path of progress. The fact is that not until quite recently has the sensitivity and the permanency of this type compared favourably with speakers supplied with field current. Now, the difference of sensitivity between the two types is small, and it is possible to obtain a flux density in the air gap exceeding 8,000 lines per square centimetre.

The Epoch Manufacturing Co., Ltd., whose speakers are well-known in this country, have recently brought out some particularly neat and serviceable permanent-magnet speakers. A model which we recently tested in these laboratories was fitted with an 8-in. diaphragm and mounted in a well-designed cabinet, having overall dimensions of 15 in. by 7¾ in. by 18½ in. high.

The permanent magnet is small, but efficient, having a sensitivity greater than has previously been possible. As a final refinement, the speaker is fitted with a four-ratio input transformer, by means of which it is possible to match the speaker to the output stage, whether an ultra low-impedance valve or pentode is employed.

Tested in our laboratory, the speaker gave quite an impressive performance. The sensitivity, although not up to the standard of a 6-volt pot, was not far behind, and in consideration of the size of the cabinet, the reproduction was excellently balanced throughout the audible scale.

There was a noticeable absence of shrillness, an undesirable quality in many moving-coil loud-speakers, yet the high notes are well in evidence, and the low notes are reproduced without "boom."

An Epoch moving-coil speaker with a permanent-magnet field

These speakers may be obtained from £3 15s., in chassis form, up to £7 16s., complete in cabinet with a four-ratio input transformer.

# "THE CHALLENGE FOUR" (Continued from page 566)

make two more holes and put the wire through them, leaving a short end. Now start the second half of the coil, making two small holes and leaving a short end to be connected to the end of the first half. Notice that the two halves are wound in opposite directions.

### Long-Wave Coils

Wind the long-wave coils of No. 40 enamelled wire as indicated, being sure that the spacing of each pair of coils is $\frac{1}{16}$ in. exactly. The coils must be wound alike so that their inductances are alike.

On one coil there is, you will notice, a reaction winding of No. 40 enamelled wire. Note its position and direction and how it is connected.

Fit small feet to the bottom ebonite pieces and terminals, if desired. To the top pieces fit single-pole switches. If these are too wide, a little should be filed from the sides of the moulded bases. For fixing, a pair of screwed brass rods are used, having nuts at the top and bottom, as indicated.

These coils are easily constructed at home. Good quality tubes of the correct diameter must be used and, of course, the winding details must be followed exactly.

In the battery set, the construction of which will now be described (leaving the mains set until next week) we have on the 21 in. by 7 in. panel a filament circuit switch, the volume control potentiometer and the differential reaction condenser. There is also the dial part of the tuning condenser, which itself is fastened to the baseboard.

Having fixed the parts to the panel, connect a number of long wires to the terminals and put the panel on one side.

Now fasten the parts to the baseboard. See that the screen-grid valve holders are so placed relative to the aluminium shields that the screen-grid valves fit satisfactorily, passing through the holes in the screens without difficulty.

### The Screens

Details of the screens are given on the Blueprint. One piece lies flat on the baseboard, and there are two upright parts of the shapes shown. Holes are drilled for the fixing wood screws which also hold soldering tags in some instances. Small terminals could be fitted to avoid soldering, if desired, or a few extra wood screws could be used. Whichever is used though, do not fail to scrape the lacquer off the screen at the point of contact. Note also that the two high-frequency chokes are fitted at right angles and that the three tuning coils are in line.

### Wiring

For wiring use thin tinned copper wire and systoflex. Be sure and follow the blueprint, fitting some of the wires before all the parts are in position. The baseboard wiring is best carried out before the panel is fitted. Then, when this is done the panel can be added and the wires already joined to the parts on the panel can be connected without difficulty. There are not many wires and wiring can be described as easy.

The results to be obtained with the set are all that one has a right to expect, good quality, easy tuning, large number of stations.

London readers should make a special point of seeing the "Challenge Four" in the Radio Department windows of Messrs. Selfridge and Co. Ltd. The Radio Department is in Somerset Street, parallel with Oxford Street, and a special show of this new set is being arranged.

Next week the A.C. model will be described.

## CHEAPER LOUD-SPEAKERS

AN attractive point about the new electrostatic type of loud-speaker is its comparative cheapness. There is neither magnet, armature, nor windings, the output from the last valve being supplied directly to a sheet-metal diaphragm mounted between two ribbed discs of insulating material. Such a construction lends itself readily to mass production. In fact it is estimated that an electrostatic speaker of the Vogt type can be marketed for about 15s. The one drawback, at present, is the high biasing-voltage required, though this presents no difficulty when the mains are available.

B. A. R.

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

**ALL BLUEPRINTS ARE FULL SIZE**

## A NOVEL METHOD OF GETTING HIGH TENSION

MANY motorists have expressed the wish to fit sets into their cars with the idea of getting a little music while *en route*, and the need for this is even greater in winter time when the roads are dreary. It is easy enough to supply the valves with low tension from the car battery, and a new solution of the high-tension problem seems to be in the direction of a small motor generator such as the M.L. anode convertor.

The M.L. Magneto Syndicate, Ltd., of Coventry, have sent for test one of these convertors in conjunction with the "Car Three" receiver described in AMATEUR WIRELESS, Number 427. Incidentally these anode convertors are used in the Scotland Yard Flying Squad cars and supply the high tension for the receivers and the low-power transmitters.

The model tried is known as the type BX, and is contained in an aluminium

**An interior view of the M.L. convertor**

box measuring 17 in. by 5 in. by 5 in. The convertor consists of a small combined permanent magnet motor and generator which takes a very small current from the car-starter battery, and delivers current at a high voltage suitable for the anode supply.

At one end of the unit is a rheostat controlling the input to the low-tension motor and at the other end is a tapped wire-wound resistance which controls the high-tension output.

The type BX unit delivers up to 20 milliamperes.

On no load the motor consumed 1.1 ampere—while at practically the full load of 20 milliamperes the low-tension consumption went up to 1.8 ampere.

The high-tension side was even more interesting, for on no load the voltage was 160, while at the 20-milliampere load it fell to only 120 volts. In actual working when the power valve was fully biased the anode voltage was about 150. The convertor is compact and practically unbreakable.

The current it consumes is negligible in a car although home working would necessitate a slightly larger low-tension accumulator than usual in order to stand up to the constant discharge of an ampere or so.

It certainly does seem to be a good way out of the high-tension difficulty either for the home or car.

"A.W." Solves your Wireless Problems

# RADIOGRAMS

ON the eve of Armistice Day, November 10, at the Lord Mayor's Banquet at the Guildhall, London, a relay will be carried out of the Prime Minister's speech. Later the famous German war play, *Brigade Exchange*, is to be broadcast through the National transmitters. On November 11, in addition to the Armistice Day service from the Cenotaph, the National programme will include the Festival of Remembrance from the Albert Hall and a special "In Memoriam" programme from the studio. As a fitting end, the Last Post will be relayed to listeners from the Menin Gate, Ypres.

The sketch, "*A Sister to Assist 'er*," which was made famous in the years 1912-14 by Sydney Fairbrother and the late Fred Emney, will be revived in the Regional programme on October 25. Vernon Watson will be heard in the part in which he succeeded Fred Emney, and the latter's daughter Doris will support him.

Sir James Barrie will face the microphone for the third time when he becomes Chancellor of the Edinburgh University on October 25. The installation ceremony will be taken by all Scottish stations of the B.B.C.

On October 18 the National programme will include an excerpt from *Eldorado*, the new musical play now running at Daly's Theatre. The caste includes Mimi Crawford, Desiree Ellinger, Donald Mather and Oscar Asche.

On the occasion of the first B.B.C. concert of the 1930 season at Queen's Hall, on October 22, Dr. Adrian Boult will make his first public appearance as music director of the new B.B.C. orchestra of 114 players.

Leslie Henson, Norah Blaney, Bransby Williams, and Cicely Courtneidge are amongst the "star" turns broadcasting in the National vaudeville programme on October 23.

Radio Vitus has closed down its Paris transmitter and will shortly resume its broadcasts from the new Romainville station, now rapidly nearing completion. In the meantime the Sunday concerts offered by that studio are to be transmitted, by courtesy, through another Paris station, on the wavelength used to date, namely, 308 metres.

It is reported from Paris that the Radio L.L. private broadcasting station is for sale and that offers for it have been tendered by both a well-known motor-car manufacturer and an equally famous perfumery manufacturer.

The new high-power transmitter destined to Radio Toulouse is expected to be ready for operation before the end of 1930. In the meantime the studio is carrying out "non-stop" broadcasts from 5 p.m. until midnight daily.

Since January 1, 1930, the French radio police have traced in and around Paris over 200 unauthorised amateur experimental stations.

"*Radio Nord Ouest*" is the call of a new private transmitter recently erected at Caen (Normandy). Tests are carried out daily from 11 a.m. on 329 metres with a power of, roughly, 600 watts in the aerial. On some weekdays broadcasts may be heard during the afternoon.

According to new regulations, the Moscow transmitters are now compelled to devote 50 per cent. of their broadcasting time to political propaganda.

The power of the new Warsaw station now nearing completion at Rasin will be 158.4 kilowatts. Its aerial masts are 600 feet high, thus making them the highest of any used in Europe. The wavelength is 1,411 metres.

(*Continued on next page*)

# RADIOGRAMS

*(Continued from preceding page)*

Radio-Belgique will shortly take over s new 15-kilowatt transmitter, tests of hich have been so frequently heard lately ı the United Kingdom. With the inaugu-ıtion of the new station it is proposed to ırry out relays of performances from some ī the most important theatres in the elgian capital.

It is officially stated that the Govern-ent of the Grand Duchy of Luxembourg ıs granted a broadcasting monopoly to the ɔciété Luxembourgeoise d'Etudes Radio-ıoniques with a view to the erection of a gh-power transmitter at some twelve iles from the capital. As the construction the new station may take over a year, it proposed to open a temporary trans-ıitter at an early date.

PCJ (Eindhoven), on 31.28 metres, now ırries out experimental tests with various ɔes of aerials twice weekly, namely, on ednesdays from 5 to 9 p.m. and on hursdays from 7 p.m. G.M.T. At half-ɔur intervals the old and the new aerials e brought into operation alternately.

The Danish authorities have equipped ıe Gedser-Warnemuende train ferry eamers with wireless transmitting and ceiving apparatus in order that pas-ngers during the journey may establish ɔmmunication with the European tele-hone system.

Arrangements have been made for an xchange of programmes between Munich ıd Vienna. On December 31 such an ɛperiment will be made, and during the ɔurse of the programme in which both ıdios are taking part listeners will hear ɔnversations between the respective an-ouncers.

Out of 146 firms that regularly use merican broadcasting stations for adver-sing purposes, it has been ascertained that t least 85 are also considerable users of ewspaper and magazine space. Of these, 7 devote a large proportion of their press dvertising to announcements relating to he radio programmes.

Deputy Judge McCleary at Lambeth ounty Court recently expressed surprise hen a landlord complained that the wire-ɛss set of his lodger was working between ı p.m. and midnight. "How on earth an a wireless set be in operation at that our?" inquired the Deputy Judge. ounsel said that he thought that there ere foreign stations which broadcast at hat hour!

An interesting exchange of programmes vill take place in the nights of October 6-17 between Radio Toulouse (France), Stuttgart (Germany) and Barcelona (EAJ 1, Spain). From midnight until 12.30 a.m., he Spanish concert will be taken by Toulouse and Stuttgart, the French station providing the entertainment until 1 a.m. From that time until 1.30 a.m. on Oc-ober 17 Stuttgart will broadcast a pro-ramme to be relayed by the two other tations taking part in the experiment.

# A NEW IRISH BROADCASTER

PLANS are going ahead for a new station in the Irish Free State, and it would appear that the B.B.C. present chain of stations will have a serious rival in the form of a 60-kilowatter to be erected at an advantageous point

I understand that although there is a certain amount of dispute as to the actual site and the studio arrangements, work on the transmitter itself is being proceeded with.

The new transmitter, which will embody the latest refinements of broadcasting technique, will have an aerial power of 60 kilowatts and will therefore be one of the most powerful transmitters in Europe. It is expected that the new station will be ready to begin operation in the autumn of 1931.

The set will be built at the Marconi Works at Chelmsford, where, as a matter of fact, the transmitters have been manufactured for erection in more than twenty-five countries!

The now universally adopted principle of low-power modulation, a system of great efficiency, will be used, and the frequency emitted by the station will be controlled by a quartz crystal, thermostatically controlled. This will ensure a constancy of the wavelength within very fine limits, an essential condition of modern broadcasting, which requires transmitting stations to keep strictly to their allotted wavelengths.

Arrangements have been made to enable the aerial energy to be doubled at a later date, if required, but this would mean some "fur flying" in the ether!

The aerial will be suspended between two lattice steel insulated masts, each 330 ft. high. The aerial will be situated at a considerable distance from the transmitter house and, in accordance with modern practice, the power from the transmitter will be conveyed by a feeder to a small building situated directly under the aerial, where the energy is transferred to the aerial by a coupling device.

### Modern Equipment

The frequency characteristic of the new transmitter will be very good, as linearity between 30 and 10,000 cycles will be arranged for in the modulation system. Free State listeners should have nothing to grumble about on the score of quality.

The transmitter can be operated on any wavelength between 300 and 550 metres. It is understood, however, that the wavelength actually used will be 413 metres.

The latest speech input apparatus is being provided, ensuring that the reproduction of the speech and music transmitted from the new station will be above reproach.

It is interesting to note that power to operate the station will be supplied from the Irish high-tension network. The alternating current from the high-power network will be rectified at the station by a Brown-Boveri mercury-arc rectifier.

Both water-cooled and air-cooled valve of the latest design will be used in th different amplifier stages. The trans mitter will be constructed on the pane system, each separate unit being containe in an aluminium case with glass doors, th panels being sprayed with dove-grey cellu lose lacquer.

It remains to be seen what effect th creation of this new broadcasting giant wi have on reception in England. If it i correct that the wavelength used will b 413 metres, then the new Irish Free Stat station will come close to the Midlan Regional in the wavelength scale, an interference may reasonably be expecte on poor sets owing to the high aeria power.

Owing to the possibility, however, c changing the transmitter's wavelengt between the limits of 300 and 550 metres it is conceivable that a more suitable wave length will be definitely settled when test on the transmitter are commenced. Recep tion from Belfast at present is very goo as reported by listeners, particularly in th south of England, and there is no doub that this new station will be similarly we received.

Is it likely that so soon as Slaithwait has settled down to comfortable workin and northern listeners have become accus tomed to a bigger wipe-out effect, there wi be a new trouble owing to the propose new Irish Free State station? K.U.

*A list of "A.W." and "W.M." Blueprints appears on page 582*

# Postcard Radio Literature

### *The New Valves*

MAZDA are doing some startling things in the way of producing new super-performance valves, and all the facts and figures are given in a Mazda book just published by the Edison Swan Electric Co., Ltd. This should be in the hands of all valve users, for the handy data given is always useful. **70**

### *The Empire Link*

This is the name given to a most interesting new "Readi-Rad" receiver which tunes from 15 metres up to 2,000 metres, thereby bringing in the short-wavers when required, and which can be made up in an hour from the kit of parts available. A free chart can be had describing this, and you can get it by means of my normal post-free catalogue service. **71**

### *The Dix-onemeter*

The Dix-onemeter, manufactured by Electradix Radios, is a multi-purpose testing instrument which should be in the possession of every enthusiast who takes an interest in set-testing. A booklet giving particulars of the fifty ranges of the Dix-onemeter is available. **72**

### *Condenser Problems*

It is never wise to buy fixed condensers without knowing exactly what capacity should be used and what voltages the condensers will stand. Great use is, therefore, to be had from the list published in a folder by the British Insulated Cables, Ltd., manufacturers of the well-known Helsby fixed condensers. This table gives full details, and you can obtain a copy on application. **73**

### *"A Bit About a Battery"*

This is the fascinating title which Dubilier give to the new booklet which they have just sent me giving a wealth of facts (a "bit" is certainly an under-estimation) about the Dubilier H.T. battery range. These batteries are available in the single- and treble-capacity types. You should get this booklet and see which type is best suited to your receiver. **74**

OBSERVER.

*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.*

## MORE RADIOGRAMS

ON the recent occasion of a special broadcast carried out by the Lille (France) studio, in commemoration of the centenary of the death of the French scientist Pasteur, the programme included the performance of a play by Sacha Guitry. As the author and his wife were unable to leave Paris, a microphone was installed at their private house, whilst the rest of the cast interpreted their respective parts at the Lille studio—By means of twin cables connecting Paris and Lille, a perfect broadcast was achieved. Monsieur Sacha Guitry and his wife, (Yvonne Printemps) were able to hear through a loud-speaker the lines spoken by their colleagues in the Lille studio and thus, although at a distance, could take up their parts as if they were in the same room.

The latest reports received from France points to the fact that the new Radio-Toulouse high-power station to be built at some twelve miles from the city will radiate 60 kilowatts in the aerial. Plant of the most modern type is to be used and the aerial masts now in course of erection will be 375 feet high.

A series of very attractive concerts has been arranged for broadcast to Scottish secondary schools. The inaugural programme includes "Music at the Court of Queen Elizabeth," sustained by the Edinburgh Madrigal Singers and Mr. Herbert Wiseman, who has been responsible for the production of the series.

The new Salzburg (Austria) relay station now nearing completion will carry out its preliminary tests towards the middle of November next. For the purposes of relays of international programmes, it will act as a connecting link between Germany and Austria.

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### EKCO A.C. ELIMINATOR PRICES

MESSR E. K. COLE, LTD., ask us to announce that an error appeared in their advertisement in the issue of AMATEUR WIRELESS dated September 20. The price of the A.C. 1V.20 H.T. unit was given as £2 19s. 6d. (which is the price of the D.C. model). This should have read £5 15s. Messrs. E. K. Cole, Ltd., offer their apologies for any inconvenience which may have been caused.

## *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.**

## THE EFFECT OF RAIN AND FOG

As a result of an extensive series of observations, it appears that neither rain nor fog has any appreciable effect on the propagation of wireless with waves of the dimensions used in broadcasting. However, with very short wavelengths, in the neighbourhood of 5 cms., the presence of rain has a very marked effect, absorbing a large proportion of the energy radiated. On still shorter waves, fog produces similar results. These experiments appear to cast doubt upon the practicability of using infra-red rays for signalling over long distances through fog, of which so much has been heard of late. M. B.

### *FOR THE CONSTRUCTOR*

**If you decide, when building or renovating your set, to have a sloping panel (a pleasant and convenient change), don't forget that even a small slope makes a big difference to the amount of baseboard space available, so it is advisable to add a couple of inches to the depth of the baseboard.**

. . . . . .

**If you don't want to buy grid-bias battery holders glue a strip of postcard, the width and height of the battery on each end, with a flap an inch long hanging over at the bottom. Bend these flaps at right angles and fasten to the baseboard with drawing pins. The battery can be removed and its position altered in a "twinkling." Before you fasten down it is wiser to put the date of purchase on the side and you will then always know just how old the grid-bias battery is.**

. . . . . .

**If you are tempted to poke the "innards" of your set with a screw-driver or similar article, just because it was the first thing that came to your hand, practice safety first and use a wooden probe. This is merely a 9-inch length of wooden dowelling or curtain rod sharpened at one end like a pencil. If you keep this always at hand you can alter your potentiometer and probe all those doubtful wires and terminals while the set is working, and there will be no danger of burning out valves.**

## AMPLIFICATION FACTOR

The "mu" or amplification factor of a valve may easily prove to be a variable quantity under working conditions. For instance with A.C. valves the "mu" factor falls off when the voltage applied to the plate is reduced, or when the grid becomes more negative. In such valves the filament is "equipotential" and any such loss in amplification is strictly proportional to the change in plate or grid potentials. In battery-driven valves, on the other hand, the effect of the voltage drop along the filament complicates matters, so that sometimes the amplification factor will increase as the grid voltage is made more negative. Variations in "mu" reduce the working efficiency of a valve, and also tend to introduce distortion. M. A. L.

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**"The Forty-five Shilling Two."**—Constructors of this efficient two-valver, described in last week's issue of "A.W.", should note that the dual-range coil shown in the photographs is the Sovereign type W.S., manufactured by Sovereign Products, Ltd., of 52-54 Rosebery Avenue, E.C.1, and this coil should have been mentioned first in the list of components.

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Experiments are being conducted with nine portable radio sets, in the Columbia national forest, to keep trail-construction camps in communication with forest headquarters.

# BROADCAST TELEPHONY

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

| Metres | Kilo-cycles | Station and Call Sign | Power (Kw.) |
|---|---|---|---|
| **GREAT BRITAIN** | | | |
| 25.53 | 11,751 | Chelmsford (5SW) | 15.0 |
| 200 | 1,500 | Leeds | 0.16 |
| 242 | 1,238 | Belfast | 1.2 |
| 261 | 1,148 | London Nat. | 68.0 |
| 288.5 | 1,040 | Newcastle | 1.2 |
| 288.5 | 1,040 | Swansea | 0.16 |
| 288.5 | 1,040 | Stoke-on-Trent | 0.16 |
| 288.5 | 1,040 | Sheffield | 0.16 |
| 288.5 | 1,040 | Plymouth | 0.16 |
| 288.5 | 1,040 | Liverpool | 0.16 |
| 288.5 | 1,040 | Hull | 0.16 |
| 288.5 | 1,040 | Edinburgh | 0.4 |
| 288.5 | 1,040 | Dundee | 0.16 |
| 288.5 | 1,040 | Bournemouth | 1.2 |
| 288.5 | 1,040 | Bradford | 0.16 |
| 301 | 995 | Aberdeen | 1.2 |
| 309.9 | 968 | Cardiff | 1.2 |
| 356 | 842 | London Reg! | 45.0 |
| 376.4 | 797 | Manchester | 1.2 |
| 398.9 | 752 | Glasgow | 1.2 |
| 479 | 626 | Midland Reg. | 38.0 |
| 1,554 | 193 | Daventry (Nat.) | 35.0 |
| **AUSTRIA** | | | |
| 246 | 1,220 | Linz | 0.6 |
| 246 | 1,220 | Salzburg | 0.6 |
| 283 | 1,058 | Innsbruck | 0.6 |
| 352 | 851 | Graz | 9.5 |
| 453 | 666 | Klagenfurt | 0.6 |
| 517 | 578.5 | Vienna | 20.0 |
| **BELGIUM** | | | |
| 200 | 1,460 | Antwerp | 0.4 |
| 212 | 1,415 | Binche | 0.2 |
| 216 | 1,391 | Brussels (Conference) | 0.25 |
| 235.5 | 1273.5 | Chatelineau | 0.25 |
| 243 | 1,235 | Courtrai | 0.1 |
| 244.7 | 1,226 | Ghent | 0.25 |
| 251.2 | 1,194.6 | Schaerbeek | 0.5 |
| 338.2 | 887 | Brussels (No. 2) | 12.0 |
| 509 | 590 | Brussels (No. 1) | 1.2 |
| **CZECHO-SLOVAKIA** | | | |
| 263 | 1,139 | Moravska-Ostrava | 11.0 |
| 270 | 1,076 | Bratislava | 14.0 |
| 293 | 1,022 | Kosice | 2.5 |
| 342 | 878 | Brunn (Brno) | 3.0 |
| 487 | 617 | Prague (Praha) | 5.5 |
| **DENMARK** | | | |
| 281 | 1,067 | Copenhagen | 1.0 |
| 1,153 | 260 | Kalundborg | 10.0 |
| **ESTONIA** | | | |
| 401 | 748 | Reval (Tallinn) | 0.7 |
| **FINLAND** | | | |
| 221 | 1,355 | Helsinki | 15.0 |
| 291 | 1,031 | Viipuri | 15.0 |
| 1,796 | 167 | Lahti | 54.0 |
| **FRANCE** | | | |
| 172.5 | 1,739 | St. Quentin | 0.3 |
| 190 | 1,579 | Valenciennes | 0.25 |
| 210 | 1,430 | Radio Touraine | 0.2 |
| 214 | 1,401 | Fécamp | 0.7 |
| 219 | 1,370 | Béziers | 0.6 |
| 235.1 | 1,275 | Nimes | 1.0 |
| 249.5 | 1,202 | Juan-les-Pins | 0.5 |
| 256 | 1,171 | Toulouse (PTT) | 1.0 |
| 265 | 1,130 | Lille (PTT) | 1.0 |
| 272 | 1,103 | Rennes (PTT) | 1.2 |
| 286 | 1,049 | Montpellier | 1.2 |
| 287.2 | 1,044.6 | Radio Lyons | 0.5 |
| 294.4 | 1,013 | Limoges (PTT) | 0.08 |
| 300 | 1,000 | Strasbourg | 0.35 |
| 304 | 988 | Bordeaux (PTT) | 1.0 |
| 316 | 950 | Marseilles (PTT) | 1.5 |
| 328.2 | 914 | Grenoble (PTT) | 1.2 |
| 329 | 911.8 | Poste Parisien | 1.2 |
| 345.2 | 869 | Strasbourg (testing shortly) | 15.0 |
| 370.4 | 810 | Radio LL (Paris) | 0.5 |
| 385 | 779 | Radio Toulouse | 8.0 |
| 447 | 671 | Paris (PTT) | 1.0 |
| 466 | 644 | Lyons (PTT) | 2.8 |
| 1,446 | 207 | Eiffel Tower | 15.0 |
| 1,725 | 174 | Radio Paris | 17.0 |
| **GERMANY** | | | |
| 31.38 | 9,560 | Zeesen | 15.0 |
| 218 | 1,373 | Flensburg | 0.6 |
| 227 | 1,319 | Cologne | 1.7 |
| 227 | 1,319 | Münster | 0.6 |
| 227 | 1,319 | Aachen | 0.31 |
| 232.2 | 1,292 | Kiel | 0.3 |
| 239 | 1,256 | Nürnberg | 2.3 |
| 246 | 1,220 | Cassel | 0.3 |
| 253.4 | 1,184 | Leipzig | 2.3 |
| 259.3 | 1,157 | Gleiwitz | 5.6 |
| 270 | 1,112 | Kaiserslautern | 0.25 |
| 276 | 1,085 | Königsberg | 1.7 |
| 283.6 | 1,058 | Magdeburg | 0.6 |
| 283.6 | 1,058 | Berlin (E) | 0.6 |
| 283.6 | 1,058 | Stettin | 0.6 |
| 316.6 | 947.6 | Bremen | 0.3 |
| 318.8 | 941 | Dresden | 0.3 |
| 325 | 923 | Breslau | 1.7 |
| 360 | 833 | Stuttgart | 1.7 |
| 372 | 806 | Hamburg | 1.7 |
| 390 | 770 | Frankfurt | 1.7 |
| 419 | 716 | Berlin | 1.7 |
| 452.1 | 662 | Danzig | 0.25 |
| 473 | 635 | Langenberg | 17.0 |
| 533 | 563 | Munich | 1.7 |
| 560 | 536 | Augsburg | 0.3 |
| 568 | 530 | Hanover | 0.35 |
| 570 | 527 | Freiburg | 0.3 |
| 1,635 | 183.5 | Zeesen | 35.0 |
| 1,635 | 183.5 | Norddeich | 10.0 |
| **HOLLAND** | | | |
| 31.28 | 9,599 | Eindhoven (PCJ) | 30.0 |
| 299 | 1,004 | Hilversum (between 11.40 a.m. and 5.40 p.m. G.M.T.) Sats. 9.40 a.m. to 12.40 p.m. | 8.5 |
| 1,071 | 280 | Hilversum | 8.5 |
| 1,071 | 280 | Scheveningen-Haven | 5.0 |
| 1,875 | 160 | Huizen | 8.5 |
| **HUNGARY** | | | |
| 210 | 1,430 | Budapest (Csepel) | 1.0 |
| 550 | 545 | Budapest | 23.0 |
| **ICELAND** | | | |
| 1,200 | 250 | Reykjavik (shortly testing) | 16.0 |
| **IRISH FREE STATE** | | | |
| 224.4 | 1,337 | Cork (1FS) | 1.5 |
| 413 | 725 | Dublin (2RN) | 1.5 |
| **ITALY** | | | |
| 25.4 and 80 | | Rome (3RO) | 9.0 |
| 247.7 | 1,211 | Trieste (testing) | 3.0 |
| 274.5 | 1,003 | Turin (Torino) | 8.5 |
| 332 | 905 | Naples (Napoli) | 1.7 |
| 379.5 | 790 | Genoa (Genova) | 1.5 |
| 441 | 680 | Rome (Roma) | 75.0 |
| 453 | 662 | Bolzano (IBZ) | 0.2 |
| 501 | 599 | Milan (Milano) | 8.5 |
| **LATVIA** | | | |
| 525 | 572 | Riga | 12.0 |
| **LITHUANIA** | | | |
| 1,935 | 155 | Kaunas | 7.0 |
| **NORTH AFRICA** | | | |
| 363.4 | 825.3 | Algiers (PTT) | 13 |
| 416 | 721 | Radio Maroc (Rabat) | 10 |
| 1,350 | 222.2 | Tunis Kasbah | 0. |
| **NORWAY** | | | |
| 364 | 824 | Bergen | 1. |
| 364.9 | 822.1 | Fredriksstad | 0. |
| 455 | 659.3 | Porsgrund | 1. |
| 493 | 608 | Nidaros | 1. |
| 1,071 | 280 | Oslo | 0. |
| **POLAND** | | | |
| 214.2 | 1,400 | Warsaw (2) | 1. |
| 234 | 1,283 | Lodz | 2. |
| 244 | 1,229 | Cracow | 1. |
| 313 | 959 | Wilno | 0. |
| 338.1 | 887.1 | Poznan | 1. |
| 381 | 788 | Lvov | 2. |
| 408 | 734 | Katowice | 16 |
| 1,411 | 212.5 | Warsaw | 14. |
| **PORTUGAL** | | | |
| 240 | 1,247 | Oporto | 0. |
| 320 | 937.6 | Lisbon (CTIAA) | 0. |
| **ROMANIA** | | | |
| 394 | 761 | Bucharest | 16 |
| **RUSSIA** | | | |
| 720 | 416.6 | Moscow (PTT) | 20 |
| 800 | 375 | Kiev | 20 |
| 824 | 364 | Sverdlovsk | 25 |
| 1,000 | 300 | Leningrad | 20 |
| 1,060 | 283 | Tiflis | 10 |
| 1,103 | 272 | Moscow Popoff | 40 |
| 1,200 | 250 | Kharkov | 25 |
| 1,304 | 230 | Moscow-Stchelkovo (C.C.S.P.) | 100 |
| 1,380 | 217.5 | Bakou | 10 |
| 1,481 | 202.5 | Moscow | 20 |
| **SPAIN** | | | |
| 251 | 1,193 | Barcelona (EAJ15) | 0 |
| 266.7 | 1,125 | Barcelona (EAJ13) | 10 |
| 340 | 860 | Barcelona (EAJ1) | 8 |
| 368 | 815 | Seville (EAJ5) | 1 |
| 424 | 707 | Madrid (EAJ7) | 2 |
| 460 | 652 | San Sebastian (EAJ8) | 0 |
| **SWEDEN** | | | |
| 135 | 2,222 | Motala | 30 |
| 231 | 1,301 | Malmo | 0 |
| 257 | 1,166 | Hörby | 15 |
| 299.8 | 1,002 | Falun | 0 |
| 322 | 932 | Göteborg | 15 |
| 436 | 689 | Stockholm | 75 |
| 542 | 554 | Sundsvall | 15 |
| 770 | 389 | Ostersund | 0 |
| 1,223.5 | 244 | Boden | 0 |
| 1,348 | 222.5 | Motala | 40 |
| **SWITZERLAND** | | | |
| 318.8 | 943 | Basle | 0. |
| 403 | 743 | Berne | 1 |
| 459 | 653 | Zurich | 0 |
| 680 | 442 | Lausanne | 0 |
| 760 | 395 | Geneva | 1 |
| **TURKEY** | | | |
| 1,200 | 250 | Istanbul | 5 |
| 1961 | 153 | Ankara | 7 |
| **YUGOSLAVIA** | | | |
| 307 | 977 | Zagreb (Agram) | 0 |
| 430.7 | 696.5 | Belgrade | 3 |
| 577.1 | 519.9 | Ljubljana | 2 |

## AIRCRAFT WIRELESS

WHEN flying in fog an ordinary compass, no matter how accurate, will not tell the pilot how far he is drifting laterally, owing to side wind, nor what forward progress he is making under an unknown head wind. Directional wireless is the only means on which he can depend to keep a straight course to the landing ground in bad visibility. An aircraft beacon system has been developed in America which depends upon the use of two directional transmitters placed at right angles to each other, each transmitting a different tone signal. So long as the aviator hears both signals with equal intensity on each side of a reversing-switch fitted to his receiver he is keeping the correct course. Should one signal predominate over the other, he knows that he is drifting to port or starboard the case may be, and corrects his steeri accordingly. M. B.

## LOCAL INTERFERENCE

THE particular form of "interference caused by passing tramcars and by t use of carpet-sweepers, violet-ray appar tus, and other kinds of electrical devices dealt with more intelligently abroad th in this country. In Germany, for instanc the broadcasting authorities supply, simple choke or filter circuit which readily fitted to the source of the troub and prevents "man-made static" fro being a bogey to the listener. On the pri ciple of "live and let live," the use of su radiation-preventers should be made un versal M. A. L.

## WHAT ARE THE SOUND WAVES SAYING?

THE sound waves brought a whole concert of Bach the other night, and I found myself thinking of the grand old Cantor of Leipzig as I heard the cheering in the Queen's Hall. Not that many people cheered *him* in his lifetime; if it had not been for Mendelssohn, who worked ceaselessly to make him known and appreciated, there might have been no cheers in Queen's Hall the other night. Bach worked hard all his life, but in his own quiet corner of Germany.

He began badly—at least I think it rather unfortunate to be bereft of both parents before one is ten—and went to live with his elder brother, John Christoph, who undertook to teach him. It was not difficult to do so for his genius was very apparent. To begin with, he was of the seventh generation of musicians; perhaps a more remarkable family than that of the Bachs never existed. Later, in John Sebastian's life, there used to be occasional gatherings of the whole clan of them, and as many as a hundred—all men, all Bachs, all musicians—have been known to congregate for a little music. Strangely enough, there are no more Bachs; in 1740 they literally existed in hundreds; the last of them died some time ago—in Australia, of all places.

The outstanding characteristic of Sebastian Bach's life was his determination. His brother possessed a volume of some organ pieces, but when Sebastian asked if he might make copies of a few of them which took his fancy, he was told to leave alone what was not his and the book was put into a cupboard. It seems that this cupboard had a kind of wire lattice door to it, and to see the book there and not to be able to handle it was more than Bach could endure. So he waited until the family had retired and then managed to extract it, copying out its contents by the light of the moon, not daring to use a candle. He obtained all he wanted—only to be caught with the finished script in his hand!

In the holidays Bach always made at least one journey to Hamburg to hear old Reinken play the organ. Reinken was a jolly old fellow, then about seventy-seven, but a splendid player. He was still going strong twenty years later, in fact he only retired a few months before his death in his hundredth year. Hamburg is thirty-three miles by rail from Lüneberg, where Bach was then living. In those days, of course, there was no rail. There were conveyances for those who could pay for them, but Bach was not one of those fortunate people. But a thirty-five mile tramp never prevented him from going to hear Reinken, all the same. On one occasion he arrived in Hamburg to find that Reinken was giving two recitals on two successive days and his disappointment was severe when he also found that he had not enough money to pay for a second night's lodging. There was nothing for it but to trudge back to Lüneberg and this he did in a very dejected frame of mind. The road was a lonely one at the best of times, and it was a weary Bach that sank down on to a seat outside an inn about fourteen miles from Hamburg. Judging from the aroma emanating from

(*Continued on page 592*)

## "WHAT ARE THE SOUND WAVES SAYING?"

(*Continued from preceding page*)

the kitchen, Bach concluded that a goodly repast was being prepared within, but as he had no money he tried not to think of the food and thought of Reinken's music instead. Suddenly a window was flung up above him and two herring heads were thrown down into the dust at his feet. As they fell a little heavily, Bach picked them up and examined them. Each contained a Danish ducat. Bach promptly entered the inn partook of a simple though satisfying meal, *and immediately tramped straight back to Hamburg*. That was how he heard Reinken's second recital.

Bach went to be organist of the New Church at Arnstadt in 1703, where he does not seem to have greatly enjoyed himself. A court of Consistory actuated all the proceedings there, and a finer set of snobbish nincompoops could not have been found in north Germany. They solemnly exhorted him to act with industry and fidelity to his high calling and to acknowledge his superiors. What he thought of *them* is another matter, and one which is plain from what happened. He chanced to hear of the great playing of Buxtehude at St. Mary's, Lübeck, and determined to hear what he could do. So he obtained a month's leave, putting in a pupil to deputise for him until his return. He rose at four one morning in October and set out to walk the fifty-odd miles that separated Arnstadt from Lübeck. On his arrival there he found much to interest him, and Buxtehude seems to have welcomed him, inviting him to attend the rehearsals of the *Abendmusik*, a series of musical performances taking place each Advent. Having heard the rehearsals, Bach remained for the performances, and finding that Christmas music being practised, thought he might as well stay to hear it. After Christmas Buxtehude began on the Epiphany music, and Bach felt he really ought not to miss that either. One morning he received a peremptory note from the Consistory at Arnstadt demanding his immediate return. He thought it wise to comply, and said farewell to Buxtehude and marched home. The next thing was to face the Consistory. This he did looking the picture of health after his exercise in the open. Where had he been all this time? He explained he had been to Lübeck to "learn something about his art," but he was given to understand that if he did not conform to rules he would find himself without a job. Then one of the members complained that his accompaniments were too elaborate and that he must revise them, someone else said that he played too long before service and when they told him of it he went to the other extreme and made it too short. Then a third member horrified everyone present by stating that a "strange maiden had been allowed to make music in the church." This was, of course, very grave. Whether Sebastian explained that she was also a Bach, and his second cousin, or whether it made any difference if he did, I have never been able to discover. But he married her two years afterwards, so perhaps it did not matter.

WHITAKER WILSON.



ANOTHER FREE GIFT NEXT WEEK
See Page 562


"Amateur Wireless and Radiovision." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to "Bernard Jones Publications, Ltd."
General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets. Contributions are always welcome, will be promptly considered, and if used will be paid for. Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed. Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," 58-61 Fetter Lane, London, E.C.4.




## PREPAID ADVERTISEMENTS

**Advertisements under this head are charged THREEPENCE PER WORD, minimum charge THREE SHILLINGS.**

**DEPOSIT SYSTEM**

As the Publishers cannot accept responsibility for the bona fides of advertisers in this publication, they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

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ADVERTISEMENT DEPARTMENT
58/61 FETTER LANE, LONDON, E.C.4

Printed in England. Published by Bernard Jones Publications, Ltd., 58/61 Fetter Lane, London, E.C.4
Sole Agents for South Africa: CENTRAL NEWS AGENCY, LIMITED. Sole Agents for Australasia: GORDON & GOTCH, LIMITED. Saturday, October 18, 1930.

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**MORE ABOUT OUR "CHALLENGE" SETS**


# Amateur Wireless

and Radiovision

Every Thursday 3d

Vol. XVII. No. 437 Saturday, October 25, 1930



# PRACTICAL GUIDE FREE To Every Reader

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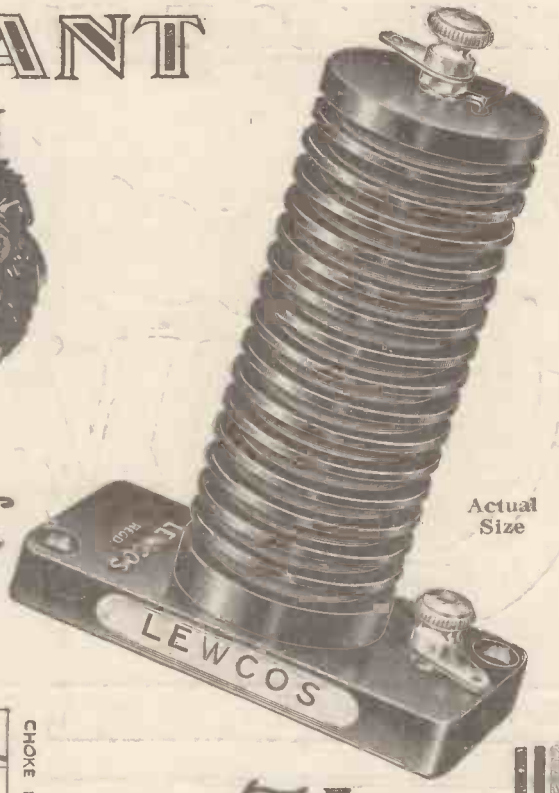
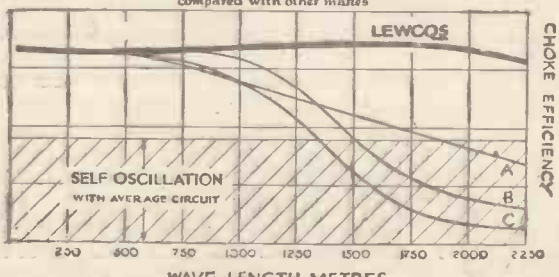
# PREDOMINANT IN ITS OWN SPHERE




Actual Size

H F CHOKE CURVES
Showing the performance of the Lewcos HF Choke compared with other makes




# The LEWCOS H.F. CHOKE


THE LEWCOS L.F. CHOKE

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The Lewcos Choke is **"The most efficient choke we have tested"** and **"Its design places it in the front rank of high-class components,"** writes Industrial Progress (International) Ltd., of Bristol.

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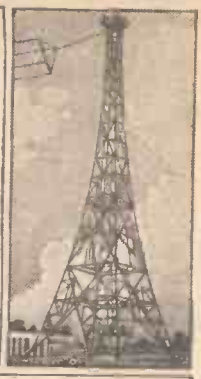
No. 437. Vol. XVII. OCTOBER 25, 1930

# Amateur Wireless and Radiovision



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

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## NEWS · & · GOSSIP · OF THE · WEEK

### ANOTHER GIFT

LAST week's "A.W." was a bumper issue, wasn't it?—and a full-size blueprint of a fine four-valve set was given free with every copy. This week you will find another gift tucked away between the pages. This time it is a booklet—"21 Sets and Speakers"—which will interest every listener who makes up his own radio apparatus. And this is not all. Our next issue will be a bumper number full of items of present-day interest; see page 614.

**Hail Radio! A statuesque tribute to the new Berlin tower—used as a wireless mast—just outside the Exhibition buildings**

### VALUE!

AND may we say just a word about real value—a phrase not always appreciated in these days of stunts and ramps. When "A.W." gives a blueprint, then it *is* a real blueprint, and is a full-size sheet giving every detail for making up the receiver it portrays. And when "A.W." gives a booklet, then it is the real thing, chock full of photographs, diagrams and practical information. You must agree that this week's gift represents real value, and is just what you need.

### IRISH BROADCASTING

AMATEUR WIRELESS was first out with the full details, in last week's issue, of the new Irish Free State broadcasting station. Just think what this will mean to B.B.C. listeners. The power will be 60 kilowatts. The wavelength will be 413 metres. That means that practically every English listener will be able to hear the station. The programmes are to be provided by advertising enterprise, as is now done at Radio Paris. What a close-at-hand competition with the B.B.C.!

### THE "CHICKEN RUN" SYMPHONY

ON Friday and Saturday mornings, when the short-waver PCJ closes down after the nightly transmissions, the studio window is opened, the microphone is placed before it and the "sounds" of a Dutch morning are broadcast. Of course, a Dutch morning is not very different from any other morning, but it must be rather a peculiar experience to hear the crowing of a newly awakened cock and other sounds of morning in the Australian bush in the middle of the afternoon. One Australian farmer, hearing such a loud crowing in the middle of the afternoon, thought his hens had been stolen and rushed out to investigate. The best story is from a poultry farmer on the Bahama Islands. His cock, hearing the Dutch one in the middle of the night, answered it. The farmer adds: "We are really thinking not of killing this cock but of giving him a good time until he dies a natural death and then burying him in great state because he is the first cock to endeavour to establish an international conversation."

### PRINCIPAL CONTENTS



### OUR TAME EXPERT

ONLY the other day a member of the Technical Staff was bewailing the fact that the age of novelty seems past. "Where," he almost sobbed, "are the reflexes, super-hets, Armstrong-supers and Flewellings of yesteryear? Nobody seems to like novelties, these days."

### AN IDEA

AND then our Tame Expert confessed that for the past few weeks he has been tinkering with a means of using an S.G. valve for L.F. amplification. It has been done before, but the Expert was trying-out new and more practicable ways. It's a tip for any of you who like something new with which to experiment. Are there still any die-hards using an Armstrong-super set?

### B.B.C. SYMPHONY ORCHESTRA

IT has gone into serious rehearsal at the time of writing. By the time this is read the first public concert of its career

# NEWS & GOSSIP OF THE WEEK—*Continued*

will have been given, on October 22, at the Queen's Hall, with Dr. Adrian Boult as conductor. During its season the orchestra will give twenty-three concerts, associated with many eminent conductors. Sir Henry Wood, Sir Landon Ronald, Ernest Ansermet, Hermann Scherchen, Oscar Fried, and Albert Coates are among the conductors. No less notable than the conductors are the soloists. These include Suggia, Solomon, Bela Bartok, Astra Desmond and Cortot.

### FOR BACH ENTHUSIASTS

IN one of the Bach programmes to be given by the B.B.C. Symphony Orchestra *all* the six Brandenberg concertos will be played. In view of the many attractions to music-lovers and of the importance of the new orchestral combination, the B.B.C. expects that the Queen's Hall concerts will be well attended. Already the advance bookings are very satisfactory, many listeners taking advantage of the subscription tickets.

### B.B.C. AND THE HALLÉ

EVIDENTLY a truce has been called in the so-called musicians' war, for we understand that for the 1930-31 season of Hallé concerts, eight are to be broadcast, as was done during the last season. "No deadlock exists between the B.B.C. and the Hallé Society," stated an official at Savoy Hill. It is understood that the B.B.C. would accept an invitation from the Lord Mayor of Manchester to attend a conference to discuss co-operation with local musical enterprise. This is surely the olive branch, which we think the Manchester people would do well to accept.

### ABOUT NO. 10 STUDIO

IN view of the fact that the average B.B.C. studio has very little echo it is interesting to note that the new No. 10 studio, which is the transformed Big Tree wharf, Waterloo Bridge, has a reverberation period of three seconds. From an acoustic point of view the B.B.C. is quite satisfied that the new wharf studio is suitable as a temporary home for the Symphony Orchestra. When Broadcasting House is finished No. 10 studio will join the rest of Savoy Hill trappings—in oblivion! The largest studio in Broadcasting House will have a floor space of 4,000 ft. which compares with the 4,500 ft. of No. 10 studio. Although it will not be quite so accommodating for the broadcasting artistes, the proposed big studio should give even better acoustics. It is already finished in the rough and extends from the sub-basement to the top of the first floor—three stories high. Then, of course, it will have its gallery for seating at least 1,000 spectators.

### TALKS APPRECIATED

WHETHER the rest of the Sunday programme is so deadly that even talks seem bright by comparison is a question we are not unkind enough to debate; but in view of our last week's article on: "Why Not Hear the Talks?" we are interested to hear the B.B.C. state that it has received many letters of appreciation relating to the science and religion series.


**CUSTOMER:** "... and I want this back in time for the Sunday programme."
**ASSISTANT:** "The *Sunday* programme, Sir?"

### WHERE AMERICA SCORES

WHEN we pride ourselves on being five hours ahead of New York time, we should remember how this discrepancy tells against us in transatlantic broadcasting. For while we are doing our evening programme from, say, eight till ten, America can relay it during its afternoon. But when the main American programme begins between eight and ten American time, we have all gone to bed. This may explain why the relaying of the B.B.C.'s programmes is much more extensively carried out in America than is the relaying of American programmes by the B.B.C. Another explanation is that the American programmes are not good enough!

### EMPIRE BROADCASTING TIMES

TALKING of the time factor in broadcasting, it will be interesting to see which parts of the Empire benefit most from the proposed B.B.C. Empire transmitter—when it gets going. If the Colonial Office agrees to the B.B.C.'s proposals, a short-wave transmitter will be erected at Daventry; but it will not be nearly so effective for any given part of the Empire as are the beam stations, which have lately been commissioned by the B.B.C. for important Empire broadcasts. It is significant that the B.B.C. stipulates only five years for the paying off of the proposed station. At the end of that time perhaps there will be enough money for two or three B.B.C. beam stations.

### OVERHEARD AT SAVOY HILL

"WHEN I was at Savoy Hill the other day," writes our own correspondent, "I was invited to don an official's headphones. I did so and heard Dr. Adrian Boult licking into shape his 114 players in the Symphony Orchestra, which was rehearsing down at the wharf studio. The music sounded a little ragged to me but the immense crescendo of strings was amazingly impressive. Dr. Boult seemed to be having a little difficulty in holding down those strings but I expect they will be quite docile on October 22. Intensive rehearsals are going on to make the Symphony Orchestra fit for its great season.

### DO READERS AGREE?

JUST before he left for his home in New Zealand, John Stannage, who was the wireless operator on the transatlantic flight by Kingsford-Smith from Ireland to New York a few months ago, said to an AMATEUR WIRELESS representative: "We find the only decent results on short waves are got with a detector and one low-frequency amplifier. I am talking of headphone reception when listening for a much-wanted but weak signal suffering from interference." The aerial on this flight was a 250-foot trailer; it probably saved the flight, at one time, when the aeroplane, in trying to get out of thick fog went so near the water that the aerial touched it and signals disappeared. Stannage at once warned the pilot, who shot up again.

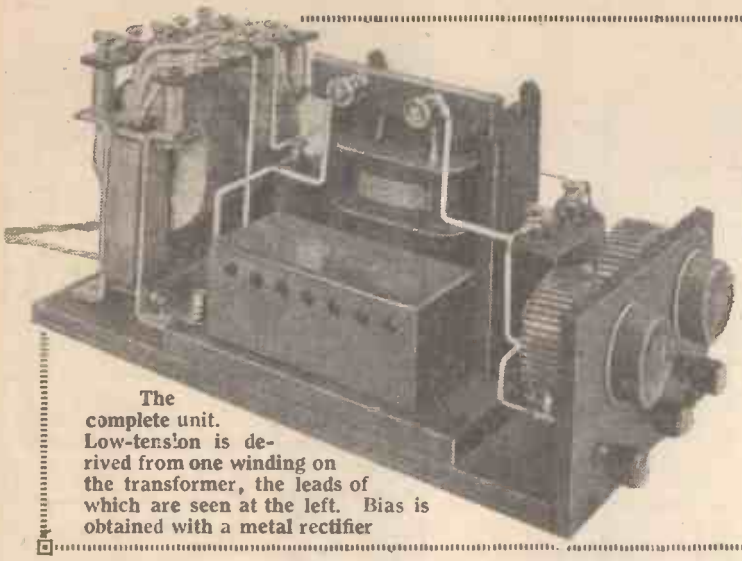
### HIGHER POWER FOR ITALY

DX ENTHUSIASTS will be glad to hear that a new broadcaster is being installed at Trieste, in Italy, and that shortly yet another "alternative" should be available on the medium waveband.

The Italian Broadcasting Co. has ambitious plans in mind, and the new Trieste station is the first move that has been made since the Rome transmitter was built.

The aerial power of Trieste will be 15 kw., with a maximum modulation of 100 per cent. It is designed to cover wavebands between 200 and 545 metres, but the normal working wave of the station will be 247.7 metres.

In view of the vital necessity of stations adhering rigidly to their working wavelength, a new type of valve drive will be incorporated in the new Trieste transmitter and this will ensure a constancy of the carrier wavelength well within the Hague Conference limits.



The complete unit. Low-tension is derived from one winding on the transformer, the leads of which are seen at the left. Bias is obtained with a metal rectifier

# A HANDY L.T. AND GRID-BIAS UNIT FOR A.C. MAINS

MANY mains users do not realise that when they take their high-tension supply from an eliminator, a greater importance attaches to the low-tension and grid-bias sides of the set.

With an eliminator the high-tension voltage is always constant and there is not the possibility of the voltage slowly decreasing with age, as there is with a dry battery. There is a certain amount of danger with the grid-bias battery, although this is not always realised. Grid-bias batteries are cheap to buy and are, generally speaking, so efficient that once fitted one can forget about them for at least six months.

Occasionally, however, one comes across a "dud," and in any case it is not easy to ascertain exactly the amount of "juice" still left in a grid-bias battery. What happens if the voltage drops through any reason is that while the high-tension voltage remains constant, the anode current increases. With some of the new power valves of the P2 and P220A class, this increase in voltage is very sudden for a small drop in grid-bias voltage, particularly when the high tension is in the neighbourhood of 150 volts, as it frequently is when the set is mains driven.

An increase in anode voltage does not matter very much on the score of consumption, because the high-tension unit can generally supply a small overload, although the H.T. voltage drops as the anode current increases, and this will naturally spoil reception.

The actual damage is done to the valve, and amateurs who will persist in using dry batteries in conjunction with an otherwise mains-driven set should make a point of occasionally checking up the voltage, as this is a good insurance against the harming of a power valve—and power valves are still relatively expensive.

There are ways out of the difficulty, and users of all mains-driven A.C. sets (fitted with A.C. valves) can generally provide grid bias by means of a dropping resistance on the filament side of the circuit. D.C. mains set users can obtain free bias in a similar manner by means of dropping resistances shunted by condensers — but care must be taken not to let the voltage taken up by the grid-bias arrangement detract to too great an extent from the anode voltage.

If you are at present working your set with an A.C. mains eliminator, then the best way out of the difficulty is to make up a little grid-bias unit, such as the one illustrated here, which will provide everlasting grid bias at a constant voltage and at practically no expense.

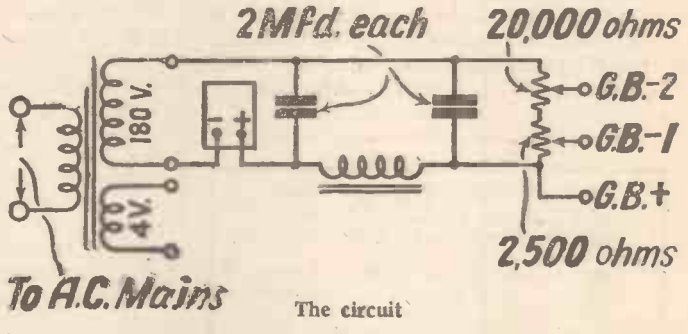
The consumption from the mains is practically immeasurable, provided that you make the unit up exactly as described and use a good power transformer.

Essentially this grid-bias unit is the same as a small high-tension eliminator using half-wave rectification, but, of course, for the sake of economy, a smaller type of rectifier is used because the current consumption is small.

A metal rectifier is used in this unit because of its simplicity, and because once fitted it can be forgotten, whereas with a valve rectifier replacement is needed at infrequent intervals. One does not mind this with a high-tension unit which is giving a certain amount of power, but one expects a grid-bias unit to be trouble-free.

The voltage of the mains is stepped down by means of a power transformer for, for normal working, nothing like the full mains voltage is needed for grid bias.

The standard type of power transformer needed for this unit is provided with a separate low-tension winding by means of which an alternating-current filament supply can be obtained, which is an obvious advantage if one has a set fitted with A.C. valves. It is not necessary, of course, to utilise this section of the secondary winding if you need the unit only for the provision of grid bias and use battery valves. No harm will result to the transformer, and it will not tend to overheat. Nevertheless, as most transformers suitable for the bias unit, such as the Clarke's Atlas used here, are provided with this low-tension winding, it is a pity not to make use of it. A simple alteration to the wiring of the set enables A.C. valves to be used.

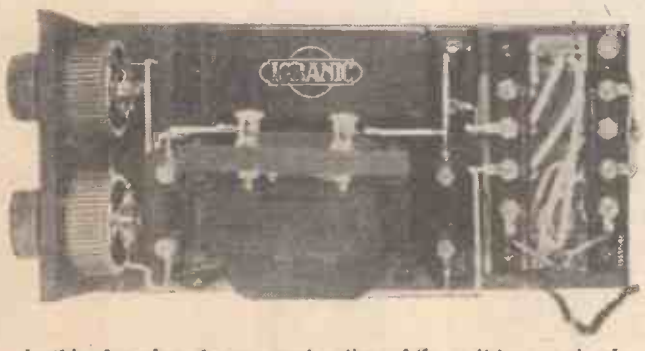



The circuit

The scheme of connections is shown in the accompanying theoretical circuit diagram, and you can compare this with the layout as shown by the photographs.

One wire of the secondary of the power transformer is taken straight through to the negative grid-bias terminal—that is the maximum negative voltage. The other side of the secondary is connected through the metal rectifier and a smoothing choke to the negative connection. Smoothing condensers are provided, one on each side of the choke, and a potential divider arrangement is placed across the maximum positive and negative connections to provide intermediate values of grid bias.

The parts you will need for the construction of this unit are shown in an accompanying panel, and, as in any mains



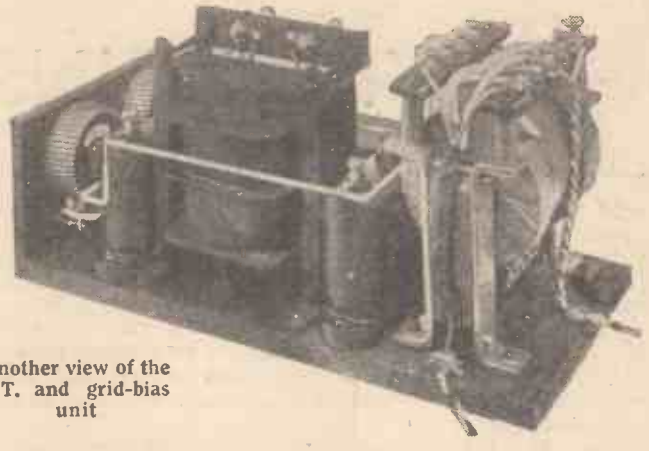
As this plan view shows, construction of the unit is very simple

## "A HANDY L.T. AND GRID-BIAS UNIT FOR A.C. MAINS"

(*Continued from preceding page*)

apparatus, you will be advised to adhere to the list given. It is never safe to experiment in the values of the choke, condenser, or transformer. In this unit these values have been specially chosen to work well in conjunction with the special metal rectifier employed.

The layout, as you will see, is on quite straightforward lines, but for those who want to guard against the possibility of any mistakes in construction and wiring a full-size blueprint has been prepared of the unit, and this can be obtained, price 1s., post free, from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4.



Another view of the L.T. and grid-bias unit

Wiring need not necessarily be done in the familiar square-corner fashion, for no question of "low loss" enters into the construction of a unit such as this. However, it is advisable to get the wiring fairly well spaced and as nearly as possible in accordance with the spacing as shown by the photograph. The possibility of hum and mains ripple may arise if the wires are incorrectly grouped.

It is advisable to make soldered connections, and if you do not use rigid insulated wire you will probably prefer to shield lengths of bare wire in insulated covering.

Make quite sure that all the wires are correctly connected. There are so few leads in the unit that there is hardly the possibility of making any mistake.

It should be remembered that, owing to the low current taken by the grid-bias potential divider, there is not the same tendency to hum as there is with some mains units where the heavy current passed by the smoothing choke, for instance, tends to saturation.

The metal rectifier used is of the Igranic-Elkon type, and the special E.G.B. grid-bias model is used. Using the components specified and on ordinary 50-cycle mains of from 200 to 250 (according to the tapping chosen on the transformer), the maximum grid bias available is over 100 volts, but, of course, this full value is never needed and the intermediate tappings will be used, these giving grid bias at any intermediate voltage.

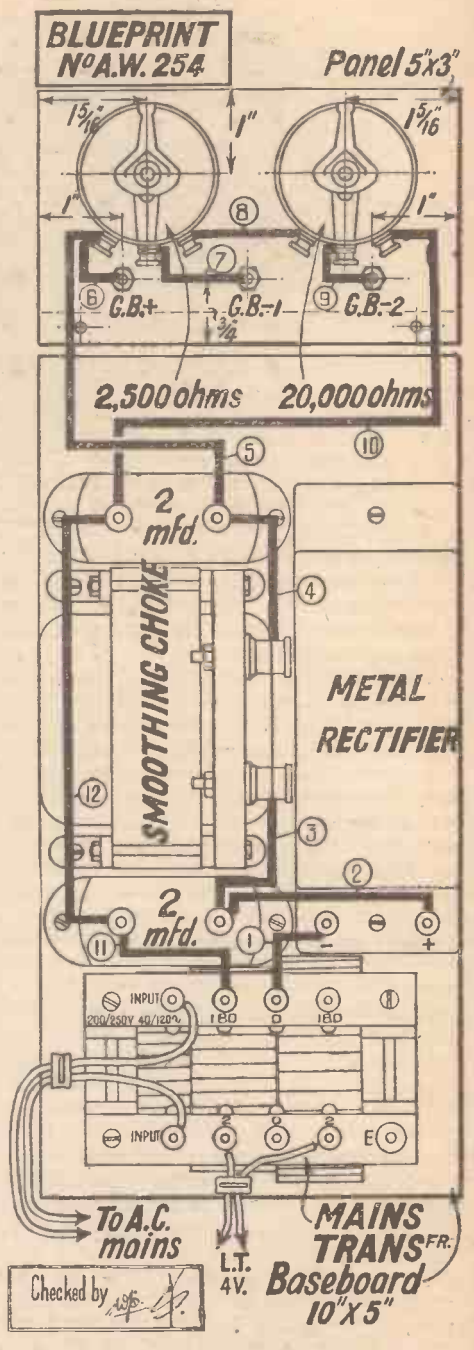
You may find that a slight amount of hum is induced in the set when the grid-bias unit is placed near to it, owing to the induction in the detector stage from the choke or transformer of the grid-bias unit.

Therefore, spend a little time in finding the best position for the unit in regard to the set, just as you would when installing a mains unit. The bias leads from the receiver to the potential divider should not be too long, but the length of the input mains lead to the unit is relatively of little importance.

Do not forget to fit a switch in this mains lead to turn off the unit when the set is not in use.

### *PARTS REQUIRED FOR THE L.T. AND GRID-BIAS UNIT*

Mains transformer with 180-volt and 4-volt secondary (Atlas, Igranic).
Grid-bias metal rectifier (Igranic type EGB).
Smoothing choke (British General, Lissen, Igranic, R.I., Ferranti, Bulgin, Varley).
Two 2-microfarad fixed condensers (Lissen, T.C.C., Dubilier).
20,000-ohm and 2,500-ohm variable resistances (Regentstat, Varley).
Three terminals marked: G.B.+, G.B.—1, G.B.—2 (Belling-Lee, Eelex, Electro-Linx).
Ebonite strip, 5 in. by 3 in. (Trelleborg, Becol, H. & B., Readi-Rad).
Baseboard, 10 in. by 5 in. (Clarion, Pickett, Camco).
Connecting wire (Glazite).
Three yards of twin flex (Lewcos).




The layout and wiring diagram. A full-size blueprint is obtainable, price 1/-

## A NEW RECTIFYING VALVE

A NEW principle in valve construction is shown by an invention of Dr. Siegmund Lowe, which though primarily intended for rectification may have interesting possibilities in other directions. The cathode, which is made highly emissive by a coating with barium, lanthanum or other metals precipitated upon it, is not heated by a local battery, but by means of an iron core *outside* the vacuum. The glass bulb is, in fact, provided with an envelope at the bottom that may be likened to the bottom of a wine bottle. In this is fitted the iron core, round which is wound a coil fed by alternating current. The cathode is cylindrical, and becomes hot by induction from the iron core.

### FOR CONSTRUCTORS

**You have probably found when you want to tighten up the nuts on the various terminals (which will insist on working loose), that many of them are buried under the wires and almost inaccessible, with the result that often enough the job gets left. If you work on the following system in your wiring, you will find it a very easy matter to keep all terminals in good order: Keep as many wires as possible running low down close to the baseboard, taking care that none passes over any terminal. The wires running to panel components should be kept low and then brought vertically to the terminals. Don't let any wire come straight up from the terminal as the wire is sure to be in the way. Especially is this so with the back terminal strip. Make *all* your wires approach the terminal from below, and your spanner will have ample room to grip the nut.**

**When wiring, always make a right-hand loop on your wires. If you do this you will never be troubled with your wires being "thrown off" the terminals.**

## DON'T FORGET THE AERIAL

DON'T forget, when you have built a new and more powerful set, to see that a suitable aerial is used.

Probably a smaller aerial will be satisfactory, unless, of course, the set is one that has really good tuning. Most sets are too powerful for their selectivity, however, with the result that the best all-round performance is obtained with a relatively short aerial.

Instead of cutting down the aerial, a fixed condenser may be added in the aerial circuit. This will, in effect, reduce the size of the aerial. A further advantage is that the effective capacity of the aerial circuit is reduced, and therefore the tuning range will be extended a little.

# Is Broadcast Advertising Coming?

*Alan Hunter throws light on the B.B.C.'s Charter and Its Relation to Sponsored Programmes*

EVER since I went to America last year I have been asking whether broadcast advertising will eventually come into the scheme of British broadcasting; having seen and heard the sponsored programmes compiled and broadcast by the big American stations I marvel at the difference between the entertainment value of an American programme and the average broadcast programme of this country.

The most stalwart supporter of the B.B.C., or its most kindly-disposed critic, would have to admit that the general entertainment value of our programmes is not high; the best-informed critic admits that the B.B.C. has a herculean task to provide 365 different programmes per annum from each Regional centre; and that while the task is herculean the revenue coffers are neither capacious nor particularly full. For although we have over 3,000,000 licensed listeners in this country, representing a revenue of 1½ million pounds, nothing approaching this sum is available for B.B.C. programmes.

### Where the Money Goes

To begin with, a large slice is carved out by the Treasury and Post Office; then there are the ever-growing engineering costs; the Regional scheme, whatever its service merits or demerits, is costing the listener a lot of money. What is left for programmes does not enable the worthy compilers to make the most of the entertainment resources in this country. The idea of paying at regular intervals fabulous fees for artistes like Chevalier is absolutely ridiculous with present resources.

I know the obvious way out is to ask the Treasury to hand over some of its share of the licence revenue. The B.B.C. would be acting in strict accordance with its charter if it did so. There is a clause in the charter that proves my point. On page 20 I read:

"The Postmaster-General undertakes to give consideration to any application which may be made to him by the Corporation at any time after the 1st January, 1929, *for an increase in the amount of the sum payable by the Postmaster-General to the Corporation* in respect of any unexpired part of the term on the ground that the sum for which payment is provided by this clause is insufficient for the performance by the Corporation of its obligations under these presents."

I have no information as to whether the Treasury has been approached; or whether, in that event, the B.B.C. has been turned down; what I do know is that the idea of brightening the programmes will remain only a pious hope unless more money is found.

Queer objections are raised whenever anyone has the temerity to suggest that, Charter or no Charter, commercial interests should be allowed to spend publicity money on sponsoring programmes. "We pay the B.B.C. our licence fee, so the B.B.C. should pay for the programmes." That is a common argument of one school of listeners; but for this annual payment the B.B.C. provides a fine engineering machine and unrivalled public services of adult education and religion.

### The B.B.C. Charter

The stock answer to the suggestion that Big Business should be allowed to sponsor one programme each evening, thereby solving the financial difficulty in providing regular top-notch performances, is that the B.B.C.'s Charter prohibits such a scheme. Even the B.B.C., when tackled on the question, shrugs its shoulders, smiles pityingly and bids one view the Charter under which it operates.

Well, let us view this Royal Charter. Fairly early in its ramifications I find Clause 3 rather illuminating and quite hopeful to my cause.

"The Corporation shall not, without the consent in writing of the Postmaster-General, receive money or any valuable consideration from any person in respect of the transmission of messages by means of the stations or any of them."

### The Provisos

Even without reading the provisos that follow, surely the B.B.C. can ask the P.M.G. —and we are entitled to know why he should refuse. But the provisos pave the way to an immediate application of the scheme of sponsored programmes. Here they are:—

"Provided that nothing in this clause shall be construed as precluding the Corporation from (1) broadcasting matter provided gratuitously by any person with or without an acknowledgment of such provision by means of the broadcasting service; (2) Receiving a consideration for broadcasting names of publishers and prices of matter which is broadcast; (3) (So far only as the licence of the Postmaster General is required) from using for broadcast purposes without payment concerts, theatrical entertainments or other broadcast matter given

(*Continued on page 631*)


**Preparing the "mikes" in the laboratory of the National Broadcasting Co. of U.S.A., which makes a feature of sponsored programmes**

# HOW TO MATCH YOUR OUTPUT STAGE AND SPEAKER

*In this article W. JAMES points out the advantages of matching the output with the speaker and explains how it may be done*

EVERYBODY knows that for the best results it is necessary for the last valve and loud-speaker circuit to be suitably proportioned.

Fortunately, exact proportioning is not needed, but volume will most certainly be lost and, perhaps, distortion will be introduced if a poorly-arranged circuit is used.

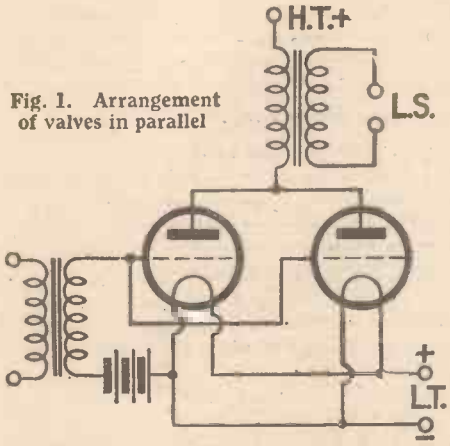



Fig. 1. Arrangement of valves in parallel

We know for instance, that when a low-resistance loud-speaker is joined to a set, the volume and quality are usually poor in comparison with when a normal high-resistance instrument is used.

The high-resistance loud-speaker may itself not be the best output for the power valve, however. With an instrument having different characteristics even more volume might be obtained.

### Output Arrangements

Output valves are of all sorts of sizes. Thus we have the ordinary power valve, with its impedance of about 4,000 ohms. Other valves have a lower impedance, even as little as 1,000 ohms. Then, again, we have the pentode valve, with different characteristics altogether. Sometimes two valves are used in parallel (Fig. 1). The combined impedance of a pair of similar valves connected in parallel, that is, with their grids joined together and their anodes, is half that of one valve.

In other circuits a pair of valves is used in push-pull (Fig. 2). Here, with similar valves, the effective anode impedance is twice that of a single valve.

Clearly it would not be fair to expect that the best possible results would be obtained from all these arrangements with a single loud-speaker. We should expect to find with such widely different impedance values equally wide differences in the results. As a matter of fact, no very great change in the output or quality of reproduction is obtained by altering the impedance of either the valve or loud-speaker by, say, 25 per cent., but when there is a relatively wide difference, a loss is certainly experienced.

### Speaker Impedances

Loud-speakers have varying impedances throughout the audible range. Sometimes, indeed, there are pronounced resonance points. Moving-coil loud-speakers have a fairly uniform impedance over the range when carefully designed, although it must be admitted that a proportion are poor in this respect. Ordinary reed types driving a cone have an impedance usually very different from the mere ohmic resistance of the coils at nearly all frequencies.

Therefore, no one figure can be given even for speakers of a type. For the maximum output from a valve, or should one say the maximum undistorted power output, it is usually necessary so to arrange the external circuit that its impedance is twice that of the valve. This does not apply to pentodes.

In order to obtain the desired output circuit impedance, a transformer is often used with the loud-speaker. Its ratio will depend upon the characteristics of both valve and reproducer. For ordinary so-called high-resistance loud-speakers and valves of the small power class, a transformer having a tapped secondary coil, as in Fig. 3, is useful. The ratios need not be more than from 1-1 to 1-5 or thereabouts. Close ratios are not needed, as the ear is not able to distinguish small differences such as would be produced by connecting the instrument to the various tappings.

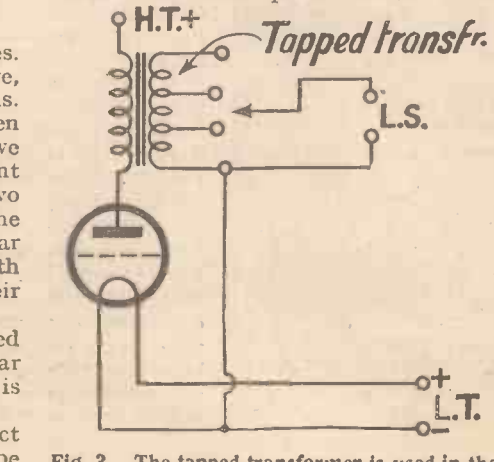



Fig. 3. The tapped transformer is used in the manner shown above

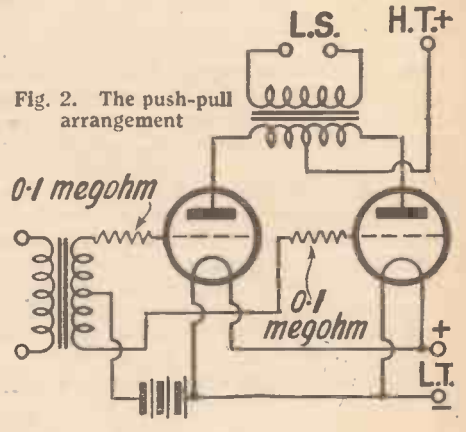



Fig. 2. The push-pull arrangement

Instead of the tapped transformer we could use a tapped output choke as part of the choke-condenser filter and obtain practically equivalent results.

### Matching by Trial

To match the circuit by trial is a matter of patient testing. You can only try the various ratios and stick to the best one. It will be found that the amount of volume and the tone both vary as the ratio is changed.

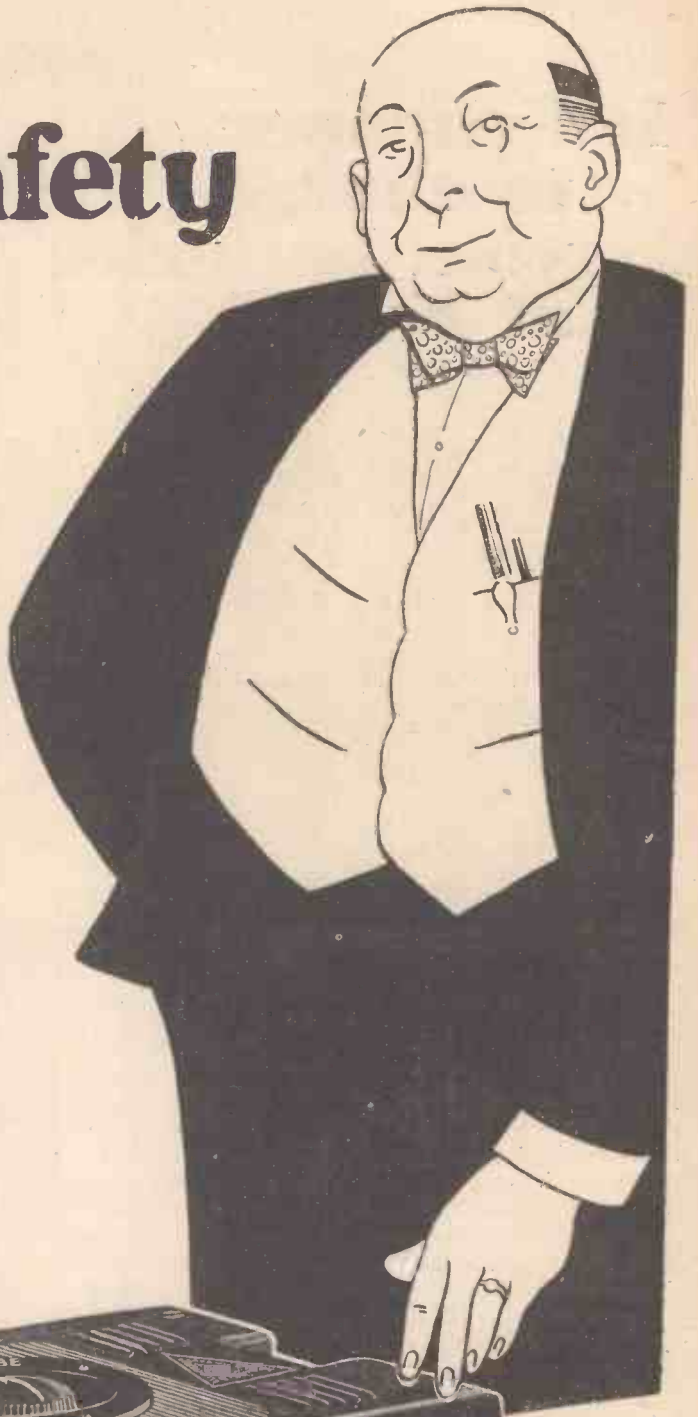
That beneficial results are obtained from matching a loud-speaker and power valve or stage is not to be denied. With a valve of, say, 4,000 ohms a transformer might enable more power to be obtained, but the tone may not be improved.

The point is that the loud-speaker people adjust their instruments to give the best tone with the valves they expect will be used. A certain amount of correction must also be reckoned with, as it is the combined result with distortions due to set and loud-speaker that we hear.

Nevertheless, we can often improve results to a worth-while extent by using a tapped output choke or transformer. With a low-resistance instrument the ratio of the transformer may well be 25-1 or more, depending upon the output stage and the actual characteristics of the loud-speaker. Résistance is, of course, no real guide

# I Like that Margin of Safety

All-electric's all right for radio, but I like to be careful about anything that's worked by electricity in the home. There's the wife and the youngsters *and* the maid who will monkey about with the set at *any time*. She does like radio—that's why my H.T. Batteries always get spent out when I want a special programme, so I've got fed up with batteries and I've bought an



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# On Your Wavelength!

### STANDARDISATION AND ECONOMY

IT is good to hear that the Central Electricity Board's scheme for standardising household electrical supplies all over the country is making such good headway. No country in the world has suffered from such chaotic conditions in the matter of electrical supply as these little islands of ours, and it is really wonderful, in face of the difficulties so introduced, that we have been able to make such progress. Even in pre-war days, for example, alternating current at a fixed voltage and frequency was standardised throughout Switzerland; but, looking at a 1914 list of our own electrical undertakings for London alone, I find household voltages of 100, 102, 104, 105, 108, 110, 150, 200, 205, 210, 220, 230, 240, and 250. About half the undertakings supplied direct current and the other half alternating. The alternating might be one-phase, two-phase, or three-phase, and the frequencies that appear in the list are 25, 40, 50, 60, 83, 85, 90, and 100. London formed a pretty fair sample for the country at large. Everywhere one found different voltages and different frequencies if A.C. was used.

### A HANDICAP

EVEN three years ago matters were not very much better. Think of the appalling handicap that this placed upon wireless manufacturers. In the United States, as well as in the great majority of European countries, mains sets can be absolutely standardised, for the current supply is nearly always A.C., with one fixed voltage and frequency. To supply the demand for all-from-the-mains receivers our makers had to turn out a comprehensive range of apparatus for all sorts of voltages and different kinds of current. They had also to adapt their A.C. smoothing circuits to suit a wide range of frequencies.

### WHAT IT WILL MEAN

WITHIN five years from now the Central Electricity Board's scheme should be completed, and then every house provided with electric light will receive an A.C. supply at 230 volts, with a frequency of 50 cycles a second. The whole of the old troubles will automatically disappear and makers will be able to concentrate on one particular form of apparatus. This will cut production costs right down, for if you are making a thousand eliminators it is infinitely cheaper to produce them all for 230 volts 50 cycles than to have to turn out 500 for these conditions, each made adaptable for different voltages and frequencies, and the other 500 for D.C. at various voltages. So far as we wireless folk are concerned, then, the change will mean a better set at a lower price; and if that isn't good news, I don't know what is.

### ANOTHER ADVANTAGE

ANOTHER interesting effect of voltage standardisation will be an all-round improvement in the efficiency of receiving sets. Owing to their design, A.C. valves are already better performers than those operated by batteries—A.C. screen-grid valves, for example, have amplification factors running into four figures—and, once the standardisation of current supply increases the demand for valves of this kind, makers will have a better chance of concentrating upon them. One need be no prophet to predict that we shall see some very remarkable A.C. valves within the next few years.

### HANDY COMPONENTS

ONE of the brightest brain-waves regarding wireless components that I have come across for a long time is that which gave rise to the spaghetti resistance. In case you don't know it, this kind of resistance looks just like an ordinary lead covered with systoflex and provided with a metal tag at each end. If you cut away the systoflex covering, you will find within "umpteen" yards of the finest wire you ever saw in your life wound round a string core. You can get them in all values, from 1,000 to 50,000 ohms, and, of course, you can get as much resistance as you like by connecting two or more in series. The 50,000-ohm variety is actually 9 in. long over all when it is stretched out, but you can actually shorten it as much as you like by the simple process of coiling it up. If you want to put a resistance of, say, 25,000 ohms into the plate circuit of a valve for decoupling purposes, all that you have to do is to use one of these spaghetti fellows as the actual connection from the H.T. positive terminal to one of those of the shunting condensers.

### A FELT WANT

WITH the growing demand for fine quality in reproduction, big wireless sets are coming to make pretty large demands in the way of high-tension current. Actually, if you want the "goods" in the way of volume and perfect purity, you have to think about 300 or 400 volts and a current of round about 80 milliamperes. Naturally, the fellow who works off batteries must regard this as beyond him, for even with accumulators the expense would be heavy. But if you have A.C. mains in the house, then there is no reason why this kind of super wireless should cost you much, so long as you have a really efficient eliminator capable of delivering such a hefty amount of juice. At the moment there are very few eliminators of this kind on the market. The great majority don't envisage a voltage much greater than 150 or a load beyond about 25 milliamperes. I believe that there is a very big field open—it will be a bigger one as time goes on—for any maker who can turn out at reasonable cost a super eliminator of the kind to which I have referred.

### THE AGE OF WONDERS

THE other day, whilst I was using a set of the very latest 2-volt valves, I could not help being struck by the astonishing progress that has been made with regard to these little "toobs." The set was a three-valver containing an S.G. stage, a grid-leak detector, and a low-impedance output valve. The filament ammeter showed that the L.T. battery was supplying just under .45 ampere, or considerably less than 1 watt. The S.G. valve required .15 ampere, the special detector .1 ampere, and the output valve .2 ampere. Compare this with the valves of a few years ago. Then the only type in common use was a 4-volt bright emitter drawing .7 ampere—nearly 8½ watts for the trio. The earliest 2-volt dull emitter was the D.E.R., of blessed memory, which needed .4 ampere of filament current, or about 2½ watts for a set of three. But neither the Ora nor the D.E.R. could give anything like the over-all amplification or the output of the 2-volt dull emitter of to-day. The former, if I remember aright, had an amplification factor of about 8, whilst that of the D.E.R. was, perhaps, a little greater, though not very much. Against these figures set 200 for the up-to-date screen-grid valve, 10 to 15 for the detector, and 5 for the output valve.

### FEEDING THE L.S.

AND, whilst we are talking about modern dull-emitter valves as compared with those of yesteryear, consider for a moment the difference in the amount of juice provided for the loud-speaker. With the highest plate voltage that you could safely put on to them, the old 2-volters would not stand more than about 1½ volts negative grid bias and the current delivered to the loud-speaker was not much over 1 milliampere. This meant that if you wanted to avoid distortion you had to reduce the volume until it was pretty well necessary to put your head into the trumpet of the speaker to hear what was coming through. The 2-volt low-impedance valve of 1930, with a plate voltage of 150, takes a negative grid bias of 24 volts or more and pumps from 15 to 20 milliamperes through the loud-speaker windings. With it you can obtain really big volume without the slightest distortion. Yes, dear reader, we certainly have advanced, and the great thing is that we have not stopped going forward. No doubt in these notes in 1935 you will find paragraphs showing that the valve of those days is as much superior to the 1930 vintage, as was the latter to that of the 1925.

### THE MIKE

WE all know that the B.B.C. has been experimenting for years with the condenser-type microphone and that at one time it threatened to displace entirely the carbon Reisz microphone used for studio and outside broadcasts. Condenser "mikes" have been, and still are, used on occasional orchestral transmissions from Savoy Hill, but considerations of difficult maintenance and a tendency to develop crackles suddenly have given the Reisz carbon microphone a new lease of life. Theoretically, of course, the condenser microphone gives the finest quality, inasmuch as it gives voltages

## On Your Wavelength! (continued)

on the output of its amplifier that are in direct proportion to the air pressures of sound waves impingeing on its diaphragm. Practical tests on the best loud-speakers indicate, however, a certain metallic quality that is unpleasant to listeners who are used to the soft "woodiness" of the Reisz "mike."

### THE CONDENSER MICROPHONE

THE condenser microphone is a very delicate instrument. The sound waves move a tightly stretched duralumin diaphragm closer and further away from a solid backplate, and the varying capacity controls, through a resistance-capacity coupling, the grid volts of a valve close behind it. Usually it requires two or three stages of valve amplification to bring the impulses from the condenser microphone up to the strength of the normal output of a Reisz microphone. The delicacy of the instrument may be judged from the fact that it has to pass through forty-six mechanical and electrical inspections before leaving the factory, and these include tests which must show the insulation resistance to be at least 80,000,000,000 ohms, the natural frequency of the diaphragm to be between 5,000 and 5,050 cycles per second, and the backplate of the condenser to be within .00008 in. of a true plane. The last test sounds pretty well impossible, but I am told it is carried out with a new type of optical measuring apparatus.

### THE DIAPHRAGM

THE tension of the diaphragm determines its natural frequency. In the case of the Western Electric condenser microphone, 5,000 cycles is the desired resonance, and this is obtained by the tightening of the diaphragm until it is observed to be in tune with a pure note of that frequency. The assembly is then sealed and the air extracted from between the condenser plates by means of a vacuum pump. Later nitrogen is introduced, and the "gas-filled" microphone is then unaffected in its capacity by changes in atmospheric pressure.

### DIRECTIONAL MICROPHONES

EXPERIMENTS have been made, both in England and U.S.A., with directional microphones. The particular advantage of such instruments for broadcasting is chiefly in connection with the relaying of stage plays from theatres, where the actors move about the stage and speak their lines with distressingly small regard for the location of the microphone—probably in the footlights. The advantage of a microphone that can be focused on an actor, like a limelight, is obvious. The microphone man sits in a box or in the front of the circle and merely points his instrument at whatever sound he wishes to be picked up. All sounds occurring outside the "beam" of the microphone, which covers an angle of about 25 degrees, are not picked up at all, thus cutting out the coughs and sneezes of the audience and the echoes of the auditorium. Directional microphones are a practical proposition, but they have not found favour with the B.B.C., owing to the loss of sound quality, which is one of the results of obtaining a good directional effect.

### "ANTI-LOGARITHMIC" HORNS

THE directional effect is usually obtained by means of a trumpet attachment, dome-shaped, which fits on the front of the normal microphone. This trumpet affair naturally has resonances, and an effort to get rid of these is made by having absorbent resonance chambers fixed on to the horn close to the microphone. These absorb the sound frequencies which tend to be emphasised by the horn, and also eliminate the "seashore" sound created by it. The "seashore" effect is that which you hear when you put a teacup, jam-jar, or similar object to one ear. Directional microphones are sometimes used in talking-picture making, though here again they are not sufficiently free from distortion to warrant general use.

### A CURIOUS TROUBLE

HAVE you ever heard of an amplifier that motor-boated with one stage? I certainly had not until the other day, when I experienced the most curious effect. I was building a power amplifier for running off A.C. mains, and the last stage was L.S.6A. The amplifier only had two stages altogether, and it was carefully filtered and generally constructed on approved principles, as a result of which I was fairly confident of avoiding any feed-back whatever.

To my horror I found that it motor-boated in the most violent manner, causing the milliammeter needle to flip from side to side in a very agitated fashion. The noise in the loud-speaker was really quite unpleasant, and I did not dare leave the set switched on for more than a few seconds, as I was afraid something would disintegrate in the works.

### A SEARCH

HOWEVER, I had to switch the set on periodically in order to see whether the various alterations which I made had any result, and I found in the end that I still got this nasty trouble, even when the first stage was completely disconnected, leaving only the last valve in circuit. This struck me as very peculiar. Motor-boating, of course, is caused by a back-coupling from the anode circuit of one valve to the grid circuit of the same valve, usually experienced by the presence of a common impedance in the anode circuit. In this particular case, with a single valve, there was no such common impedance. True, I was using an automatic grid-bias arrangement, but this was very heavily condensered, and increasing the size of this condenser made no difference whatever. I even went to the trouble of putting in a grid-bias battery to ensure that there should be no trouble from this cause, but the motor-boating still persisted and, indeed, seemed to increase.

### THE CAUSE

WHAT made matters worse was when I had tested the hook-up of the set no such trouble had been experienced, and I could not for the life of me see any difference in the final version and the hook-up. Testing in such a case as this is rather difficult, because one does not know where on earth to start, but I adopted the method which is the only satisfactory one in any case of fault-finding—that of elimination—and after puzzling over the circuit and removing bits here and there for some time, I finally cured the fault by disconnecting a small .0003 by-pass condenser in the H.F. portion of the circuit. This happened to be connected across the H.T. voltage, and it had broken down under the strain. The breakdown was not complete, but only partial, so that there was an intermittent short-circuit occurring on the amplifier every time the voltage sparked across the plates, which it did several times a second, giving the unpleasant motor-boating effect. Replacing this condenser by another put right the whole trouble and the amplifier worked perfectly satisfactorily.

### ONE UP TO WIRELESS

WHEN I look through the advertisement pages of a wireless paper, one thing often impresses me very much. This is the general reliability of the advertisements. Every maker claims, of course, that his particular condenser or coil or battery is the best; but that, after all, is only natural exuberance, and everyone understands. What I am driving at is that it hardly ever happens that one finds either a completely dud component advertised or extravagant and impossible claims made for any particular piece of apparatus. This happy result has been brought about by the wise policy of the best papers, such as AMATEUR WIRELESS and *Wireless Magazine*, with regard to advertisements. If you were to come along offering to buy space to advertise some flat-catching but thoroughly bad gadget, hoping to sell it by means of fantastic claims, you would find your offer quite politely turned down. No section of the Press safeguards its readers so well as do the wireless journals. That is one great reason why it pays, when you are contemplating the purchase of advertised goods, to see whether they are announced in the wireless papers as well as in the lay press. The lay papers, of course, know little or nothing about wireless goods and cannot possibly exercise the same kind of supervision, for they do not and cannot run test departments—at any rate, on the same extensive lines.

THERMION.

**SOME OF NEXT WEEK'S FEATURES:**

**Aerials and Earths for Present-day Conditions.**

**Mains Snags—and How to Avoid Them.**

**The Making of a Radio Play.**

## THE HOW AND WHY OF RADIO

# VI—HOW LOUD-SPEAKERS WORK

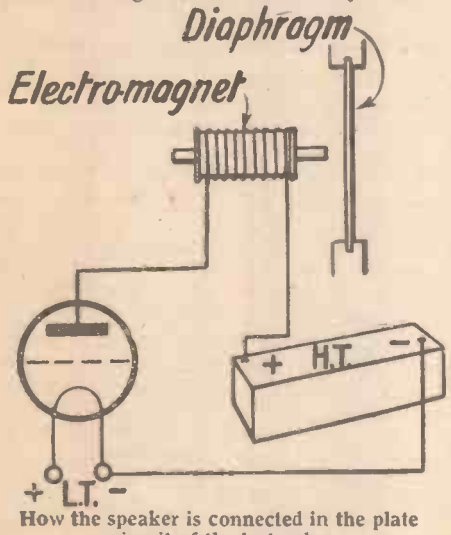
***If you are a beginner in wireless, now is your chance to gain a clear conception of its theory and practice. In this series of articles, specially prepared for the beginner, no previous knowledge of wireless is assumed. Every aspect of the subject will be dealt with in ensuing issues, and the whole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

BEFORE we find out how they work, let us be quite clear as to why we have loud-speakers. When we listen to a wireless set we hear sound waves, or vibrations of the air; a particular column of air is being set in motion by the rapid vibration of a diaphragm, which may take the form of a large cone or a small thin sheet of iron.

The device that causes the diaphragm to vibrate to produce sound waves is usually an electro-magnet. Its pull on the diaphragm, direct in a horn speaker, and through the medium of a reed in a cone speaker, depends upon the strength of its magnetism; its varying attraction for the reed or diaphragm is determined by the variation in the current flowing through it.

That current is the anode current of the power valve; and, in brief, one can say that the greater the anode current variations the greater is the volume of sound created. That is why the object of a wireless set is to produce the greatest possible current changes in the anode circuit of the last valve; for the loud-speaker is a current-operated device.

The simplest loud-speaker is the horn type, consisting of a small diaphragm, made of iron, sometimes aluminium or other non-magnetic metal, securely fixed all

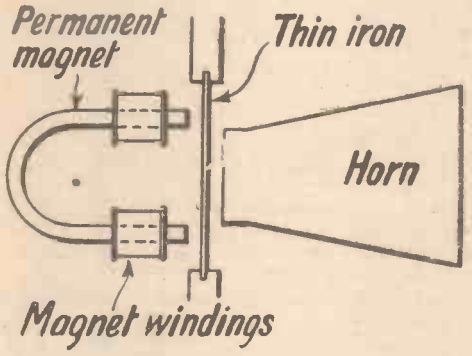



**How the speaker is connected in the plate circuit of the last valve**

round the edge, but free to move at its centre. Almost touching this centre is a powerful permanent magnet exerting a constant magnetic pull on the whole diaphragm. The nearer the centre the diaphragm is to the pole pieces of the magnet the more sensitive is the mechanism.

Usually this distance between the diaphragm and the magnet can be adjusted by a knob at the back of the loud-speaker; so that when the current flowing through the magnet coils is very strong the distance can be increased to avoid rattling.

Around each of the two pole pieces of the permanent magnet are wound coils of fine wire, providing a very high inductance, so




**Schematic diagram of horn-type speaker**

that even a small current change will have a big effect on the magnetising pull. As the anode current flowing through these magnet coils varies, so does the pull on the diaphragm, which vibrates at the frequency of the low-frequency current changes, thus setting up sound waves, which are reinforced by covering the diaphragm with the neck of a horn.

This construction and action also applies to headphones, except that no horn is required, as the ear is so close to the air actually set in motion by the diaphragm.

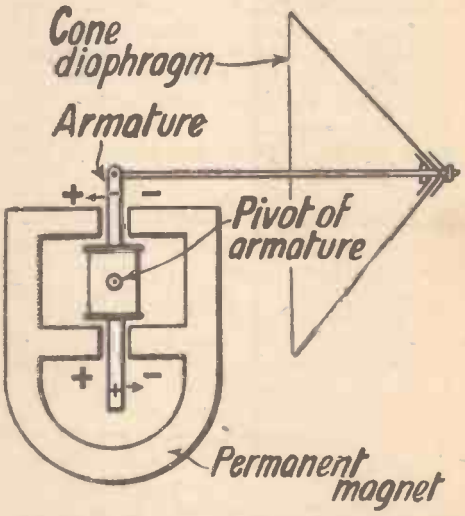
The disadvantage of the simple horn loud-speaker is twofold; it cannot respond to low notes unless the horn widens according to a logarithmic law—none too easy to put into practice; secondly, the directional effect of the horn tends to accentuate the megophone effect inseparable from this type of loud-speaker.

So the cone diaphragm loud-speaker has come into its own. Here the diaphragm is large enough to set sufficient air in motion to give adequate sounds without the need for a horn. The cone can be made of heavy paper, wood, linen, or other material that does not resonate at an audible frequency. Because of this, both high and low notes can be dealt with equally well. Several methods are available for actuating the large cone diaphragm; the most popular is to use a balanced-armature movement, as incorporated in all the popular cone loud-speakers now on the market. Distinct from the balanced-armature cone is the moving-coil loud-speaker, which has a coil instead of an armature, set in motion in the field of a powerful magnet.

The predecessor of the balanced-armature movement had a small strip of iron called the armature in place of the iron diaphragm. The varying attraction of the magnet on this armature caused it to vibrate like the diaphragm, but its vibrations were communicated to a reed fixed to the centre of the large cone, which in turn vibrated and set up sound waves. For various reasons this simple mechanism was found to be unsuitable; no very fine adjustment could be made and the sensitivity and power-handling capabilities were limited.

In a balanced-armature movement there are four magnet poles instead of two, and current changes in the armature coil caused big variations in the movement of the armature. The modern balanced-armature movement employs a very powerful permanent magnet; two positive poles are arranged at one side of a pivoted armature and two negative poles at the other side.

The armature has round it a highly inductive coil. One end of the armature is connected through a rod to the cone diaphragm, so that any movement of the armature causes diaphragm movements and,




**Schematic diagram of balanced-armature unit**

therefore, sound waves. As soon as anode current flows through the armature coil, one end becomes positive and the other negative; the direction of the current determines which end becomes positive and which end becomes negative; but as the low-frequency current is rapidly changing in direction, a given end of the armature becomes alternately positive and negative.

When one end of the armature is positive, that end is attracted to the near-by negative

(*Continued in third col. of next page*)

**NEXT WEEK: VII—AERIALS AND EARTHS FOR PRESENT-DAY CONDITIONS**

# IN MY WIRELESS DEN

## WEEKLY TIPS— CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

### Reversing Transformer Connections

I SUPPOSE that most people when they wire an L.F. transformer follow the marks on the component and join the G terminal to the grid and the GB terminal to the grid bias.

With some transformers a better result is obtained by reversing these two wires. The characteristics of the transformer may change considerably when the connections are reversed, the higher notes being perhaps increased or reduced in strength.

An effect upon the stability of an amplifier is also to be noted, particularly when two stages are used, in fact, it used to be the common practice to reverse the connections to one of the transformers.

I am not suggesting that a transformer should always be wired in the opposite way to the maker's markings, but that reversing the secondary might be tried.

### Trouble with Shields

Poor results from a set having shields as part of the circuit are often to be traced to faulty fitting of the shields and to poor contacts. When filament wires are taken to a metal shield a good contact must be made and it is advisable to use large screws with washers or else to fit small terminals.

Sometimes a shield is actually part of a high-frequency circuit. In this instance a poor contact will spoil the tuning or perhaps make the set unstable.

### When an Earth is Needed

It is difficult to say whether the effectiveness of an earth is more apparent on the long or medium waves. But I do know that some sets behave fairly well when tuned over the medium waveband and tend to be unstable on the long waves, the trouble being removed by providing a good earth.

This is not true of every type of set. Those having a powerful high-frequency amplifier and therefore likely to be unstable with the slightest fault, are the chief offenders and a good earth often seems essential.

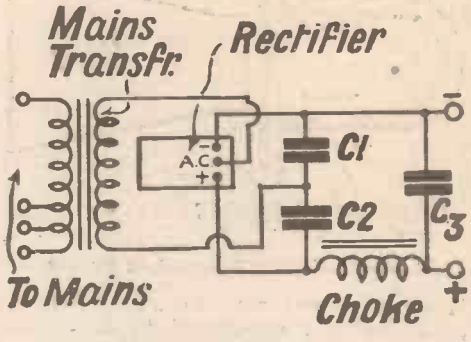
### A Good Eliminator Circuit

The voltage-doubler circuit, which is often used with metal rectifiers, has several advantages over the half-wave arrangement.

First, owing to the fact that there are two condensers in the circuit of the rectifier, shown in the accompanying diagram, the current which flows in the event of an accidental short-circuit is restricted.

Secondly, a relatively low A.C. voltage is all that is needed for the circuit. These two advantages are more than sufficient to warrant the use of this circuit instead of the half wave. Usual values for the two condensers C1 and C2 are 4 microfarads, and note should be made of the fact that one side of the secondary coil of the transformer goes to the junction of the two condensers.

A usual value for the choke is 40 henries




**A useful eliminator circuit, details of which are given in the accompanying paragraph. Voltage-doubler connections are employed**

with the full-load current flowing, and C3 may be of 4 or more microfarads. Condensers C1 and C2 have an amount of work to do, being included in the rectifying circuit, but C3 also carries current, as it is across the output circuit. It is a reservoir condenser and smooths the output.

### When Charging Accumulators

Charging accumulators in parallel may be satisfactory, but on the other hand it is possible that one cell will receive a greater charge than another.

This does not matter very much when the cells are carefully watched or when the current through each cell is measured, as an allowance can be made. It is a mistake, however, to assume that the same current passes through all the cells in parallel, as I know from correspondence is done.

Accumulators are still badly treated in many instances, but yet they seem to last for lengthy periods.

Why people buy low-capacity filament batteries I do not know. Surely the cost over a period is greater than when a battery which will last for two or three weeks is used. Besides, the small batteries must give out rather suddenly and cannot be so serviceable.

### Volume Control and Pick-ups

Pick-ups are, as a rule, fairly sensitive to light loads, such as would be imposed by a high-resistance potentiometer

Usually the amount of the treble is cut down when a resistance is joined across the instrument.

This is likely to be a serious matter if the resistance is of too low a value, for the quality is dependent to no small extent upon the relative strength of the treble and bass.

Some potentiometers, having a resistance of 100,000 ohms or more, have but little effect upon the characteristics of most pick-ups, but lower values are likely to affect tone.

When a transformer is employed to raise the strength the quality may be noticeably affected, for then we have the characteristics of the transformer to modify those of the pick-up. Some pick-ups show up overloading rather more than others and are, therefore, to be avoided unless the magnifier is so arranged that overloading in the first stage does not occur. This first-stage overloading ought not to happen when a volume control is used, but unless it is joined across the pick-up itself the first valve will probably easily be overloaded.

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### "HOW LOUD-SPEAKERS WORK"

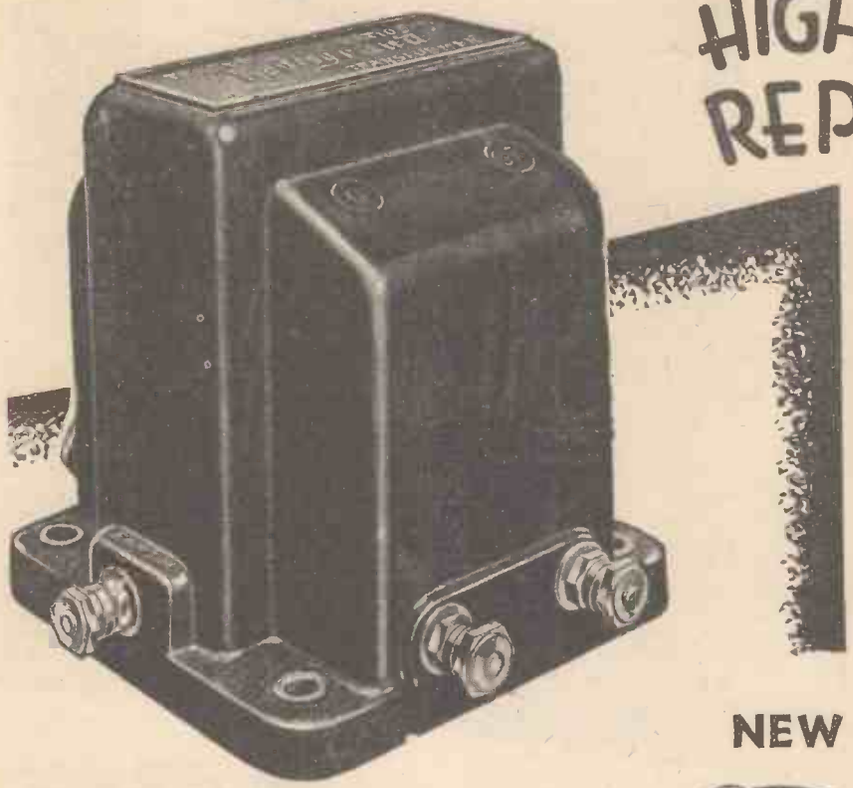
(*Continued from page* 609)

pole piece of the permanent magnet. The other end of the armature, being negative, is attracted towards the near-by positive side of the magnet. Now, as the armature is pivoted at the centre, it follows that with positive and negative poles arranged on each side, a negative pull at one end has the same effect on the movement of the armature as a positive pull at the other end. So for any given polarity of the armature it has a double incentive to move on its pivot either to right or left. The diagram should clear up any difficulties in grasping this action.

The other way of driving a cone diaphragm is by using a coil instead of an armature. The magnet can be either permanent or excited by means of a 6-volt accumulator, or, better still, from the mains. The usual moving coil consists of a magnet with two poles of one polarity and one pole of the opposite polarity. Around the single pole is supported a small coil; when current from the anode circuit of the valve flows through this coil it becomes an electro-magnet; changes in the anode current cause this little coil to vary its magnetism, which in turn tends to move the coil backwards and forwards. These movements are communicated to the cone diaphragm, to the centre of which the moving coil is fixed.

# OUTSTANDING!

## —& at a Popular Price yet giving HIGHEST QUALITY REPRODUCTION



Ask your dealer to show you the new range of Telsen Components, each one embodies many new and exclusive features making for better and cheaper radio.

The already famous Telsen Transformers have been entirely redesigned, each model now embodies new windings and core, in addition to which they are fitted with earth terminals—a very desirable feature in these days of high efficiency two-transformer coupled sets, finally they are shrouded in Genuine Bakelite Mouldings.

The complete range of Telsen Components includes Valve Holders (four and five pin types), H.F. Chokes, Fixed (Mica) Condensers, etc., they are so scientifically designed that no real radio enthusiast will ignore their claim as "Radio's Choice" for "Better Radio Reception."

Telsen "Radiogrand" Transformer, new model, shrouded in Genuine Bakelite, with new windings and core, fitted with earth terminal. Made in ratios 3—1 and 5—1. Price, each **12/6**

Telsen "Ace" Transformer, the ideal model for all Portable Sets and where space is limited. Made in ratios 3—1 and 5—1. Price, each **8/6**

Telsen 7—1 Super Ratio "Radiogrand" Transformer, giving enormous amplification with perfect reproduction, shrouded in Genuine Bakelite with new windings and core, fitted with earth terminal. Price, each **17/6**

## NEW TELSEN COMPONENTS

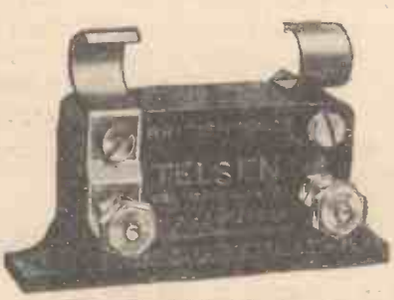

4-PIN VALVE HOLDER

Telsen Valve Holder, low capacity, self-locating, supplied with patent soldering tags and hexagon terminal nuts. Price **1/-**

Telsen 5-Pin Valve Holder. Pro, Pat. No. 20286/30. Genuine Bakelite mouldings fitted with nickel silver shock-absorbing spring contacts Price, each **1/3**


5-PIN VALVE HOLDER


Telsen H.F. Chokes, designed to cover the whole wave-band range, from 18 to 4,000 metres, extremely low self-capacity, shrouded in genuine Bakelite. Inductance 153,000 microhenries, resistance 400 ohms. Price, ea. **2/6**




Telsen Fixed (Mica) Condensers, shrouded in genuine bakelite, made in capacities up to ·002 u.F. Pro. Pat. No. 20287/30. ·0003 supplied complete with Patent Grid Leak Clips to facilitate series or parallel connection. Can be mounted upright or flat. Tested on 500 volts. Price, each **1/-**

# TELSEN COMPONENTS

Advt. of Telsen Electric Co. Ltd., Birmingham

# ---when the Red Light is on

## Some Personal Sketches of well-known Broadcasters before the "Mike"

By SAVOY HILLER

IT is an extraordinary thing how varied are the methods employed by some of our best known broadcasters.

Take, for example, comedians. All the most successful comedians write their own "material"; and this is an important consideration when one realizes that many of the best known wireless humorists have to broadcast as often as five or six times a

Miss Mabel Constanduros is the originator of her own "material"

month and must of necessity provide a new "act" every time.

Tommy Handley reads everything, and you would never think to *watch* him when he is before the microphone that he is being funny at all. Unlike Leonard Henry, he hardly ever alters his expression, for the latter keeps up a running fire of comical facial contortions the whole time he is performing.

### Clapham and Dwyer

Clapham and Dwyer never use manuscript at all, and nearly all their work is spontaneous, as is that of Flotsam and Jetsam. It is no uncommon occurrence to see Flotsam and Jetsam sitting in the artistes' waiting room at Savoy Hill, ten minutes before they are due to "appear," writing out the material which in a few minutes' time will be heard by millions of listeners

Miss Mabel Constanduros, famous for her "Mrs. Buggins," also writes all her own "material," and invariably wears a sort of half smile all the time she is broadcasting, just as if she is enjoying it all as much as you are.

### "Dressing" the Part

The majority of artistes "dress" when they are broadcasting. They feel that they can get the proper atmosphere by so doing. Julian Rose, the famous Jewish comedian, likes to appear in full make-up if he can. And talking of make-up, an amusing scene was witnessed in one of the studios, only a few months ago. Tommy Handley was playing the part of a comic detective in a musical radio sketch, entitled *Lost Pearls*. It so happened, however, that he was appearing at the Shepherds Bush Empire later in the evening in *The Disorderly Room*, a military music-hall sketch, and as is so often the case, he would not have had time to change unless he had appeared in his stage make-up for his broadcast from Savoy Hill. Imagine therefore, the extraordinary spectacle in the studio when what appeared to be a perfectly good captain in His Majesty's army, complete with khaki uniform and Sam Browne belt, sang a song which described him as a Private Detective. The small audience present in the studio that evening were, needless to say, extremely mystified.

Many people think that Jack Payne, the leader of the B.B.C. Dance Orchestra, has a powerful singing voice, but as a matter of fact, Jack's voice is barely loud enough to fill a small suburban drawing-room. He gets his effect by placing his lips not more then six inches from the microphone.

### Impromptu Performances

As regards pure ingenious invention, however, none can compare with the "Uncles" and "Aunts" in the "Children's Hour." Uncle Columbus, who is, incidentally, a responsible official at Savoy Hill, has an astonishing personality. Before now, something has suddenly gone wrong at the last moment, and the "Children's Hour" has been in difficulties, with only a quarter of an hour to go. Uncle Columbus, however, never loses his head. He just walks up to the microphone and keeps things going in his inimitable way until the fault has been rectified.

### The Shy Voice

Many listeners know and welcome that little bit of pianoforte music which is


often unexpectedly put into the programme to fill in a few minutes' gap. This music is played by Miss Cecil Dixon, who, apart from her excellent musical abilities, has gained renown for the shy way in which she announces the name of the piece which she has just played. Miss Dixon is just like this in real life, and accomplished as she is, one could hardly meet a more modest person. She knows so many big classics by heart, that if she goes out to a party, she has to carry a little book of titles in her bag to enable her to remember all the pieces that she does know.

Face as well as voice feature in Leonard Henry's appearances

Perhaps one of the most harassing positions at the B.B.C. is that of the announcers. It must be remembered that broadcasting is not all done from one studio. Actually there are nine studios at Savoy Hill, and as the building was not originally constructed for broadcasting—it was, in the first place, a block of flats—all these studios are on different floors, with the result that an announcer is quite likely to

(*Continued at foot of next page*)

# Next Week's Special Features

ANOTHER remarkable issue of AMATEUR WIRELESS is our promise for next week. You have had two. Next week's will be a third.

Our special gift issues are reaching such enormous circulations that we are obliged to realise that our present readers must include many thousands who are not regularly acquainted with us, and so for their benefit we set forth here a few of the features which will make next week's number noteworthy.

### For the Beginner

A very interesting and delightfully simple article showing how the aerial and earth should be erected to satisfy present-day conditions and telling the beginner the things he must learn.

### For the "Mains" Man

A special article entitled "Mains Snags and How to Avoid Them." The reader changing from a battery-operated to a mains-operated set needs to observe a number of points and warnings. There are certain mistakes he must avoid at all costs. This article explains them.

### For those who would like to Write a Radio Play

The number of aspirants for radio-play honours is legion. In "The Making of a Radio Play" an expert behind the scenes explains those difficult and technical points that every would-be radio author ought to bear in mind, and which our readers generally will find of great interest.

### For the Set Builder and User

(1) Some further information on the "A.W." "Challenge Four," the highly successful set designed by Mr. James and forming the subject of the gift blueprint presented with AMATEUR WIRELESS last week. Mr. James will discuss the choice of valves that particularly suit his set; will describe how to get the best out of it; and will present a development of the condenser scale readings showing how and where the stations come in.

(2) A gadget for the man who wants to reach out for foreigners—a simple screen-grid high-frequency unit incorporating the well-known ohmic band-pass coupling. This can be added to practically every receiver.

### For the Ether Searcher

An article entitled "On the Track of Those Thirty Stations," in which are given away the secrets of "bringing them in."

These items don't exhaust next week's issue by any means. There are many others—all helpful, most of them illustrated, and all interesting.

Every new reader and every newcomer to radio must make a special point of ordering next Thursday's issue at once.

Usual price, **3d.**

## USING FRAME AERIALS

FRAME aerial reception with a set having two screen-grid stages is interesting, to say the least. In the first place complete shielding is practically essential and feed back from the loud-speaker to the aerial must be avoided.

Too small a frame, with its low damping, must be avoided or bad quality may be experienced. Of course, the small frame could be wound of fine wire, but the pick-up will suffer.

What with the directional properties of the frame aerial itself, and its relatively sharp tuning, a fairly flat amplifier can be used and the results are extremely good.

It is possible to gang the tuning with care, but perhaps it is best separately to tune the frame aerial and to gang-tune the circuits of the amplifier. Experimenters who have a suitable set could try this. The outdoor aerial will naturally affect the results, increasing the pick-up.

## DO YOU KNOW—

**that all power valves have not the same characteristics and there are some specimens which pass about 15 milliamps, at a normal voltage of about 150, although biased at up to 20 volts or so on the grid? These valves are not economical to work, but, nevertheless, they may be capable of standing up to a much greater input voltage, and in local-station loud-speaker sets they may be an advantage.**

## "WHEN THE RED LIGHT IS ON"

(*Continued from preceding page*)

**A trio of well-known broadcasters. On the left, Flotsam and Jetsam, much of whose work is spontaneous. On the right is Teddy Brown in his microphone get up**

find himself faced with the problem of introducing a speaker in No. 2 studio (which is in the basement), and immediately afterwards having to read the News Bulletin in No. 4 studio (which is on the second floor). There are five hundred employees at Savoy Hill, and it is an unwritten law that if one sees an announcer coming, one must always stand aside and let him pass.

Curiously enough, a large section of the public think that there is only *one* announcer. This is probably owing to the announcers all being trained, as it were, at the same school, and having naturally suitable voices for the microphone. Actually, however, there are, at the present moment, five announcers at the London station, and to one who knows them all personally it is easy to distinguish them, but, for the listener the distinction is probably impossible.

The "Roosters," who regularly broadcast have an "effect" in their performance, which necessitates the use of a most amusing apparatus. This is to produce the effect of noise made by soldiers on the march, and it is extremely entertaining to watch the "Roosters" in front of the microphone, when they are doing this part of their performance. About three feet away from the microphone are four big metal trays. In each of these trays there is about an inch of mixed shingle and gravel. When the time comes for the "effect," the performers step into the trays and mark time. But this is not all. To get the noise of the jingle of equipment, one of the artistes has a four-pound bag of nails in his right hand and which he continually bumps up and down, in time with the marching feet. The combination of all these sounds is so realistic

that many letters have been received at Savoy Hill, asking how the effect was obtained, or if the B.B.C. had a platoon of Guardsmen to parade in the studio.

*A Weekly Programme Criticism*—By SYDNEY A. MOSELEY.

# Without Fear or Favour


## A VICTORY

### SATURDAY VAUDEVILLE

GREAT victory over Fat Stock Prices! Was it not in these columns that we gently pulled the tail of prize heifers whose intrinsic worth was inflicted on us while we were eating our bread and cheese? Well, the farmers, who are notorious early birds, will have to listen to the earlier News Bulletin. They won't mind, I am sure. Neither will we.

What about leather prices? There's nothing like leather.

◆ ◆ ◆

Curious what sensitive skins suburbanites have. (As an old 'un myself, I ought to know.) Hammersmith, where I used to live, has a big cinema at popular prices. Its orchestra broadcasts between 1 and 2 o'clock in the National programme. As a cinema orchestra catering for its own type of audience it is *par excellence*. But when it gives us saxophone solos, fox-trot ballads, and Oriental fantasies, I say I prefer the fare of some of the West End hotels. For Saturday afternoons give me the small, quiet string quintets we used to have.

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Now, for a musical afternoon of real enjoyment—and I challenge any listener who heard to gainsay it—was the Thursday ballad concert from one to half-past, and the orchestral concert which followed until three o'clock. In the first part, we had Margaret Harrison and Joseph Yates. Then the Midland studio orchestra, under the direction of Frank Cantell, gave us Mozart, Gounod, and Coleridge-Taylor, with Margaret Jaques (contralto) and Charles Woodford (solo violoncellist). A truly enjoyable afternoon.

◆ ◆ ◆

*The Charcoal Burner's Son*, a dramatic story with music for children, was amusing enough for the kiddies. But what a list of personnel! No wonder they had to rush the birthdays. Still, let the children have the best—although, as this was Saturday and pay-day, I couldn't help wondering what this little hour cost us.

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Listening to the Russian songs in the *Foundations of Music*, rendered well enough by Paul Molchanoff, I asked myself whether it was a good idea to give us these rather "samey" songs altogether.

◆ ◆ ◆

Dr. Adrian Boult's talk on the coming symphony concert season sounded as if it were delivered impromptu—not always a disadvantage. He must not, however, drop his voice at the end of sentences.

◆ ◆ ◆

Listening to the horticultural talk on Saturday night, I thought: Why not weekly talks on cycling, swimming, bee-keeping, spiritualism, fishing, dogs, elephants—what?

◆ ◆ ◆

The Saturday vaudeville evening was quite good, although I had some difficulty in following Scott and Whaley.

Wish Wynne's sentimental character study did not appeal, but her reiteration of "Babes in the Wood" must mean that there is a section of her listeners who like to hear it. Personally, my happiest recollection of Wish Wynne was in regard to totally different material.

◆ ◆ ◆

Nancy Brown's selection of songs was good; so was her voice.

◆ ◆ ◆

I was glad to hear again that little gem, *The Old Firm's Awakening*, by A. J Talbot, the cast consisting of Bobbie Comber,


**Lissenden's impression of Tommy Fields**

## THE LADY ANNOUNCER

### RIDGEWAY PARADES

Ernest Sefton, and Lilian Harrison, who fitted in exactly.

The only blemish in this little play was interruption in the form of laughter in the studio, which certainly spoils the whole illusion of being present at the little scenario. I see the Editor heads a recent note on this subject as "The Gigglers." That just fits the bill!

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Hold me back! A lady announcer! Careful, clear and—well, a change from the mere masculine voice. (I waited again for the charming voice, but the mere male was persistent and asserted himself once more.) But shall we have lady announcers? Shall us?

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The Blackhill Colliery Prize Band gave us rather an original brass band concert. They gave us two ordinary marches, three selections—and eight baritone songs! I should have liked to have heard this band in a more varied programme.

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Philip Ridgeway started off so brilliantly with his "Parades" that it was obvious to anyone that he would have to work hard in order to keep up to the high standard he had set himself. Judging by "Ridgeway Parade, Number Three," the task has proved too difficult for Mr. Ridgeway. The show was different to the others, being by comparison slow, tame, and rather humourless. The broadcast was a disappointment, and I hope the producer finds some better material for the next phase.

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I have commented recently upon the steady flow of new piano-duettists into Savoy Hill, and have remarked upon the sameness of all these turns. When Edith Gunthorpe and Cecil Baumer were billed recently I expected a further chapter of pianola-like fox-trots, and was agreeably surprised when these artistes proved to be possessed of a classical bent.

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*Cavalleria Cockniana* was a feeble affair of the sleep-inducing variety.

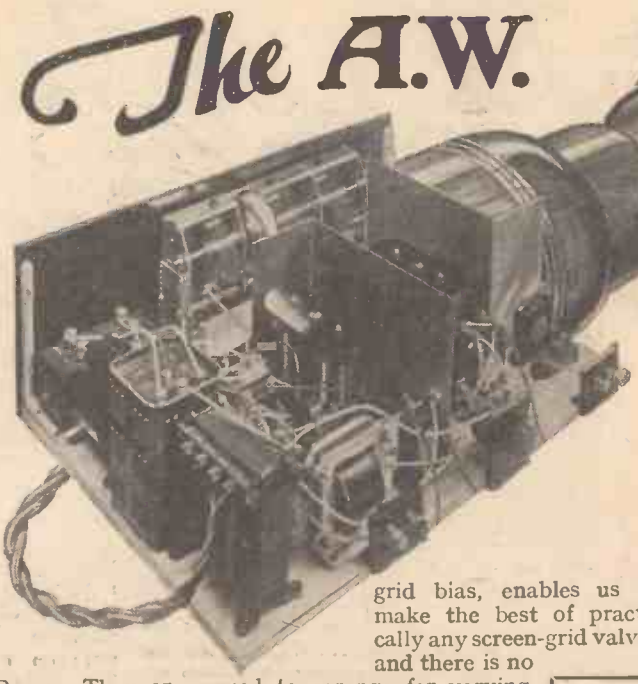
◆ ◆ ◆

Those who missed Pouishnoff's recital from London Regional missed hearing one of the finest performances ever broadcast The recital was brilliant throughout.

# The A.W. CHAL

## F

### The Subject of the Sec



THE A.C. "Challenge Four" comprises the battery model (described last week) having the necessary modifications and a power unit.

Thus the same tuned circuits are to be found in both models, but because A.C. screen-grid valves pass grid current when the grid is connected to the cathode, it is essential to provide adequate bias. A fixed condenser of 1 microfarad is, therefore, included in both screen-grid valve grid circuits and flexible wires are taken to the grid-bias battery.

These condensers are used to by-pass the battery, and the two wires have wander plugs marked G.B.—1 and G.B.—2. They are shown in the diagram as well as in the Free Blueprint which was issued last week.

It will also be noticed that the terminal blocks used in the battery model are not required in the A.C. model, excepting that for the loud-speaker and the aerial and earth.

### Modifications

A potentiometer fitted to a small piece of ebonite is arranged at the back of the set, this being for the screen-grid circuits. Actually the ends are taken to the positive and negative sides of the high-tension supply, and the sliding contact is joined to the screens of the two valves. It is, therefore, possible to apply just the right voltage to the screens by adjusting the potentiometer. This adjustment, together with the grid bias, enables us to make the best of practically any screen-grid valves and there is no need to arrange for varying the supply to the anodes.

Five-pin valve holders are, of course, used in all stages, excepting the last, in which I have used an ordinary power valve, heating its filament with alternating current. A note should be made of the heater contacts of the five-pin holders, and also the cathode contacts, and it is advisable to try valves in the holders to make certain that the fit is satisfactory. A loose contact in an A.C. set is liable to produce noise and hum.

A choke-condenser output filter is used in the A.C. model for two reasons. The first is that smoothing is assisted, the tendency being for the low-frequency currents to pass from the anode of the power valve through the loud-speaker to the filament and so to avoid the high-tension circuit altogether. The second reason is the obvious one that the filter prevents the direct current from passing through the loud-speaker. One side of the loud-speaker is, in fact, connected to earth.

In the anode feed to the detector is a 30,000-ohm resistance, and a 20,000-ohm resistance is included in the supply to the anodes of the screen-grid valves. These resistances drop the voltages to suitable values and are not in any way critical. Resistances of the flexible type are used, being cheap and quite suitable

### COMPONENTS REQUIRED FOR THE "CH

Cabinet (Clarion).

Ebonite panel, 21 in. by 7 in. (Trelleborg, Becol, Raymond).

Three-gang .0005-mfd. condenser with drum dial (J.B., Lotus, Polar, Formo).

.00034-mfd. differential reaction condenser (Lotus).

Two 120,000-ohm potentiometers (Regentstat).

Three special dual-range coils (Clarke's Atlas, Tunewell, Wearite, Readi-Rad, H. & B.).

Two 5-pin universal valve-holders (Junit, H. & B., Parex).

Five-pin valve-holder (Burton, Lotus, Benjamin, W.B.).

Four-pin valve-holder (Burton, Lissen, W.B., Lotus, Benjamin).

Five 1-mfd. fixed condensers (Lissen, T.C.C., Dubilier, Igranic).

Two 2-mfd. fixed cond... Dubilier, Lissen).

Three 4-mfd. fixed co...

Two H.F. chokes (T... Readi-Rad, Igranic, R.I...

Two .0003-mfd. fixed... T.C.C., Atlas, Readi-Ra... Igranic, Graham-Farish...

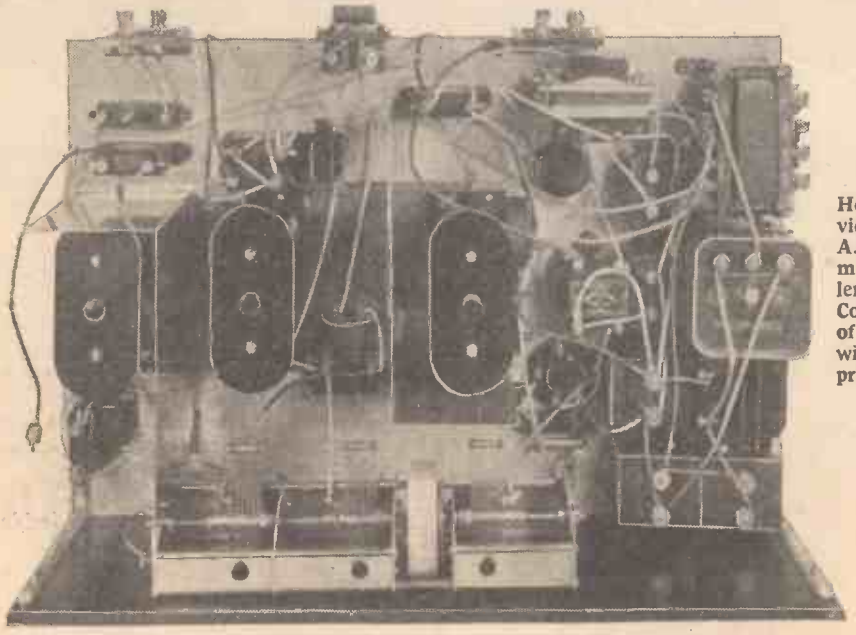
.0002-mfd. fixed conde... Readi-Rad, T.C.C., Wa... Graham-Farish).

1-megohm grid-leak ... sen, Dubilier, Readi-R...

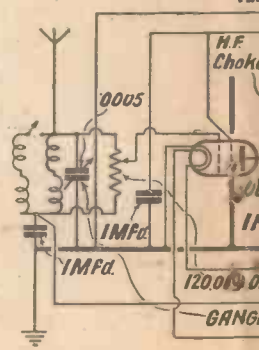
Low-frequency transfo... II, Telsen, R.I., Lewc... Ferranti, Brownie, Burt...

Two terminal blocks... Lissen).

Four terminals, marke...



Here is a plan view of the A.C. mains model "Challenge Four." Comparison of this picture with the blueprint will be helpful




A.C. Mai...

# LENGE FOUR
# OR A.C. MAINS

**nd Free Blueprint Given Away With Last Week's Issue**

for the work they have to perform.

In the power circuit proper we have a mains transformer and a metal rectifier. These are used with two 4-microfarad condensers in a voltage-doubler circuit. A choke is used for smoothing and a further 4-microfarad condenser.

All these parts are arranged at one end of the baseboard, the rectifier being stood on end and fastened securely with straps.

The blueprint shows all the parts in position, the panel being exactly the same as in the battery model with the exception of the battery switch, which is not used.

**HALLENGE FOUR" A.C. MAINS MODEL**

ensers (T.C.C., Igranic,

ndensers (T.C.C.).

elsen, Lissen, Varley, , Lewcos, Wearite).

condensers (Lissen, d, Dubilier, Watmel, ).

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(Junit, Belling-Lee,

d: L.S.+, L.S.—, A., E. (Belling-Lee, Eelex, Clix, Igranic, Burton).

Set of special screens (Readi-Rad, Parex, H. & B., Wearite).

One 20,000-ohm and one 30,000-ohm Spaghetti resistances (Bulgin).

Pair panel brackets (Bulgin, Readi-Rad, Keystone).

Pre-set condenser, .0001-mfd. maximum (Formo, Sovereign).

A.C. transformer with following secondaries; 4-volt, 6-amperes, 135-volt (R.I. type E/Y19).

Metal rectifier, type HT7 (Westinghouse).

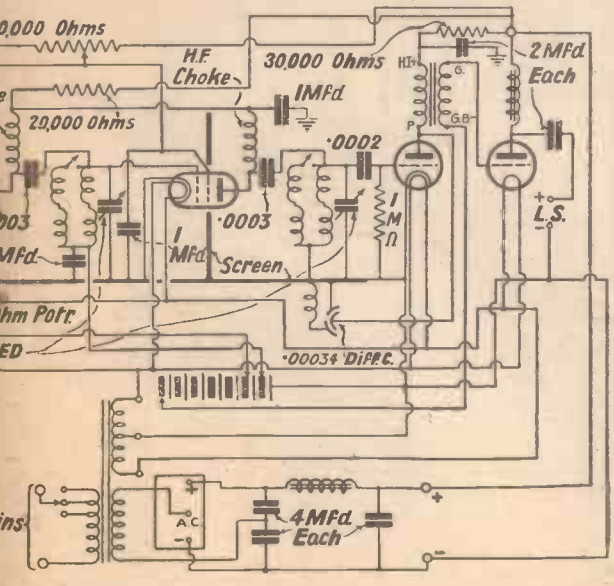
Low-frequency choke (Ferranti type B2, Igranic, R.I., Lissen, Varley).

Low-frequency choke (Igranic C30).

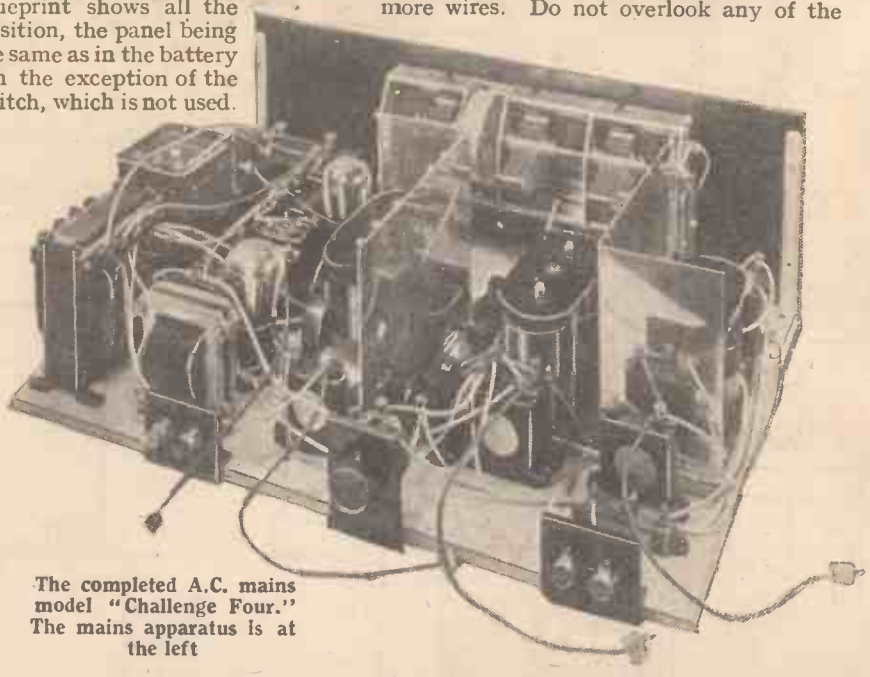
Four wander plugs, marked: G.B.+, G.B.—1, G.B.—2, G.B.—3, (Belling-Lee).

Ebonite bracket 3 in. by 2 in.

Connecting wire, flex and insulated sleeving.




The circuit of the A.C. mains set



The completed A.C. mains model "Challenge Four." The mains apparatus is at the left

When wiring, the wires having letters at their ends in the diagram should be seen to.

### Wiring

Wire A goes to the bottom left-hand terminal of the reaction condenser and wire B to the outside right-hand terminal of this condenser. Wire C goes to the fixed plates of the tuning condenser just above the reaction condenser, and wire D joins with the fixed plates of the centre tuning condenser. Wire E goes to the sliding contact of the potentiometer on the panel, and wires F and G to the outside ends. Wire H is taken to the earth terminal on the side of the tuning condenser and the last wire, I, goes to the fixing plate at the end of the condenser, being placed below the holding down screw.

These wires will be followed easily upon referring to the wiring of the battery set, and they should be joined to the parts on the panel first. Then they can be cut to length and fitted when the panel is in position.

Be sure that the screens are clean at the places where contacts are made and place suitable washers below screws.

The A.C. set is very little harder to wire than the battery model, although there are more wires. Do not overlook any of the cathode wires or wires connected to the screens.

### The Rectifier

The rectifier used is rated at 200 volts

The construction of the coils is simple, but they can be purchased ready made if desired

# "THE 'A.W.' CHALLENGE FOUR" (Continued from preceding page)

28 milliamperes, but the voltage will be greater if less current is taken. In a set of this description, however, we can use a fairly large power valve, such as the Mullard AC064 or AC044. The AC064 has an impedance of 2,000 ohms and a magnification factor of 6. With a grid bias of negative 21, the anode current is 21 milliamperes for a voltage of 200. This is the valve recommended for the power stage.

The completed "Challenge Four" cabinet by Clarion Radio Furniture

For detection we can use the independently-heated cathode valve, type 354 This also is a Mullard valve, but other makes work very well in the detector stage.

### S.G. Valves

In the screen-grid positions we can use Mullard S4VB valves or the Osram equivalent. The set should not be switched on without the power valve in circuit, as this valve will pass a fairly heavy current and so prevent the voltage from rising to much above 200.

Needless to say, the circuit should be handled with care when the current is on. As the tuning of the set is similar to that of the battery type, I will deal with both next week.

**NEXT WEEK:**
**HINTS TO GET THE BEST OUT OF THE "CHALLENGE" SETS**

## SANS AERIAL

HAVE any readers experimented with short-wave receivers *using no aerial at all*? Excellent results can be had by disconnecting the aerial wire and connecting the earth wire to the aerial terminal, leaving the earth terminal free. In some cases, results may be quite as good as with the ordinary aerial-earth combination. The only serious disadvantage is that hand-capacity effects will become much worse Experimenting with two different earths will sometimes bring in quite good results, one earth connection going to the regular earth terminal on the set and the other to the aerial. With a small receiver using this arrangement, I have had results quite as good as those obtained with an outdoor aerial. This method is particularly useful with a portable short-wave outfit. The two earths must be well separated and, if ordinary earth rods are used, they must be placed far apart.

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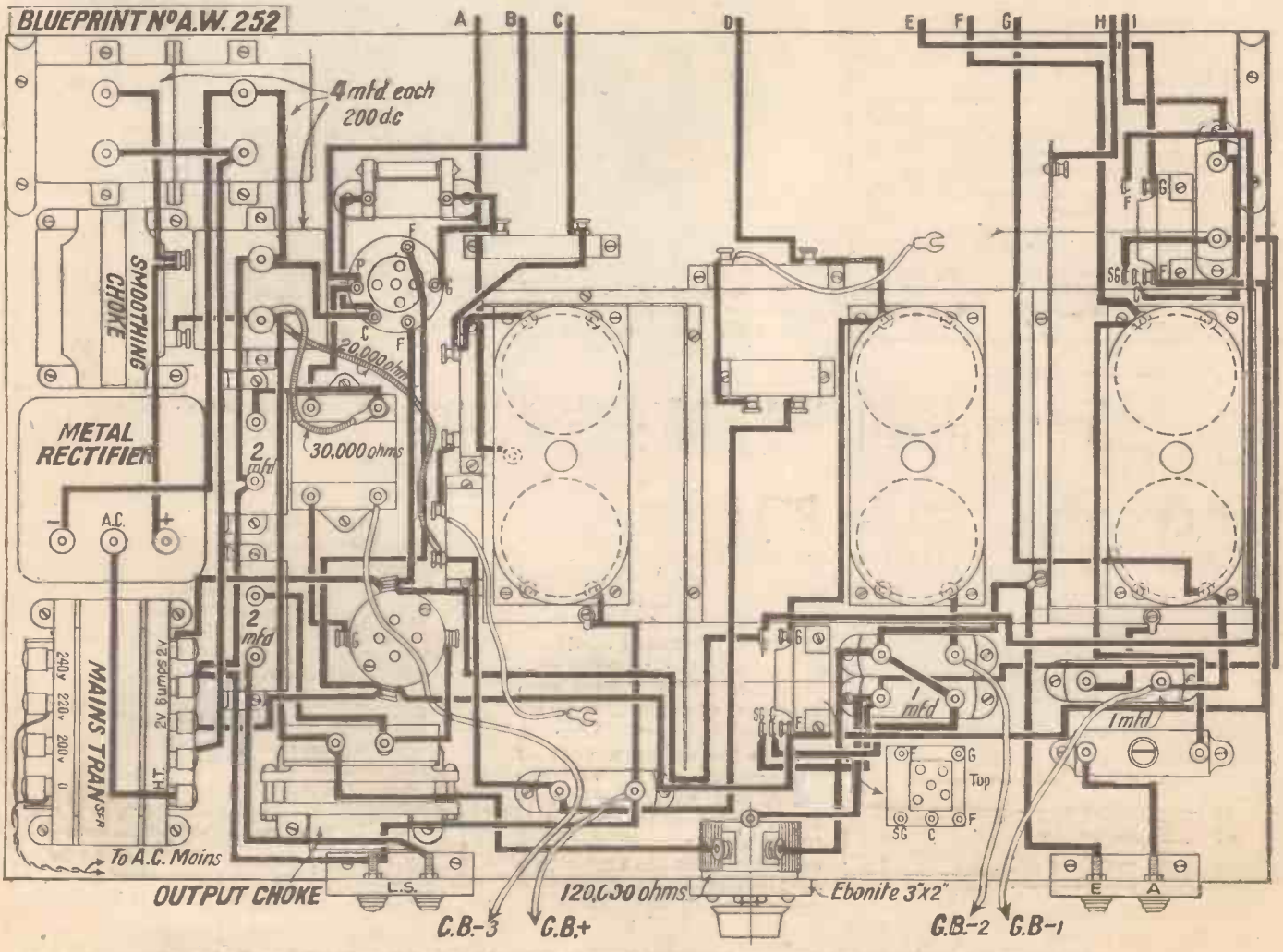
*Talks that should be arranged:*
*(1) "How to Cure Inebriety," by John Drinkwater.*
*(2) "The Return of the Penny Postage," by Sir Josiah Stamp.*




Reproduction of the blueprint of which a large free copy was given away with last week's issue of "A.W."

SETS OF DISTINCTION

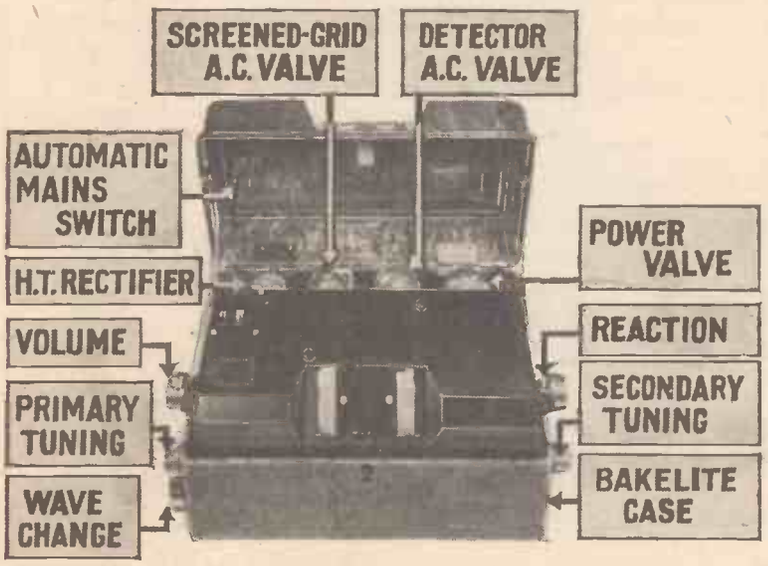
# PHILIPS MODEL 2531 A.C. THREE

*Makers: Philips Lamps, Ltd. Price £23.*

AS soon as I saw the new Philips model 2531 I was impressed; firstly, with its remarkable compactness, and, secondly, with its pleasing brown bakelite container.

I soon discovered why the Philips set was so compact. On opening the lid I found almost every square inch occupied, the three-valve set, with all its smoothing, being enclosed in a metal container at the front, and the three valves, with the rectifying valve, fitted in a line at the back.

The lid itself is unique, for, as it opens, a robustly-constructed switch contact is broken. This means that whenever the set is opened for inspection the mains supply is cut off inside the metal container.




This interesting picture of the interior of the Philips set shows the many good features that are incorporated, and the excellent construction

The high-tension rectifier is a Philips 506K; the first receiving valve is a Mullard S4V screened grid, which, like the Mullard 244V detector following it, is indirectly heated at 4 volts with "raw" A.C. The last of the three valves is a Mullard PM24A pentode, directly heated at 4 volts from the supply.

Anyone who knows the capabilities of these valves would naturally class the set in which they were incorporated as sensitive and powerful; but that would be an inadequate classification, for the Philips three-valver is also notable for its easy control and its fine quality of reproduction.

The controls are arranged in a manner characteristic of Philips—just where they are wanted. At each end of the container are complementary controls, left for primary tuning and right for secondary tuning.

As the set is switched on, by the mains switch at the left-hand end of the set, these dials are brightly illuminated.

Tuning by no means exhausts the controls of this set. At the left is the volume control and at the right the reaction control. The control for volume operates in front of the detector, so that when the detector and power valves are alone used for gramophone record reproduction an external pick-up volume control is needed.

I have still to mention the wave-change switch, worked by a very strong switch knob on the bottom left-hand side of the set. This switch differs from the normal in having three positions. The first covers the 200-450-metre range, the second 400-950 metres, and the third 900-2,100 metres. These three ranges are clearly marked on the three sections of the switch knob.

### Wavelength Range

I am very much taken with this waveband switching. It enables the medium waves between 200 and 600 metres to be explored with a thoroughness not always possible with tuners that attempt to include all the medium waves in a single range of the variable condenser.

The three ranges cover everything between 200 and 2,100 metres, without the usual gap between 550 and 1,000 metres. This waveband switching is, I believe, an exclusive Philips feature. My tests have proved its great value.

My home supply is 200 volts, for which the Philips under test was accordingly wired. The dealer can easily arrange the mains transformer so that the set is suitable for all supplies.

### A Practical Test

After switching on, I had to wait fifteen seconds for the A.C. valves to heat up, after which I got going on the 200-450-metre section of the tuning. My 70-ft. aerial was plugged in to terminal A2. I should mention that terminals A1 and A3 are provided for more or less selectivity respectively.

As soon as a set goes on I can gather more than an inkling as to whether its ultimate classification will be good, bad, or indifferent. Here I had no doubt after the first five minutes. This Philips set is good; in fact, very good. It tunes easily, without the need for critical adjustment; it brings in the distant stations without forcing reaction; it cuts out the locals without resorting to the shabby trick of cutting down the volume.

Now I do not propose to give you a lengthy list of the stations tuned in during the tests; you might not believe me, and if you did a mere log is not very illuminating. The first station I received was Madrid, which came in at 151 and 128 on primary and secondary dials respectively. Not far above it was Stockholm, 160 and 134, coming in more strongly than Rome at 165 and 136.

Coming down the scales, Frankfurt was very powerful at 128 and 115, clear of Toulouse, 125 and 112, which in turn was clear of the London Regional at 112 and 106. Between the Regional and the National, which came in at 76 and 65, I found Bordeaux Lafayette at 92 and 82. Hilversum at 88 and 80 was very strong. Göteborg at 72 and 61 was terrific. Not much weaker was Dresden at 70 and 58. There were plenty more stations received at full loud-speaker strength.

I would ask you to note a large section of tuning left below the National 261-metre station. This enables such stations as Leipzig, Juan les Pins, Nürnberg, Cork, and numerous others, including the Swedish relays, to be tuned in at good strength.

The 400-to-950-metre section was found very productive, especially between 400 and 550 metres. Such stations as Milan, Brussels No. 1, Vienna, and Budapest came in with exceptional vigour.

On the 900-2,100-metre band the set was exemplary. I got Zeesen almost clear of Daventry, Radio Paris and Eiffel Tower quite clear, Huizen and Hilversum at good strength, also Kalundborg and Motala.

TROUBLE-FREE SET BUILDING

USE READY RADIO APPROVED NON-SOLDERING KITS ONLY

USE 'JIFFILINKS' FOR WIRING-UP

# "CHALLENGE FOUR"

| | £ s. d. |
|---|---|
| 1 Drilled ebonite panel, 21 in. by 7 in. | 7 0 |
| 1 Hand-polished solid oak cabinet, with baseboard | 1 12 6 |
| 1 J.B. 3-gang .0005 condenser, with drum dial | 1 15 0 |
| 1 Lotus .00034 differential condenser | 8 6 |
| 1 Regentstat 120,000-ohm potentiometer | 9 6 |
| 1 Readi-Rad on-and-off switch | 10 |
| 3 Readi-Rad Challenge dual-range coils | 1 11 6 |
| 2 Junit 5-pin universal valve holders | 3 6 |
| 1 W.B. 5-pin valve holder | 1 3 |
| 1 Benjamin Vibrolder | 1 6 |
| 3 T.C.C. 1-mfd. condensers | 8 6 |
| 1 T.C.C. 2-mfd. condenser | 3 10 |
| 1 Lewcos H.F. choke | 7 9 |
| 1 Readi-Rad "Hilo" H.F. choke | 4 6 |
| 2 Readi-Rad .0003 fixed condensers | 1 8 |
| 1 Readi-Rad .0002 fixed condenser | 10 |
| 1 Lissen 1-meg. grid leak and holder | 1 6 |
| 1 Varley Ni-core II L.F. transformer | 15 0 |
| 5 Junit terminal blocks | 3 4 |
| 10 Belling-Lee engraved terminals | 5 0 |
| 1 Set Readi-Rad special screens | 8 6 |
| 1 Bulgin spaghetti resistance, 15,000 ohms | 1 3 |
| 1 Pair Readi-Rad panel brackets | 10 |
| 1 Formodensor, type F | 1 6 |
| 4 Valves, as specified | 2 19 0 |
| 1 Set Readi-Rad Jiffilinx | 2 6 |
| Screws, plugs, etc. | 1 8 |
| **TOTAL (including valves and cabinet)** | **£12 18 3** |

**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

*Owing to an error in our advertisement of last week the above prices were incorrectly quoted.*

**RECOMMENDED ACCESSORIES**

| | £ s. d. |
|---|---|
| 2 Fuller 60-v. H.T. batteries, super capacity | 1 7 0 |
| 1 Fuller 16-v. G.B. battery | 2 10 |
| 1 Fuller 2-v. 30-amp. A.H. accumulator | 11 0 |
| 1 Amplion cone loud-speaker | 1 19 6 |
| 1 Atlas eliminator, model No. A.C.56X | 8 15 0 |

**Set of Readi-Rad Challenge dual-range coils specified and approved by MR. W. JAMES in his new "CHALLENGE FOUR" RECEIVER**

**£1 : 11 : 6**

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

*TO OVERSEAS CUSTOMERS.*
*All your goods are very carefully packed for export and insured, all charges forward.*

**Ready Radio**
159, BOROUGH HIGH STREET, LONDON BRIDGE, S.E.1.
Telephone: Hop 5555 (Private Exchange) Telegrams: READIRAD, SEDIST.

*TO INLAND CUSTOMERS.*
*Your goods are dispatched post free or carriage paid.*

Immediate Dispatch

Cash or Easy Payments

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

# WATCHING DIAPHRAGMS VIBRATE

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

*An article describing a simple method of watching a loud-speaker in operation*

ONE of the most interesting exhibits at the recent show was a cinematograph film showing loud-speaker diaphragms actually in the process of vibration. Probably many of those who saw this film were of the opinion that it was an ordinary slow-motion picture taken four to eight times as fast as the ordinary picture and then projected at the normal speed so that action was slowed down. If one thinks the matter out, however, it is obvious that this method is quite impracticable.

The speed of the ordinary slow-motion picture is 128 pictures per second. This would not be fast enough to capture even a vibration at 100 cycles, for in 1/100th of a second the diaphragm moves completely in and out. The process, therefore, is based upon something rather more subtle, and actually a device known as a stroboscope is employed for the purpose. A cinematograph camera is incidental and records the result. Stroboscopic examination is becoming rather popular to-day, and some details of the underlying principles will be of interest.

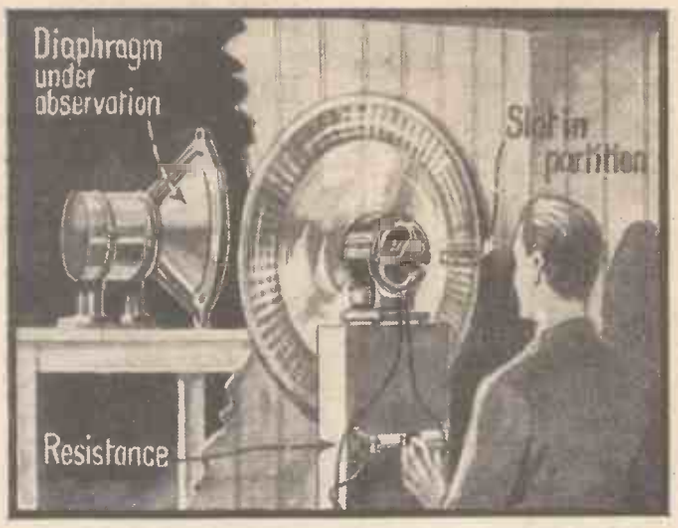
### The Stroboscopic Principle

Several firms demonstrating gramophone motors at Olympia were giving away speed indicators, which consisted of a disc around the edge of which were a series of alternate black and white segments. If one of these discs is placed on a gramophone turntable, and is viewed by ordinary daylight or light from a D.C. supply, the black and white segments simply merge together in a grey ring. If the device is viewed by the light from an alternating-current supply, however, the black and white segments are seen to be apparently stationary or, perhaps, rotating slowly in one direction or the other.

If the speed of the motor is varied, the speed at which the segments appear to rotate also varies. In fact, as the speed is increased the rotation of the segments gets slower and slower until they appear to be stationary, after which they will commence to rotate in the opposite direction; the discs are so designed that when the segments appear stationary, the speed of the motor is correct (78 or 80 revolutions per minute).

Why is this effect observed and what has it got to do with loud-speaker diaphragms? The answer is that it is based upon what is called the stroboscopic effect, and is due to the fact that light from an alternating current lamp fluctuates in intensity a large number of times per second. The eye cannot appreciate fluctuations (except in the case of 25-cycle supply), but the variations are nevertheless there. The connection between these discs and loud-speakers arises from the fact that the same principle is applied to the examination of loud-speaker diaphragms, as we shall see. The principle of the operation is as follows.

Let us assume that we have a disc which has some sort of inscription on it, and that this disc is placed on a turntable rotating at a speed of 3,000 revolutions per minute, i.e. 50 times per second. Let us also assume that we view this with a light which is switched on and off exactly 50 times per second. When the light is on, the disc will be viewed instantaneously with the writing in a certain position. The light is then switched off and the disc continues to revolve on the turntable in darkness. One fiftieth of a second later the disc will have made one complete revolution and will, therefore, be in exactly the same position as before. At this point the light is switched on again and we see the disc once more in the same position as before. The cumulative effect of these glimpses of the disc every fiftieth of a second shows us the disc apparently stationary, although it is actually revolving at 3,000 revolutions per minute.




**By rigging up an apparatus on these lines it is possible to watch the vibrations of a speaker diaphragm**

### Simple Tests

In the case of the gramophone disc just considered, the speed of rotation is nothing like 3,000 revolutions per minute and, therefore, a ring is used around the periphery having a number of alternate segments of black and white. The number of these segments is so chosen that at the correct speed of 80 revolutions per minute the disc will just have had time to move through the distance between one segment and the next during the period of darkness. When the illumination comes on again the disc has moved one step farther on and seems to be in the same position as before, so that the segments appear stationary.

Reverting to our original case of the disc revolving at 3,000 revolutions per minute, let us suppose that we decrease the speed of the turntable very slightly. Then at each one-fiftieth of a second interval the disc will not have had time to complete one revolution, and will, therefore, be seen slightly behind its original position. Since this occurs each fiftieth of a second, the result is that the writing on the disc will appear to rotate backwards. If, on the other hand, we increase the speed of the turntable, the disc will have had time to go slightly beyond its original position and the net result will be that it appears to rotate forward.

Let us now extend this principle of stroboscopic vision to a device which is moving in some other manner, such as a diaphragm of a loud-speaker. Let us assume that we have a diaphragm which is oscillating backwards and forwards exactly 100 times per second, and let us view this through a lens or screen in front of which a shutter rotates also exactly 100 times per second. If the shutter contains a narrow slit, the effect will be that at one particular point in the rotation of the shutter the lens is uncovered and we are able to see the diaphragm momentarily.

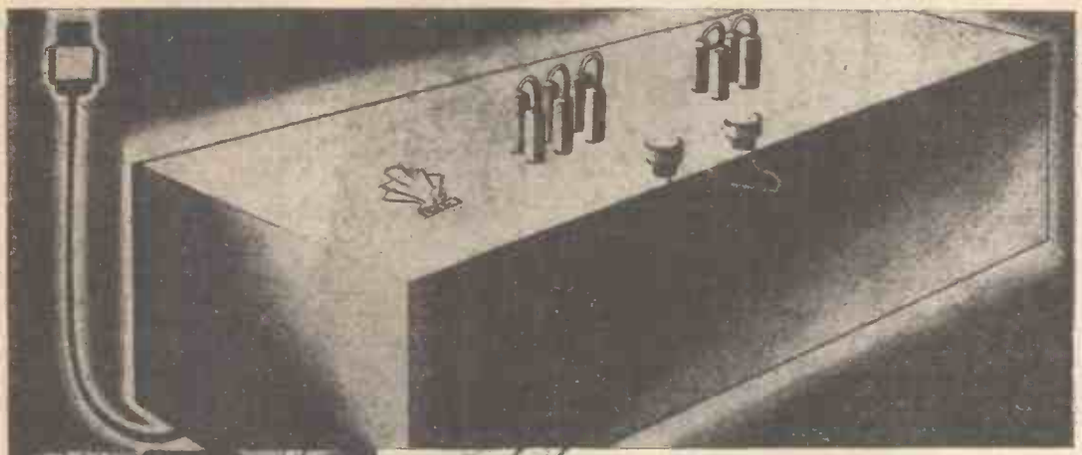
Since the shutter is rotating at 100 revolutions per second, however, and the diaphragm is vibrating at the same speed, we shall always catch our glimpse of the diaphragm in the same position, either just beginning to move or in the middle of its stroke or wherever it happens to be. If, however, we vary the speed of the shutter slightly we shall have exactly the same action as took place with the disc on the turntable.

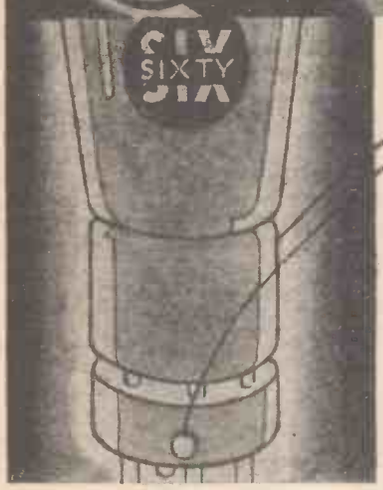
It is clearly not practicable to have a shutter revolving at 100 revolutions per second. Although this is feasible mechanically, it would only suffice to show us the vibrations of the diaphragm at such low frequencies as 100 cycles per second, whereas we wish to view a diaphragm at much higher frequencies than this. The remedy, of course, is to use a large number of slits in the shutter. If the shutter has, for example, 100 slits, then it need only revolve at 1 revolution per second, or, if we speed it up to, say, 50 revolutions per second, which is only 3,000 revolutions per minute, we shall then be able to view the motion of the diaphragm at frequencies of 5,000 cycles per second.

It should be emphasised that the diaphragm or other device under examination must be moving at a constant speed during the test. In the case of a loud-speaker, we supply voltage from a constant-frequency oscillator or record and adjust the stroboscopic disc to correspond to this frequency. The test is then repeated at a number of points throughout the audible range.

# Make Your Battery Set All-Electric

## *The Six-Sixty A.C. All-Mains Conversion Equipment is suitable for practically any Battery Operated Receiver.*






**No internal wiring alterations. Equipment includes specially selected Six-Sixty A.C. Valves—and Six-Sixty 4/5 pin valve holder adaptors.**

Yes, we know how you feel about it—this question of scrapping a perfectly satisfactory battery set in order to change to all-mains—so we have produced the Six-Sixty all-mains conversion equipment. To start with, you need to alter nothing of the construction of your set—the special Six-Sixty valve-holder adaptors make your present valve-holders fit the 5-pin valves supplied. Then you are buying a unit, in the fullest sense, an eliminator and a set of specially selected A.C. valves, built by *one* manufacturer to co-operate and work perfectly together.

The Six-Sixty Unit can be supplied to operate from any A.C. house mains. H.T. tappings of 50, 75, 100, 120, 150 and 200 volts are provided and G.B. tappings of 1.5, 3, 4.5, 8, 15 and 20 volts, any three H.T. or two G.B. values being available simultaneously. Grid Bias is on the ultra modern automatic principle—all risk of overloading eliminated. The dimensions (13 x 5½ x 4) of the complete equipment are not larger than your present batteries—an important point—and the H.T. leads need never be removed from the set when once inserted. Isn't that what you've been waiting for ? Of course it is—but why wait any longer ?

Price: Mains Unit (H.T., L.T. and G.B.) only ... ... £6 : 6 : 0
A.C. Mains Conversion Equipment complete from £8 : 5 : 0


**SAY GET THIS FREE.**

*The Six-Sixty Booklet which tells how any set can be a much better set and up-to-date. And all about the famous SIX-SIXTY range of valves and equipment. Write for it NOW.*

# SIX-SIXTY

(B.V.A. RADIO VALVES AND EQUIPMENT)

*Six-Sixty Radio Co.. Ltd.. Six-Sixty House, 17/18, Rathbone Place, Oxford Street, W.1. Telephone: Museum 6116/7.*

# WHAT IS THE SECRET?

***That is what everybody is asking—what is the secret of WIRELESS MAGAZINE'S great success? Part of the answer will be found here—the rest you will learn by getting a copy.***

EVERYBODY is talking about the success of *Wireless Magazine*, which last month was sold right out in most places within a few days of publication. Just what is the secret of its popularity?

The answer to that question is not difficult to find. *Wireless Magazine* is succeeding because it gives its readers just what they want. They expect to get—and receive—service, information, entertainment, and impartial comment on current radio topics. All these features are given in full measure.

### Best Value for One Shilling

Consider the November issue of *Wireless Magazine* for a moment. It costs one shilling, and for this sum you get a 140-page paper, including a 16-page "Easy Steps in Radio" Supplement printed in colour.

Although intended especially for beginners, the supplement will be of interest to all radio men. It is divided into eleven sections, dealing with various aspects of reception. The comprehensive nature of the contents will be evident from the list of section titles. Here they are:—The Nature of Wireless; Aerial and Earth Essentials; What the Tuner Does; Why You Need a Detector; Amplifying at High Frequencies; Amplifying at Low Frequencies; Valves for Every Purpose; Power for the Receiver; Inside the Loudspeaker; Points about Commercial Sets; and A Selection of Home-Constructor Sets.

Not bad for a free supplement, eh? Many of your non-technical friends will be glad to hear of it.

But this supplement is only a small part of a galaxy of fine features. Here are some more interesting facts.

### Special Technical Articles

For the technical "fan" there are articles on extending loud-speaker leads to any part of the house; one-knob control for modern sets; a new explanation of atmospherics; experiences of radio reception in an underground cavern; and an article by the Editor asking whether television is at a standstill.

Not feeling like anything so technical? Well, how about an article on a change of policy at Savoy Hill; putting over sponsored programmes; an analysis of programme items; or notes on the reception of Continental stations?

If that is not sufficient there are the gossip features—"Radio Medley" and "Under My Aerial"—and a couple of amusing sketches on radio experiences.

Gramo-radio enthusiasts will find in a special 8-page section devoted entirely to their interests an article on making gramophone records at home and a review of the month's record releases; while music-lovers will be able to learn something from an article on stringed instruments and a review of recently broadcast music.


***This fine 140-page issue, with a special 16-page "Easy Steps in Radio" Supplement, is now on sale everywhere for 1s.***

Should you be wanting to build a set there are complete details of a new edition of the Brookman's Three that can be assembled for £7; another "Five-point" set, which gives both medium and long waves at the operation of a single switch, although standard two-pin plug-in coils are used. For those interested in mains working there is an A.C. screen-grid three with a high-tension unit that can be built separately for supplying any other set and a direct-current high-tension unit.

### Half-price Blueprints

Moreover—and here is another secret of *Wireless Magazine*'s success—a full-size wiring guide, panel template and layout for any set can be obtained for half-price by using a special coupon in every copy. This coupon is worth 6d. if you are going to build a two- or three-valve set; and 9d. if you prefer a set with more than three valves. Worth looking into, isn't it?

Surely there is nothing more to be said, even though there *are* 140 pages, you will be thinking. But wait a moment, we have not quite finished yet.

Realising that many people prefer to buy a set rather than build one, *Wireless Magazine* started a year ago a special series of tests on commercial sets. Every month there are full-page reports on four or five new receivers, but if these are not enough, you can get personal advice by post. Full particulars will be found in the issue.

### Station Identification

Let us conclude by mentioning two more features that will be found of great value. The first, specially for *constructors*, is a table published every month giving characteristics of all the chief valves suitable for use in modern sets; the second feature, for *listeners*, is a page of five station-identification panels every month, giving all the information you need to recognise the foreign transmissions.

Don't forget that this fine collection of radio fare is available at every bookstall in the country for a shilling. Ask for *Wireless Magazine*, not the only wireless magazine, but—THE WIRELESS MAGAZINE.

---

Radio Pictures, Inc., W2XR, an experimental television station in Long Island City, broadcasts pictures daily, except Sundays and holidays, on 2,160 kc., from 4.30 to 6.30 p.m. and from 7.30 to 10 p.m


### Reversed Batteries

SIR,—In reply to "Thermion's" request regarding a battery which gave a reverse reading to what it should, may I tell you that I had a similar case. The grid-bias battery, which I was using to light a small lamp, gave an opposite reading on one cell when I tested it with a voltmeter. Stranger still, this cell, when I happened to test it later on, had again changed and was back to normal.

This I think is slightly different from the case he mentioned. I should like to find a reason for this phenomenon and I look forward to some explanation from you or one of your readers in the near future.

H. L. (Ayr).

### Appreciation

SIR,—I sent my Blue Spot unit back to the makers (F. A. Hughes & Co., Ltd.) after I had had it two years because of some little defect. They wrote and said it would cost a few shillings to put right and by return of post I received a new unit, up-to-date pattern. That is a "friend" to wireless and business.

My thanks to AMATEUR WIRELESS, where I first saw the Blue Spot advertised.

L. W. (Honiton).

### "Searcher Two"

SIR,—I have built up the "Searcher Two" receiver and fail to get satisfactory results. This is probably due to my not being quite sure in the windings of the coils. It is not clear whether the reaction winding is joined to the aerial winding or not. Perhaps, if you can explain more clearly the correct sequence in the winding of the coils, I may find my fault and remedy it.

P. D. (Hants).

First of all, you are advised to refer to the small drawings of the coils on page 182 of the issue dated August 23, 1930. Taking the medium-wave coil first, start the winding at the top of the coil at point "E." Anchor the wire through two small holes in the coil former and then wind on sixty turns of No. 24 d.s.c. copper wire. Make two small holes near to the sixtieth turn and anchor the wire by doubling it back in the form of a twisted bight. Do not break the wire. Keeping the wire intact, wind on another fifteen turns and then cut the wire and anchor off through two small holes as before. Through the same two holes anchor the end of some No. 36 d.s.c. copper wire and join the end of the 36-gauge wire to the end of the 24-gauge wire, thus connecting the two coils together. Wind on twenty-five turns of the 36-gauge wire—for the reaction winding—and anchor off the end through two more small holes in the former near to the last turns. Attention may now be directed to the winding of the long-wave coil. This is wound fully with No. 36 d.s.c. copper wire. Begin as before by anchoring the beginning of the wire through two small holes in the top of the former and then wind on 130 turns of wire. Make two small holes near to the 130th turn and, without breaking the wire, anchor it through the small holes and continue winding for another sixty turns. Again, two small holes should be made in the former near to the last turn and, still without breaking the wire, wind on a further thirty turns of wire. After the end turn of this section of the winding, the wire should be anchored off through a further two small holes.

At each beginning, end, and tapping bight of the winding, sufficient length of wire should be allowed for making connections from the coil to the various parts of the receiver.—ED.

### The Radio Exhibition at Olympia

SIR,—I visited the above Exhibition, and was astonished at the great improvement in loud-speakers and in the simplification of wireless sets. These have been commented on by many people, so I will confine myself to the remarkable omissions.

While improving loud-speakers, headphones appear to have been quite neglected. Why? Surely they are as important, especially when some people do not want to be compelled to listen.

Again, for those living near a broadcasting station a crystal set and headphones still give the purest possible reproduction in the case of speech, and when I wish to listen to a talk I invariably use these. Why is not further research done in respect of crystals, so as to improve sensitivity, seeing that they are the purest detectors obtainable?

W. R. W. (Stroud Green).

*A short ballad-concert programme:*
*(1) "Wrap Me Up in My Tarpaulin Jacket," sung by John Coates.*
*(2) "Goodbye to Summer," sung by Kate Winter.*
*(3) "Hark, Hark, the Dogs do Bach," relayed from the Kit-Cat Restaurant.*

### The Non-technical Salesman

SIR,—May I heartily endorse the sentiments of your correspondent, R. L. N., towards the utterly ignorant and unintelligent type of man that one finds only too often in the employ of large manufacturers.

How on earth their non-technical salesmen are going to sell complicated apparatus to a discriminating purchaser is beyond my comprehension. Perhaps they will rely upon their high prices and after service (if any) to pull them through. What hopes!

R. L. (London).

### U.S.A. Television Reception

SIR,—Since you published a press photograph of me in connection with my recent reception of television direct from New York, it may interest you to know that I have received a reply cablegram from Schenectady, N.Y., confirming my reception. This is the first reception in this country of transatlantic television and, I think, constitutes an amateur long-distance television record. At least I have not yet received any contradiction to this statement, in spite of the publicity given to it in the daily Press.

P. W. WALTERS (Bedford Park).

# RADIOGRAMS

MISS NORAH BARING, a star of the cinema screen, has been specially engaged by the B.B.C. to play the part of Cecily Cardew in *The Importance of Being Earnest*, when Oscar Wilde's comedy is broadcast respectively through the Regional and National transmitters on October 30 and 31. In the "talkies" she was in the cast of *At the Villa Rose* and *The House of the Arrow*; in silent films she appeared in *Underground* and *A Cottage on Dartmoor*.

*Give Me New York*, a high-speed revue by Holt Marvell, has been revised by the author and will be revived on November 13; it was first produced two years ago, but the new edition includes a musical score. The plot is not lacking in "pep" and is carried through at high speed, in view of the fact that it deals with the endeavours of an English impresario to place a London play in New York, extracts of which have to be submitted over the transatlantic telephone at the cost of £3 a minute; hence the "go" in the show.

On October 25 scenes will be broadcast nationally from *Charlot's Masquerade*. The musical part of the relay will include two numbers which are scoring a signal success, namely, "Sweet Temptation" and "Who Cares?" Beatrice Lillie will be heard in a pair of playlets by Ronald Jeans ingeniously worked out in the form of newspaper headlines.

**DO YOU KNOW—**

**that if you have flex connections and not terminal strips for the battery points at the back of your set, then the flexible leads should be carefully grouped? The high tension, low tension, and grid bias should be separately plaited. It is not advisable to plait the grid-bias and high-tension wires together, and this is particularly the case when the set works from the mains.**

**that with some sets a reaction condenser of .0001 microfarad is sufficient? A reaction condenser of .0003 microfarad makes control of oscillation difficult, especially on distant stations. Never use a larger reaction condenser than is really needed to give free oscillation over the wavelength range of the set.**

**that some novel opening signals and interval indicators are being used by some of the Russian stations. These include factory whistles and gramophone records of factory noises.**

Norah Howard, at present appearing in *Bitter Sweet*, will take part in an "all-star" programme to be presented through the National stations on November 1. The entertainment also includes Bernard Clifton (songs and duets), and Ronald Frankau. Teddy Brown and Mario de Pietro will play throughout the programme.

Mr. L. du Garde Peach, a member of the Council of the British Drama League, has been commissioned by the B.B.C. to give four talks to northern listeners on play producing for amateurs. Mr. Peach owns a little theatre at Great Hucklow, in Derbyshire, the company consisting of the villagers.

*Before the Party*, a short play by Somerset Maugham and Michael Talbot, is down for broadcast from the London studio on November 19 and 20.

From Sunday, October 12, the B.B.C. carried out some readjustments in the transmission of the London alternative programmes, a step which may prove of assistance to listeners who obtain better reception from the Regional than from the National transmitter. Generally speaking, where there is only one programme, both the Regional and Daventry National will transmit it. Thus, for example, the Sunday evening service and the daily programme from 10.15 to 11 a.m., in future, will be broadcast by the London Regional instead of the London National transmitter, which has been used in the past. When two programmes are "on tap," there will be no alteration in existing arrangements and the National programme will be transmitted on both 1,554.4 metres and on 261.3 metres, while the London Regional transmitter radiates the Regional entertainment on 356.3 metres.

# BROADCAST TELEPHONY

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

| Metres | Kilocycles | Station and Call Sign | Power (Kw.) |
|---|---|---|---|
| **GREAT BRITAIN** | | | |
| 25.53 | 11,751 | Chelmsford (5SW) | 15.0 |
| 200 | 1,500 | Leeds | 0.16 |
| 242 | 1,238 | Belfast | 1.2 |
| 261 | 1,148 | London Nat. | 68.0 |
| 288.5 | 1,040 | Newcastle | 1.2 |
| 288.5 | 1,040 | Swansea | 0.16 |
| 288.5 | 1,040 | Stoke-on-Trent | 0.16 |
| 288.5 | 1,040 | Sheffield | 0.16 |
| 288.5 | 1,040 | Plymouth | 0.16 |
| 288.5 | 1,040 | Liverpool | 0.16 |
| 288.5 | 1,040 | Hull | 0.16 |
| 288.5 | 1,040 | Edinburgh | 0.4 |
| 288.5 | 1,040 | Dundee | 0.16 |
| 288.5 | 1,040 | Bournemouth | 1.2 |
| 288.5 | 1,040 | Bradford | 0.16 |
| 301 | 995 | Aberdeen | 1.2 |
| 309.9 | 968 | Cardiff | 1.2 |
| 356 | 842 | London Reg. | 45.0 |
| 376.4 | 797 | Manchester | 1.2 |
| 398.9 | 752 | Glasgow | 1.2 |
| 479 | 626 | Midland Reg. | 38.0 |
| 1,554 | 193 | Daventry (Nat.) | 35.0 |
| **AUSTRIA** | | | |
| 246 | 1,220 | Linz | 0.6 |
| 246 | 1,220 | Salzburg | 0.6 |
| 283 | 1,058 | Innsbruck | 0.6 |
| 352 | 851 | Graz | 9.5 |
| 453 | 666 | Klagenfurt | 0.6 |
| 517 | 578.5 | Vienna | 20.0 |
| **BELGIUM** | | | |
| 206 | 1,460 | Antwerp | 0.4 |
| 212 | 1,415 | Binche | 0.2 |
| 216 | 1,391 | Brussels (Conference) | 0.25 |
| 235.5 | 1273.5 | Chatelineau | 0.25 |
| 243 | 1,235 | Courtrai | 0.1 |
| 244.7 | 1,226 | Ghent | 0.25 |
| 250.7 | 1,196.5 | Schaerbeek | 0.5 |
| 338.2 | 887 | Brussels (No. 2) | 12.0 |
| 509 | 590 | Brussels (No. 1) | 1.2 |
| **CZECHO-SLOVAKIA** | | | |
| 263 | 1,139 | Moravska-Ostrava | 11.0 |
| 279 | 1,076 | Bratislava | 14.0 |
| 293 | 1,022 | Kosice | 2.5 |
| 342 | 878 | Brunn (Brno) | 3.0 |
| 487 | 617 | Prague (Praha) | 5.5 |
| **DENMARK** | | | |
| 281 | 1,067 | Copenhagen | 1.0 |
| 1,153 | 260 | Kalundborg | 10.0 |
| **ESTONIA** | | | |
| 401 | 748 | Reval (Tallinn) | 0.7 |
| **FINLAND** | | | |
| 221 | 1,355 | Helsinki | 15.0 |
| 291 | 1,031 | Viipuri | 15.0 |
| 1,796 | 167 | Lahti | 54.0 |
| **FRANCE** | | | |
| 172.5 | 1,739 | St. Quentin | 0.3 |
| 200 | 1,500 | Radio Roubaix | 0.2 |
| 210 | 1,430 | Radio Touraine | 0.2 |
| 214 | 1,401 | Fécamp | 0.7 |
| 219 | 1,370 | Béziers | 0.6 |
| 235.1 | 1,275 | Nimes | 1.0 |
| 249.5 | 1,202 | Juan-les-Pins | 0.5 |
| 256 | 1,171 | Toulouse (PTT) | 1.0 |
| 265 | 1,130 | Lille (PTT) | 1.0 |
| 272 | 1,103 | Rennes (PTT) | 1.2 |
| 286 | 1,049 | Montpellier | 1.2 |
| 287.2 | 1,044.6 | Radio Lyons | 0.5 |
| 296.6 | 1,012.2 | Limoges (PTT) | 0.08 |
| 299.5 | 1,001.3 | Paris Experimental and on 40.90 m. | 0.35 |
| 300 | 1,000 | Strasbourg | 0.35 |
| 304 | 988 | Bordeaux (PTT) | 8.0 |
| 316 | 950 | Marseilles (PTT) | 1.5 |
| 328.2 | 914 | Grenoble (PTT) | 1.2 |
| 329 | 911 | Caen (Normandy) | 0.6 |
| 329.5 | 910.3 | Poste Parisien | 1.2 |
| 345.2 | 869 | Strasbourg (testing shortly) | 15.0 |
| 369.3 | 812.2 | Radio LL (Paris) | 0.5 |
| 385 | 779 | Radio Toulouse | 8.0 |
| 447 | 671 | Paris (PTT) | 1.0 |
| 466 | 644 | Lyons (PTT) | 2.3 |
| 1,446 | 207 | Eiffel Tower | 15.0 |
| 1,725 | 174 | Radio Paris | 17.0 |
| **GERMANY** | | | |
| 31.38 | 9,560 | Zeesen | 15.0 |
| 218 | 1,373 | Flensburg | 0.6 |
| 227 | 1,319 | Cologne | 1.7 |
| 227 | 1,319 | Münster | 0.6 |
| 227 | 1,319 | Aachen | 0.31 |
| 232.2 | 1,292 | Kiel | 0.3 |
| 239 | 1,256 | Nürnberg | 2.3 |
| 246.4 | 1,217.2 | Cassel | 0.3 |
| 253.4 | 1,184 | Leipzig | 2.3 |
| 259.3 | 1,157 | Gleiwitz | 5.6 |
| 270 | 1,112 | Kaiserslautern | 0.25 |
| 276 | 1,085 | Königsberg | 1.7 |
| 283.6 | 1,058 | Magdeburg | 0.6 |
| 283.6 | 1,058 | Berlin (E) | 0.6 |
| 283.6 | 1,058 | Stettin | 0.6 |
| 316.6 | 947.6 | Bremen | 0.3 |
| 318.8 | 941 | Dresden | 0.3 |
| 325 | 923 | Breslau | 1.7 |
| 360 | 833 | Stuttgart | 1.7 |
| 372 | 806 | Hamburg | 1.7 |
| 390 | 770 | Frankfurt | 1.7 |
| 419 | 716 | Berlin | 1.7 |
| 452.1 | 662 | Danzig | 0.25 |
| 473 | 635 | Langenberg | 17.0 |
| 533 | 563 | Munich | 1.7 |
| 560 | 536 | Augsburg | 0.3 |
| 566 | 530 | Hanover | 0.35 |
| 570 | 527 | Freiburg | 0.3 |
| 1,635 | 183.5 | Zeesen | 35.0 |
| 1,635 | 183.5 | Norddeich | 10.0 |
| **HOLLAND** | | | |
| 31.28 | 9,599 | Eindhoven (PCJ) | 30.0 |
| 299 | 1,004 | Hilversum | 8.5 |
| 299 | 1,004 | Radio Idzerda (The Hague) | 0.6 |
| 1,071 | 280 | Scheveningen-Haven | 5.0 |
| 1,875 | 160 | Huizen | 8.5 |
| **HUNGARY** | | | |
| 210 | 1,430 | Budapest (Csepel) | 1.0 |
| 550 | 545 | Budapest | 23.0 |
| **ICELAND** | | | |
| 1,200 | 250 | Reykjavik (shortly testing) | 16.0 |
| **IRISH FREE STATE** | | | |
| 224.4 | 1,337 | Cork (1FS) | 1.5 |
| 413 | 725 | Dublin (2RN) | 1.5 |
| **ITALY** | | | |
| 25.4 and 80 | | Rome (3RO) | 9.0 |
| 247.7 | 1,211 | Trieste (testing) | 3.0 |
| 274.1 | 1,094.5 | Turin (Torino) | 8.5 |
| 332 | 905 | Naples (Napoli) | 1.7 |
| 379.5 | 790 | Genoa (Genova) | 1.5 |
| 441 | 680 | Rome (Roma) | 75.0 |
| 453 | 662 | Bolzano (IBZ) | 0.2 |
| 501 | 599 | Milan (Milano) | 8.5 |
| **LATVIA** | | | |
| 525 | 572 | Riga | 12.0 |
| **LITHUANIA** | | | |
| 1,935 | 155 | Kaunas | 7.0 |
| **NORTH AFRICA** | | | |
| 363.4 | 825.3 | Algiers (PTT) | 13.0 |
| 416 | 721 | Radio-Maroc (Rabat) | 10.0 |
| 1,350 | 222.2 | Tunis Kasbah | 0.6 |
| **NORWAY** | | | |
| 364 | 824 | Bergen | 1.0 |
| 365.7 | 820.4 | Frederiksstad | 0.7 |
| 455 | 659.3 | Porsgrund | 1.5 |
| 493 | 608 | Nidaros | 1.2 |
| 1,071 | 280 | Oslo | 0.5 |
| **POLAND** | | | |
| 214.2 | 1,400 | Warsaw (2) | 1.9 |
| 234 | 1,283 | Lodz | 2.2 |
| 244 | 1,229 | Cracow | 1.5 |
| 313 | 959 | Wilno | 0.5 |
| 338.1 | 887.1 | Poznan | 1.9 |
| 381 | 788 | Lvov | 2.2 |
| 408 | 734 | Katowice | 16.0 |
| 1,411 | 212.5 | Warsaw | 14.0 |
| **PORTUGAL** | | | |
| 240 | 1,247 | Oporto | 0.25 |
| 320 | 937.6 | Lisbon (CTIAA) | 0.25 |
| **ROMANIA** | | | |
| 394 | 761 | Bucharest | 16.0 |
| **RUSSIA** | | | |
| 720 | 416.6 | Moscow (PTT) | 20.0 |
| 800 | 375 | Kiev | 20.0 |
| 824 | 364 | Sverdlovsk | 25.0 |
| 938 | 320 | Kharkov | 25.0 |
| 1,000 | 300 | Leningrad | 20.0 |
| 1,060 | 283 | Tiflis | 10.0 |
| 1,103 | 272 | Moscow Popoff | 40.0 |
| 1,304 | 230 | Moscow-Stchelkovo (C.C.S.P.) | 100.0 |
| 1,380 | 217.5 | Bakou | 10.0 |
| 1,481 | 202.5 | Moscow | 20.0 |
| **SPAIN** | | | |
| 251 | 1,193 | Barcelona (EAJ15) | 0.5 |
| 266.7 | 1,125 | Barcelona (EAJ13) | 10.0 |
| 349 | 860 | Barcelona (EAJ1) | 8.0 |
| 368 | 815 | Seville (EAJ5) | 1.5 |
| 424 | 707 | Madrid (EAJ7) | 2.0 |
| 460 | 652 | San Sebastian (EAJ8) | 0.5 |
| **SWEDEN** | | | |
| 135 | 2,222 | Motala | 30.0 |
| 231 | 1,301 | Malmo | 0.75 |
| 257 | 1,166 | Hörby | 15.0 |
| 290.3 | 1,002 | Falun | 0.65 |
| 322 | 932 | Göteborg | 15.0 |
| 436 | 689 | Stockholm | 75.0 |
| 542 | 554 | Sundsvall | 15.0 |
| 770 | 389 | Ostersund | 0.75 |
| 1,223.5 | 244 | Boden | 0.75 |
| 1,348 | 222.5 | Motala | 40.0 |
| **SWITZERLAND** | | | |
| 318.8 | 943 | Basle | 0.65 |
| 403 | 743 | Berne | 1.1 |
| 459 | 653 | Zurich | 0.75 |
| 678.7 | 454.6 | Lausanne | 0.6 |
| 760 | 395 | Geneva | 1.5 |
| **TURKEY** | | | |
| 1,200 | 250 | Istanbul | 5.0 |
| 1961 | 153 | Ankara | 7.0 |
| **YUGOSLAVIA** | | | |
| 368.6 | 978.4 | Zagreb (Agram) | 0.7 |
| 430.7 | 696.5 | Belgrade | 3.0 |
| 577.1 | 519.9 | Ljubljana | 2.8 |

## A NEW SPEAKER

AN "A.W." representative was recently given a demonstration of a new type of speaker shortly to appear on the market. This speaker has been developed by Film Industries, Ltd., of 73 Gower St., W.C.1., for talking-film work, and has been so successful that it has been decided to produce a smaller model for wireless reception.

The speaker is of the permanent-magnet coil-driven type, fitted with an exponential horn, and a practical method of folding the horn has been arranged so that the speaker can fit a cabinet space of 24 in. by 18 in. by 13 in. The speaker performed very well indeed in comparison with a standard moving-coil instrument.

Three lawsuits opposing the new South Carolina tax on radio receiving sets have been filed in Charleston, S.C. The defendants are the States and local tax officials. The South Carolina law proposed to levy a graduated tax of from two shillings on radio receiving sets valued up to £10 to ten shillings on sets valued at more than £100. An injunction restraining the collection of the radio tax from 50,000 owners of receiving sets in South Carolina is asked.

The official opening of the new Strasbourg-Brumath (France) station has been postponed to November 15. In the meantime, a permanent studio orchestra of some forty musicians has been specially engaged for the winter season.

## "IS BROADCAST ADVERTISING COMING?"

(*Continued from page* 601)

in public in London or in the provinces."

Under Section (1) I can visualise the B.B.C. allowing one of our big manufacturers to provide gratuitously a really good performance once a week. The fact that this firm would pay the artistes does not run contra to the clause in the Charter. Even the key-note of a sponsored programme—the acknowledgment of the persons or firms named—is specifically accounted for under this section.

I do not know whether Section (2) is taken advantage of by the B.B.C., but Section (3) certainly is, nearly every time an hotel dance band broadcasts. Why not act upon Section (1) also? The way, as I have shown, is clear enough.

### *Sponsored Programmes at Home*

While we in this country are asking ourselves about sponsored programmes, they are already the backbone of America's radio entertainment. Nearer home we have Radio Paris flooding the south of England with Sunday programmes of jazz sponsored by British advertisers; the power of the Paris station is being increased, presumably to widen the market of its broadcast wares.

In the Irish Free State sponsored programmes are being given a trial; and when the 60-kilowatt Irish station gets going next year, another source of sponsored programmes will be at the disposal of British listeners.

The Continental stations are not, to my mind, working on the right lines; the sponsored jazz and light musical programmes are not up to the standard of similar programmes by the B B.C. I can understand the objections some listeners may raise against the sponsored programme if their only experience of it is through a Continental station. We hear too much advertising clap-trap interspersing numbers played by mediocre orchestras.

That is not at all my idea of a British sponsored programme; the whole basis of such a programme must be that the advertiser, by virtue of his financial resources, shall provide listeners with the highest possible forms of entertainment—it need not be jazz. As a reward, the advertiser shall be allowed to associate his name or that of his product with the orchestra or hour during which it broadcasts.

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According to advices received from the Federal Radio Commission, a new radio network has been formed called the Southern Broadcasting Company, linking seven broadcasting stations in Texas and designed to serve all the south-western States, namely, Eastern New Mexico, Southern Oklahoma, south-western Louisiana and Arkansas.

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## "CHALLENGE FOUR" COMPONENTS

It should be noted that a two-gang condenser was mentioned in the kit of parts for the "Challenge Four," in the H. and B. Radio Co.'s advertisement in last week's issue. The correct three-gang condenser is, however, being supplied with every H. and B. kit.

# WE TEST FOR YOU

*A weekly review of new components and tests of apparatus.*

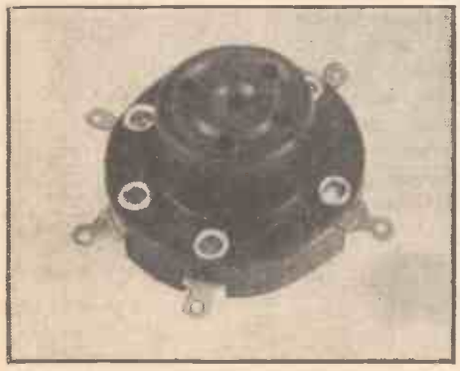
*Conducted by our Technical Editor, J. H. REYNER, B.Sc., A.M.I.E.E.*

### Lotus Valve Holder

WE are accustomed to take it for granted that the contact between valve pin and socket in a holder will be electrically efficient; and, indeed, we are probably justified in this assumption if the pins of the valve are split or fitted with "banana" contacts. A new problem has now arisen, however, for some of the modern mains valves have solid pins.

Since this step has been taken by valve manufacturers, the remedy for the evil lies in the valve holder. We were interested to see that in the new Lotus valve holders, made by Messrs. Garnett Whiteley, of Liverpool, each socket consists of two metal springs, which are prised by the pin when inserting the valve. The electrical contact is perfectly reliable, whilst no undue force has to be exerted when inserting or removing the valve.

In other ways the holder is conventional; the sockets are taken out to five soldering tags, which are a continuation of the socket. The moulded casing has a circular groove, in which the valve may be rotated until it falls into its correct position. It is impossible to obtain contact between the



A Lotus valve holder which is efficient and low-priced

pin and socket until this position has been found.

The price of this component is 9d. without terminals and 1s. with terminals. Altogether it is one of the neatest we have seen.

### Lowne Linen Speaker

THE linen diaphragm speaker has become very popular of late and various modifications of the original idea have appeared. An interesting attempt to combine the action of the linen-diaphragm speaker with the free-edged cone has been received for test in our Laboratories.

The speaker, which is made by the Lowne Electric Clock Co., of Lowne Electric Works, Boone Street, S.E.13, comprises a linen diaphragm, 16 in. by 14 in., which is strained back by a Bowden wire. The tension, however, is not as great as usual, and the diaphragm is provided with a rectangular framework of cane about 2 in. from the outside edge. This framework is held in position by wires running across the face of the speaker and the linen outside the framework is not doped. By this means a semi-free suspension is obtained.

The unit appeared to have too fine a clearance and tended to rattle on relatively small volumes, which prevented us from appraising the qualities of the speaker fully. As far as we could judge, however, its response was good and its sensitivity up to the average. The unit is provided with

A new linen-diaphragm speaker—the Lowne

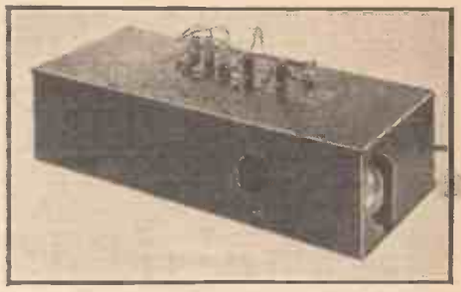
three terminals to enable the best impedance to be chosen for the output stage of the set.

The price is £2 10s. in oak, while the chassis fitted with a Triotron unit costs £1 14s. 6d.

### Six-Sixty Mains Unit

ALTHOUGH there are a large variety of all-mains sets from which to choose, many readers have already made up their sets and are quite satisfied with their performance. They are, therefore, loth to discard the set in preference for a new one. The other alternative is to fit an eliminator providing H.T., L.T., and grid bias. Nothing less will do, for grid-bias batteries have a limited life and if not inspected periodically may lose their voltage and ruin the power output valve. One of the chief advantages of automatic grid bias is that it is self-adjusting and increases in proportion to the anode current.

We have just tested a very practical Six-Sixty all-mains eliminator for incorporation with any type of set. It is contained in a metal case measuring 12¾ in. by 5½ in. by 3¼ in., and is quite complete. A Six-Sixty full-wave rectifier is mounted in one corner of the case, and is accessible for inspection and removal without dismantling any part of the case. Sockets are provided for three H.T. positive leads and two G.B. negative leads; for each of these sockets there is a wander plug, which may be inserted in a number of other sockets, at



The Six-Sixty mains-drive conversion unit

the side of which the approximate voltage is marked.

The H.T. maximum output is given as 200 volts, and on test it was found that this voltage was given on passing an anode current of 22 milliamps. When the output current is increased to 40 milliamps, the voltage fell to 150 volts, and again dropped to 120 volts with an output of 50 milliamps. On the next tapping, marked 150 volts, this value was obtained with an output of 16 milliamps. Another tapping marked 120 gave us its rated voltage at 12 milliamps, so that there is provision for ample current on all taps.

For detector and screen-grid work, voltages of 60 and 75 are provided.

There are six grid-bias tappings, varying from 1.5 volts negative up to 20 volts negative. These values were found to be substantially correct with an A.C.P. in the final stage of an amplifier. If a larger output valve, such as a PX4, is used in the last stage, the grid bias will automatically adjust itself to a higher and correct value.

Two terminals are provided for the heater, whilst an extra socket is for the H.T. negative and G.B. positive of the set. By the use of Six-Sixty valve adaptors, any set may be converted to A.C. working. These adaptors are placed in the valve holders and the terminals thereon are connected to the L.T. winding on the eliminator. Then on inserting suitable A.C. valves in the adaptors the circuit works as before.

Our tests were carried out on an A.C. set with a super-power valve in the final stage. The mains hum was sufficiently small to pass unnoticed, even when receiving a weak station. There was complete freedom from any signs of back-coupling.

## WHAT ARE THE SOUND WAVES SAYING?

GRIEG'S real name was Greig, pronounced *Gregg*, not *Greeg*. On his father's side he was of Scottish origin, but I do not think we ought to claim him as our own because he inherited all his music from his mother, and also because he was nothing if not Norwegian in his way of thought. His grandfather, by the way, was with Prince Charles Edward at his defeat in the battle of Culloden in 1746.

Grieg was sent to Leipzig conservatoire soon after he left school where he studied with Richter, Hauptmann, Wenzl, and Moscheles. It was an unfortunate move, all the same. Leipzig conservatoire was founded by Mendelssohn and the Mendelssohnian tradition has never left it. Not that *that* matters; there is nothing wrong with anything Mendelssohn ever did. But the conservatoire was not the place to send a lad from the mountains of Norway. Grieg was soaked in Norwegian tradition and folk-lore; he had little or no use for music outside his native Norway. All the same he received a splendid training. He met Sullivan, amongst other students there, and describes an hour he spent with him in the following words:

"I once had the pleasure of passing an hour with Sullivan which I shall not forget. It was during a performance of Mendelssohn's *St. Paul*. We sat and followed the music with a score—and what a score! It was Mendelssohn's own manuscript which Sullivan had succeeded in borrowing for the occasion from the director of the conservatoire, Conrad Schleinitz, who was (as is well know) an intimate friend of Mendelssohn. With what reverence we turned from one page to another! We were amazed at the clear, firm notes that so well expressed the ideas of the writer."

Grieg lived the life of a recluse for the most part, though he occasionally made excursions abroad and played in public. He was enormously popular in London when he came over in 1888. But, otherwise, he preferred to spend his time thinking and composing in his beautiful Norwegian home, Bergen. I was looking at some photographs of the house not long ago. It appears that he bought the house from a peasant and, judging from the pictures I saw of the views from his study window, the district must be one of the most beautiful in Norway.

He wrote much that is of the greatest musical value to us who love to listen to native themes, so long as they have been in the refiner's fire first of all. Grieg not only used native themes but wrote themes that were so Norwegian that it was difficult to tell whether they were his or Norway's.

His is beautiful music; there is a freshness in it that finds reflection in the cold waters of the fjords, a breeze blowing through his themes that comes from noble mountains.

WHITAKER-WILSON.

## A WIRELESS GUIDE

A handy notebook for valve users has just been issued by the General Electric Co., Ltd. This is far more than a catalogue of Osram valves. It is a useful book for the pocket, which forms a convenient station log and notebook.

## MORE RADIOGRAMS

ETHER searchers have picked up transmissions from a "mystery" station calling itself Radio Sonora and which, according to the language, would appear to be situated in Portugal. The broadcasts are carried out on 207 metres every Tuesday, Wednesday, Saturday and Sunday, between 11 a.m. and 1 p.m., and again from 9 to 11.30 p.m. Radio Portok, another private station situated at Oporto, continues to broadcast regularly on 240 metres. Concerts of gramophone records are to be heard every Monday, Wednesday and Friday between 11.30 and 1 p.m., and from 9 to 11.30 p.m.; on Tuesdays, Thursdays and Saturdays, tests are also made between 6.30 and 8.30 p.m. G.M.T.

Work on the buildings for the super-power Warsaw broadcasting transmitter at Raszyn has progressed so far that the Polskie Radjo chief engineer Vladyslav Heller has proceeded to Chelmsford (England) to carry out the final tests. The normal power of the transmitter will be 120 kilowatts in the aerial but should it be found necessary to do so, the energy can be increased substantially. It is expected that crystal reception will be obtained from these broadcasts within a radius of some 400-500 kilometres.

The Paris "mystery" station Experimental Radio has informed the French press that its transmissions will be resumed on October 25. Simultaneous broadcasts on 299.5 metres (300 watts) and on 40.9 metres (6 kilowatts) are to be carried out daily between 2 and 5 and from 6 to 7 p.m. G.M.T.

On Sunday, October 5, the Lille (PTT) station having been informed of the destruction of the airship R101, steps were immediately taken by the local authorities to send a mobile transmitter to the scene of the catastrophe. Special descriptive broadcasts were carried out at 2.50, 5.50 and 9.15 p.m. G.M.T., the second one being relayed to the Ecole Supérieure and to the Eiffel Tower (Paris). At 9.40 p.m. a full description was transmitted in German, picked up by Berlin and relayed to a number of German stations.

The P.M.G. of Australia recently announced that he has accepted the tender of Standard Telephones and Cables (Australia), Ltd., for five radio relay transmission stations. The five stations will be

*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.**

erected near Newcastle, Rockhampton, Warwick, in the district between Albury and Corowa and in the vicinity of Port Pirie.

The First Scottish National Radio Exhibition is announced to take place in the Waverley Market, Edinburgh, from November 12 to 22. Stand accommodation is reported to have been well taken up.

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IT should be noted that incorrect prices were given in error in the READY RADIO CO.'s advertisement on page 569 of last week's issue for the "Challenge Four" kits. Kit "A" costs £8 6s. 9d. (or twelve monthly payments of 15s. 3d.), kit "B" costs £11 5s. 9d. (or twelve payments of £1 0s. 9d.), and kit "C" costs £12 18s. 3d. (or twelve payments of £1 3s. 9d.).

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

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

# Postcard Radio Literature

***How it is Done***

I HAVE already advised you to get in touch with Radio Service (London) Ltd., if you want to settle accumulator troubles once for all. They have just sent me a folder, which you should have, showing how it is possible to hire out H.T. and L.T. batteries at very low charges. **75**

***New Cabinet Ideas***

I am very much impressed by the new cabinet designs which Camco (the Carrington Manufacturing Co., Ltd.) have produced for the new season. There are some fine transportable cabinets and several handsome "boxes" which will do justice to the very best radio-gramophone layout. Get the new sheet illustrating these. **76**

***Those Switches***

There is nothing like a poor switch to spoil the sweet control of a set. Very good switches for all purposes and for switching in high-voltage mains circuits, are made by Claude Lyons, Ltd. Before you buy, you should write for a new booklet describing the whole range of switches. **77**

***Cheap H.T.***

Please don't be deterred from enjoying the advantages of a mains eliminator on account of the cost. H. Clarke & Co. (Manchester), Ltd., have sent me a folder showing how Atlas eliminators can be obtained on hire-purchase terms; and the initial deposits are very low. **78**

***A Non-Spill Problem***

Some users of non-spill accumulators prefer to have those types in which free acid is between the plates, and not jelly electrolyte. A good example of this type is the Edwards non-spilling accumulator which can be obtained in many different capacities. A leaflet telling all about things is issued by the manufacturers, Rowland, Edwards and Co., Ltd. **79**

***Colverstat Resistances***

The Colvern coil people are specialising in a new line, accurate wire-wound resistances on glass formers. There are many uses for these heavy-duty Colverstats, and I am very interested in a folder just received, describing the types to be had and the various ways in which they can be used.

OBSERVER. **80**

***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.***

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Talisman Two (D, Trans) .. .. .. AW194
No-battery A.C. Mains Two (D, Trans) .. AW230
No-battery Gramo-radio 2 (D, Trans) .. AW238
1930 Talisman 2 (D, Trans) .. .. .. AW239
Easy Tune Short-wave 2 (D, Trans) .. .. AW242
Searcher Two (D, Trans) .. .. .. AW245
Arrow Two (D, Trans) .. .. .. .. AW249
Forty-five-shilling Two (D, 8 Trans) .. .. AW250
Brookman's Two (D, Trans) .. .. .. WM168
New Crusader (D, Trans) .. .. .. WM182
Radio-Record Two (SG, D) .. .. .. WM187
Gleaner Two (D, Trans) .. .. .. WM201
Music Monitor (D, Trans) .. .. .. WM208
Merlin Two (A.C. Set) .. .. .. .. WM213

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1930 Ether Searcher (SG, D, Trans) .. .. AW211
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Britain's Favourite Three 1930 (D, 2 Trans) .. AW243
Car Three (D. R.C. Trans) .. .. .. AW244
The "A.W." Exhibition 3 .. .. .. .. AW247
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Brookman's Three (SG, D, Trans) .. .. WM161
Community Three (D, RC, Trans) .. .. WM164
Brookman's Push-Pull Three (SG, D, Trans) 1/6 WM170
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Concert Three (D, 2 Trans) .. .. .. WM199
New Lodestone Three (HF, D, Trans) .. .. WM205
De-Luxe Three (D, RC, Trans) .. .. WM209
Five-Point Three (SG, D, Trans) .. .. WM212
Falcon Three (A.C. Set) .. .. .. WM217
New Brookman's Three (SG, D, Trans) .. WM218

## FOUR-VALVE SETS (1s. 6d. each)

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Transportable Four (SG, D, 2 RC) .. .. WM180
Super Q4 (SG, D, 2 Trans) .. .. .. WM189
Lodestone Four (HF, D, RC, Trans) .. .. WM193
Searcher's Four (SG, D, RC, Trans) .. .. WM194
Invitation Four (SG, D, RC, Trans) .. .. WM200
Regional Band-pass Four (SG, D, RC, Trans) WM211
Five-Point Four (SG, D, RC, Trans) .. .. WM216

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All-wave Lodestone Five (HF, D, RC, Push-pull) WM146
1930 Five (2HF, D, RC, Trans) .. .. WM171
Dual-screen Five (2SG, D, RC, Trans) .. WM185
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Overseas Five (3SG; D, Trans) .. .. .. WM191

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Two-valve Amplifier .. .. .. .. AW216
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Amateur Wireless — COUPON Available until Saturday NOVEMBER 1, 1930

Printed in England. Published by Bernard Jones Publications, Ltd., 58/61 Fetter Lane, London, E.C.4
Sole Agents for South Africa: CENTRAL NEWS AGENCY, LIMITED. Sole Agents for Australasia: GORDON & GOTCH, LIMITED. Saturday, October 25, 1930.